

# CONSTRUCTION MANAGEMENT

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## Academic Programs

Program name	Program type
Construction Management	BS, Minor
Cross Disciplinary Studies Minor in Heavy Civil	Minor
Real Property Development	Minor

The professional constructor plays the central role in building and maintaining the infrastructure of this country and in markets around the world, making significant contributions throughout the planning, design, construction, and facilities management phases of major projects. The curriculum of the Construction Management program is specifically designed to prepare young men and women to fill this essential role. Building on a solid foundation in architecture, engineering, and business, the curriculum introduces students to construction methods and materials; to the techniques used to manage budgets, schedules, quality, and safety; to the varied contracting approaches used to deliver today's complex construction projects; and to the leadership and teamwork skills demanded by this profession. This curricular content is delivered in a unique, project-based environment that explores how these management principles are applied in each of the construction sectors, such as, commercial building, residential, heavy/civil, industrial, and specialty.

The vision of the department is "Building Leaders through Collaboration and Innovation." As stated in our mission, "The Cal Poly Construction Management program builds innovative leaders in the construction industry". Based on this mission, the department is proud to embody the values of this polytechnic university which "promotes the application of theory to practice". We are committed to, believe in, and are faithful to continuously improving construction education by these core values:

- Project Based Learning
- Collaboration
- Learn by Doing
- Environmental Responsibility
- Diversity and Inclusion
- Service to communities, organizations, and societies
- Professionalism and Leadership
- Technology Integration
- Undergraduate Research
- Ethical Integrity
- Life-Long Stewardship of the CM department

Due to the department's close association with practitioners in the industry, many professional development opportunities are provided for our students. Over 200 companies per year recruit for internships, co-ops, and permanent job placements directly through the department. Through our Professional Advancement for Construction Students (PACS) program, students are systematically introduced to and encouraged to participate with the major associations and societies representing this industry. These opportunities include participation in the Associated

Students of Construction Management (ASCM), which serves as the umbrella organization for many student professional chapters and clubs including AGC, ABC, CMAA, DBIA, NAHB, MCAA, NECA, Women in Construction, Building Information Modeling, Emerging Green Professionals, and Sigma Lambda Chi, the national honorary society for construction students. Extensive interaction with industry brings practicing professionals into the classroom and students out to the jobsites of projects throughout the region. Finally, student participation in regional and national project management competitions gives our students the opportunity to test their knowledge and management skills against teams of students from other universities.

For both first time Freshmen and transfer students from community colleges, the Construction Management faculty and staff are committed to providing the best education possible for the future generation of leaders in the construction profession. These future constructors are educated in modern, state-of-the-art facilities utilizing the technology typical of the companies for whom they will work. They benefit from a unique, interdisciplinary program that has been accredited by the American Council for Construction Education (ACCE) since 1978. The program at Cal Poly remains one of the largest and most respected Construction Management programs in the United States.

## Transfer Students

Transfer students are welcome in the Construction Management program and should contact the department for advising help with efficiently scheduling their graduation requirements. Most lower division courses may be completed at most California Community Colleges. Full time students who have successfully completed these lower division courses prior to transferring into the department can usually anticipate graduating in six or seven quarters. Transfer students should work closely with their assigned advisors before registering for classes every quarter to ensure efficient progress to degree.

## Laptop Requirement

The department has a requirement that all students have a laptop computer. Most Construction Management classes emphasize cooperative projects/assignments, and a laptop computer provides the required mobility to facilitate collaboration. Most construction management software packages are designed to operate on a PC platform, so it is highly recommended that student laptop computers are loaded with the Windows operating system regardless of the manufacturer of the computer. See <https://construction.calpoly.edu/content/prospective/laptop-requirements> (<https://construction.calpoly.edu/content/prospective/laptop-requirements/>) for the current departmental laptop recommendations. Financial aid may be available to help cover the cost of the laptop computer - contact the Financial Aid Office (<http://financialaid.calpoly.edu/>) for more information.

## Undergraduate Programs BS Construction Management

The Construction Management Department is the only one of its kind housed in a college that includes all of the other planning and design professions that define the built environment: Architecture, Architectural Engineering, Landscape Architecture, and City and Regional Planning.

## Construction Management Minor

The Construction Management Minor provides students with an introduction to the body of knowledge expected of persons pursuing careers in the construction industry. This minor focuses on the materials, means and methods which encompass the construction process.

The Construction Management Minor will give students a competitive edge when applying for certain jobs in the built environment and is recommended for majors in architecture, architectural engineering, business, civil engineering, mechanical engineering, and electrical engineering. Contact the department for more information.

## Cross Disciplinary Studies Minor in Heavy Civil

The Heavy Civil Minor is designed to prepare Construction Management and Civil Engineering students for careers in the heavy civil sector of the construction industry. Graduates in this field will have careers in the heavy civil sector of the construction industry, where they will help manage heavy civil projects such as highways, bridges, dams, water treatment facilities, power plants, and other large-scale infrastructure throughout the US and the world.

This minor is intended for students in the CM and CEENV Departments and acceptance to the minor is competitive. Contact the departmental offices of either major for more information about the application process. Application is normally made during a student's second year of study at Cal Poly. Coursework will be completed in both departments leading to common upper division courses, two courses specific for the heavy civil minor, and a heavy civil internship required in the summer of the student's second or third year.

## Real Property Development Minor

The department offers a Real Property Development Minor. Please see the College of Architecture and Environmental Design (<https://catalog.calpoly.edu/collegesandprograms/collegeofarchitectureandenvironmentaldesign/#minortext>) for more information.

### CM Courses

#### CM 102. Introduction to Construction Management. 2 units

Term Typically Offered: F, W, SP

Introduction to the fundamental concepts and overview of the essential elements associated with the construction profession, to include: construction trends, ethics, safety and health issues, and professional practice methods. 2 lectures.

#### CM 113. Construction Materials and Assemblies. 2 units

Term Typically Offered: F, W, SP

Recommended: CM 102.

Exploration of the various materials, assemblies, and processes used and applied in the building construction process. Includes presentation, discussion, analysis, study and research of construction materials and assemblies. 2 lectures.

#### CM 114. Construction Materials and Assemblies Lab. 2 units

Term Typically Offered: F, W, SP

Corequisite: CM 113. Recommended: CM 102.

Exploration of the various materials, assemblies, and processes used and applied in the building construction process. Includes presentation, discussion, analysis, study and research of construction materials and assemblies. 2 laboratories.

#### CM 115. Fundamentals of Construction Management. 6 units

Term Typically Offered: F, W, SP

Prerequisite: ARCE 106 or CM 113; MATH 141; and PHYS 141.

Production of drawings and specifications for residential and light commercial construction. Integration of scheduling, estimating, codes, and contracts with a project based approach. Manual drawing techniques and computer aided drafting with building information modeling develop visualization skills for architectural systems. 4 laboratories, 2 activities.

#### CM 214. Residential Construction Management. 5 units

Term Typically Offered: F, W, SP

Prerequisite: CM 115, PHYS 132 or PHYS 142, or CHEM 124. Corequisite: CM 232.

Materials, methods, and techniques associated with residential and light commercial construction operations. Topics include shallow foundations, timber and masonry framing, roofing, and exterior and interior finishes. Scheduling, estimating, and construction contracts are integrated into a project based approach. 3 laboratories, 2 activities.

#### CM 232. Evaluation of Cost Alternatives. 3 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 142 or MATH 182.

Basic principles of economic evaluations using fundamental concepts of time value of money to compare cost alternatives related to construction, design, and real property development. 3 lectures.

#### CM 239. Construction Surveying. 4 units

Term Typically Offered: F, W, SP

Prerequisite: MATH 119 or equivalent.

Theory and practice of plane surveying with an emphasis on construction applications. Topics include property use and care of survey equipment and instruments, distance measurement, leveling, angular measurement, construction layout, basic roadwork, and as-built surveys. 3 lectures, 1 laboratory.

#### CM 280. Building Information Modeling. 2 units

Term Typically Offered: F, W, SP

Prerequisite: CE 113 or CM 115.

Use of building information modeling software to emphasize residential, commercial, and heavy civil assembly methods and techniques. BIM drafting applications integrated with construction materials, details, and assemblies supporting the understanding of the construction building process. Course may be offered in classroom-based, online, or hybrid format. 2 activities.

**CM 310. Construction Means and Methods. 4 units**

Term Typically Offered: F, SP

Prerequisite: CM 113 or CE 259 or ARCE 106.

Construction means, methods, and techniques related to the built environment including residential, commercial, heavy civil and HVACR construction. Focus on the major construction material assemblies and systems with an emphasis on constructability, best practices, and application. Field trips required. 4 lectures.

**CM 313. Commercial Construction Management. 5 units**

Term Typically Offered: F, W, SP

Prerequisite: ARCE 212 and CM 214. Corequisite: CM 280 and CM 334.

Materials, methods, and techniques associated with large commercial and institutional construction operations. Topics include building systems analysis of foundations, waterproofing, structural framing, exterior cladding, and finishes. Scheduling, estimating, and construction contracts are integrated into a project based approach. 3 laboratories, 2 activities.

**CM 314. Heavy Civil Construction Management. 5 units**

Term Typically Offered: F, W, SP

Prerequisite: CM 239 or BRAE 239; CM 313 or CM/CE 371.

Materials, methods, and techniques associated with civil engineering projects and heavy construction operations. Topics include tunnel, bridge, dam, and road construction; equipment selection; and temporary structures. Scheduling, estimating, and construction contracts are integrated into a project based approach. 3 laboratories, 2 activities.

**CM 317. Sustainability and the Built Environment. 4 units**

Term Typically Offered: F,W,SPSU

2020-21 or later: Upper-Div GE Area B

2019-20 or earlier catalog: GE Area B5, B6, or B7

Sustainability Focused

Prerequisite: Junior standing; completion of GE Area A with grades of C- or better; one course in GE Area B4 with a grade of C- or better (GE Area B1 for students on the 2019-20 or earlier catalogs).

Interdisciplinary analysis of sustainable strategies and technologies to enhance the built environment. A systems approach to green building science that includes sustainable site development, water use efficiency, renewable energy, improving material use, indoor environmental quality, and design innovation. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE Area Upper-Division B (GE Areas B5, B6, or B7 for students on the 2019-20 catalog).

**CM 318. Housing and Communities. 4 units**

Term Typically Offered: F,W,SPSU

2020-21 or later: Upper-Div GE Area D

2019-20 or earlier catalog: GE Area D5

Sustainability Related

Prerequisite: Junior standing; completion of GE Area A with grades of C- or better; one course in GE Area B4 with a grade of C- or better (GE Area B1 for students on the 2019-20 or earlier catalogs); and one lower-division course in GE Area D.

An overview of the social, economic, environmental and cultural impacts of housing on communities and nations. Students are presented with varied perspectives to understand the different facets of housing and their impacts on the human experience. Course may be offered in classroom-based or online format. 4 lectures. Fulfills GE Upper-Division D (GE Area D5 for students on the 2019-20 or earlier catalogs).

**CM 334. Construction Law. 2 units**

Term Typically Offered: F, W, SP

Prerequisite: CM 115 and BUS 207.

The intersection of law and the construction industry. Topics of study include a survey of most major legal issues potentially encountered during construction activity. Course may be offered in classroom-based, online, or hybrid format. 2 activities.

**CM 335. Construction Accounting. 2 units**

Term Typically Offered: F,W,SPSU

Prerequisite: BUS 215 and CM 232.

Fundamentals of construction accounting principles to include income recognition, job cost control, cash flow analysis and associated cost reports. Course may be offered in classroom-based or online format. 2 activities.

**CM 371. Construction Management and Project Planning. 4 units**

Term Typically Offered: F, W, SP

Prerequisite: ARCE 106, CE 259 or CM 113.

Theory and practice of planning, scheduling, estimating, and reporting for construction projects. Fundamentals of scheduling logic including critical path, deterministic, and probabilistic scheduling; including the impact of constraints. Identifying resources and estimating time requirements for design activities and project operations. Not open to Architectural Engineering or Construction Management majors. 3 lectures, 1 activity. Crosslisted as CE/CM 371.

**CM 400. Special Problems for Advanced Undergraduates. 1-2 units**

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 6 units, with a maximum of 4 units per quarter.

**CM 411. Specialty Contracting Construction Management. 5 units**

Term Typically Offered: F, W, SP

Prerequisite: CM 313.

Materials, methods, and techniques associated with mechanical, electrical, and plumbing systems. Topics include heating, ventilating, air conditioning, power distribution, grounding, lighting, communication, fire detection/protection, and plumbing. Integration of scheduling, estimating, and construction subcontracts with a project based approach. 3 laboratories, 2 activities.

**CM 413. Jobsite Construction Management. 5 units**

Term Typically Offered: F,W,SP,SU

Prerequisite: CM 214 or CM 313.

Management activities applicable to the construction process involving techniques, applications, and theory needed in a jobsite environment. Addresses the relationships, roles, and perspectives of all stakeholders. Integrated utilization of temporary structures associated with field construction. Course may be offered in classroom-based, online, or hybrid format. 3 laboratories, 2 activities.

**CM 415. Integrated Project Delivery. 4 units**

Term Typically Offered: TBD

Prerequisite: CM 413 and CM 480.

Team based collaborative effort to analyze and evaluate the unique interdisciplinary challenges associated with coordinating and integrating the design and construction processes to deliver a project with respect to the design, budget, schedule, quality, and performance expectations of a client. Not open to students with credit in CM 450. 4 laboratories.

**CM 420. Service / Experiential Learning. 1-6 units**

Term Typically Offered: SP

Prerequisite: Third-year standing.

Service and project-based learning and teaching techniques as applied to a variety of construction management concepts. Goals and objectives achieved through service-learning, project-based, and/or experiential pedagogical approaches. The Class Schedule will list topic selected. Total credit limited to 8 units. 1-6 activities.

**CM 421. Emerging Trends. 1-6 units**

Term Typically Offered: TBD

Prerequisite: Third-year standing.

Emerging trends related to construction management concepts and practices. Goals and objectives achieved through analysis, study, and research of a particular construction emerging trend. The Class Schedule will list topic selected. Total credit limited to 8 units. Course may be offered in classroom-based, online, or hybrid format. 1 to 6 activities.

**CM 422. Professional Preparation. 1-6 units**

Term Typically Offered: F, W, SP

Prerequisite: Third-year standing.

Professional practice related to the construction management industry. Goals and objectives achieved through analysis, study, and preparation for a particular professional practice. The Class Schedule will list topic selected. Total credit limited to 8 units. Course may be offered in classroom-based, online, or hybrid format. 1 to 6 activities.

**CM 423. Construction Materials / Assemblies. 1-6 units**

Term Typically Offered: TBD

Prerequisite: Third-year standing.

Various materials and assemblies related to construction process. Goals and objectives achieved through analysis, study, and research of a particular construction material and/or assembly. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 6 activities.

**CM 424. Construction Technology. 1-6 units**

Term Typically Offered: SU

Prerequisite: Third-year standing.

Technology related to construction management education and the construction industry. Goals and objectives achieved through analysis, study, and research of a particular construction technology. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 6 activities.

**CM 425. Sustainability and Environment. 1-6 units**

Term Typically Offered: TBD

Sustainability Focused

Prerequisite: Third-year standing.

Sustainable and environmental issues related to the construction industry. Goals and objectives achieved through analysis of a particular construction related sustainable and/or environmental issue. The Class Schedule will list topic selected. Total credit limited to 8 units. Course may be offered in classroom-based, online, or hybrid format. 1 to 6 activities.

**CM 426. International Construction Studies. 1-6 units**

Term Typically Offered: TBD

Prerequisite: Third-year standing.

Exploration of international construction studies through several potential teaching techniques, including field trips to countries overseas, research and case studies of companies and projects, and management skills and leadership as they relate to international construction. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 6 activities.

**CM 436. Heavy Civil Temporary Structures and Shoring. 4 units**

Term Typically Offered: W

Prerequisite: ARCE 315 or CE 352; and CM 314.

Design and construction of retaining walls, concrete formwork, falsework, scaffolding, ramps, platform, bracing, and guying as applied to heavy civil projects. Field trip may be required. 2 lectures, 2 laboratories. Crosslisted as CE/CM 436.

**CM 437. Heavy Civil Projects and Equipment. 4 units**

Term Typically Offered: SP

Prerequisite: CM 314.

Heavy civil projects logistics, construction, operations, planning, management, workflow and sequencing, equipment management, fleet configuration and maintenance, equipment productivity and cost optimization. 2 lectures, 2 laboratories. Crosslisted as CE/CM 437.

**CM 443. Management of the Construction Firm. 3 units**

Term Typically Offered: F, W, SP

Prerequisite: CM 334; CM 335; and CM 413.

Applications of strategic management techniques and business strategy for managing and long-range planning of the construction firm. 3 activities.

**CM 450. Integrated Project, Design and Program Management. 5 units**

Term Typically Offered: F, W, SP

Prerequisite: STAT 251 or STAT 312, CM 313 and CM 334.

Evaluation of roles and relationships of owner, designer, and construction professionals over project life cycles. Modeling, conceptual estimating, lean scheduling, contract selection, integrated delivery, design management, program management, and influential leadership strategies and techniques. Not open to students with credit in CM 415. Course may be offered in classroom-based, online, or hybrid format. 3 laboratories, 2 activities.

**CM 460. Senior Project Methodology. 2 units**

Term Typically Offered: F, W, SP

Prerequisite: CM 313; junior standing; Construction Management majors only.

Introduction to senior project processes, timelines, requirements, and best practices including topic selection, literature review, methodology, and paper formatting. 2 lectures.

**CM 461. Senior Project I. 1 unit**

Term Typically Offered: F, SP

Prerequisite: CM 460 and consent of project advisor. See department for additional guidelines and requirements.

Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. Student proposal must be submitted and approved by project advisor prior to registration for course. Construction and team projects encouraged.

**CM 462. Senior Project II. 1 unit**

Term Typically Offered: F, W, SP

Prerequisite: CM 460 and consent of project advisor. See department for additional guidelines and requirements.

Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. Student proposal must be submitted and approved by project advisor prior to registration for course. Construction and team projects encouraged.

**CM 463. Senior Project: Professional Practice for Constructors. 3 units**

Term Typically Offered: TBD

Prerequisite: CM 413. Corequisite: CM 443.

Practical application of construction management theory and practice solving problems related to the built environment. 3 laboratories.

**CM 470. Selected Advanced Topics. 1-4 units**

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures.

**CM 471. Selected Advanced Laboratory. 1-4 units**

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.

**CM 475. Real Property Development Principles. 4 units**

Term Typically Offered: F, SP

Prerequisite: Minimum junior standing.

Development process and its major actors: investors, developers, government agencies, environmental and local stakeholders; their development roles, objectives, approaches. Basics of urban markets and economics, financing, regulation, public planning; value added, contractual, environmental and community context factors. Course may be offered in classroom-based, online, or hybrid format. 4 lectures.

**CM 480. Preconstruction Integration and Planning. 2 units**

Term Typically Offered: TBD

Prerequisite: CM 313.

Examination of the role of preconstruction services, team integration, and joint design planning in several Integrated Project Delivery (IPD) approaches. Various tools and techniques associated with preconstruction services and design planning from the proposal stage through the design stages of a project. 2 activities.

**CM 485. Cooperative Education Experience. 1-6 units**

Term Typically Offered: F, W, SP

CR/NC

Prerequisite: Consent of instructor.

Full-time work experience in an area directly related to the construction industry for 3 months. Positions are paid and usually require relocation and registration in course for one quarter. Registration in course is required at start of work experience. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. May be repeated for credit. Major credit limited to 6 units; total credit limited to 12 units. See department for additional requirements.

**CM 495. Cooperative Education Experience. 12 units**

Term Typically Offered: TBD

CR/NC

Prerequisite: Consent of instructor.

Full-time work experience in an area directly related to the construction industry for 6 months. Positions are paid and usually require relocation for two consecutive quarters. Registration in course is required at start of work experience. Formal report and evaluation by work supervisor required. Credit/No Credit grading only. May be repeated for credit. Major credit limited to 6 units; total credit limited to 24 units. See department for additional requirements.



**CM 510. Principles of Integrated Facility Management. 4 units**

Term Typically Offered: TBD

Prerequisite: Consent of instructor.

Examination of the facility management profession and all functions associated with it, including strategic planning, financial planning, budgeting, project management, operations and maintenance, sustainability, and emergency preparedness, and how those functions interface with the overall goals of the business enterprise. Course offered online only. 4 lectures.

**CM 521. Construction Cost Estimating and Work Procurement. 4 units**

Term Typically Offered: TBD

Prerequisite: Consent of program coordinator.

Examination of the construction discipline of cost estimating and pre-construction activities, emphasizing both the core and higher functions associated with types of estimates, measuring and pricing, bidding procedures and strategies, procurement, pre-construction services, budget, and cost control analysis. 4 lectures.

**CM 522. Construction Planning, Scheduling, and Impact Analysis. 4 units**

Term Typically Offered: TBD

Prerequisite: Consent of program coordinator.

Examination of the construction discipline of planning, scheduling, management, and control relating to both core and higher functions associated with network diagram analysis, CPM scheduling, project diagnostics, short interval, resource loaded, pull scheduling, forecasting, and earned value management techniques. 4 lectures.

**CM 523. Construction Contracts and Law. 4 units**

Term Typically Offered: TBD

Prerequisite: Consent of program coordinator.

Examination of the discipline of law and contracts as they relate to the construction industry, including both the core and higher functions associated with the construction process, business organization, employment responsibilities, liability, damages, claims, dispute resolution, and risk management. 4 lectures.

**CM 524. Construction Project Management and Control. 4 units**

Term Typically Offered: TBD

Prerequisite: Consent of program coordinator.

Examination of the discipline of construction project management and control relating to both the core and higher functions associated with the construction process, pre-construction services, and management in the areas of safety, quality, resource, risk, schedule, budget, changes, and value. 4 lectures.

**CM 525. Construction Workforce, Productivity, and Safety. 4 units**

Term Typically Offered: TBD

Prerequisite: Consent of program coordinator.

Examination of the disciplines of workforce productivity and safety as they relate to the construction industry, including both the core and higher functions associated with field personnel management, construction operations, lean construction techniques, equipment utilization, productivity, and OSHA regulations. 4 lectures.

**CM 570. Selected Advanced Topics in Construction Management. 4 units**

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed study of selected topics in Construction Management. The Class Schedule will list topic selected. Total credit limited to 12 units. 4 seminars.

**CM 571. Selected Advanced Laboratory. 1-4 units**

Term Typically Offered: TBD

Prerequisite: Graduate standing or consent of instructor.

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. The Class Schedule will list topic selected. Total credit limited to 8 units. 1 to 4 laboratories.