

# Construction Management (CM)

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## COURSES

### **CM 1311. CONSTRUCTION DRAFTING. 3 Hours.**

Introduction to computer aided drafting, using AutoCAD.

### **CM 1331. CONSTRUCTION SURVEYING. 3 Hours.**

Introduction to surveying including distance measurement, corrections, leveling, measurement of angles and directions, traverse adjustment, volumes, cross section and area computations, and error theory. Methods and technologies such as Excel, MathCAD, global positioning system and geographic information systems used to manage data in surveying. Emphasis on the use of total stations. Prerequisite: Grade of C or better in CM 1311.

### **CM 2311. INTRODUCTION TO CONSTRUCTION MANAGEMENT. 3 Hours.**

Characteristics of the construction industry; types of construction companies, contracts, people involved in a project, their responsibilities and interrelationships; ethical conduct; evolution of a project; interpreting working drawings; construction bonds; contract documents.

### **CM 2313. CONSTRUCTION MATERIALS AND METHODS. 3 Hours.**

Materials, methods and sequences of the construction process; emphasis on design, specification, purchase and use of concrete, steel, masonry and wood. An understanding of the uses of construction materials. Prerequisite: Grade of C or better in CM 2311.

### **CM 2315. INTRODUCTION TO MECHANICS FOR CONSTRUCTION. 3 Hours.**

Structural behavior in buildings; forces, moments, support reactions; free-body diagrams, equilibrium; internal forces in columns and beams; deflection; buckling. Prerequisite: Grade of C or better in MATH 1303 and PHYS 1441.

### **CM 2331. CONSTRUCTION DOCUMENTS. 3 Hours.**

Introduction to construction documents and applicable software for use in communicating building design intentions to field personnel, including an understanding of how to interpret, explain, quantify and use construction documents to bid, construct and manage construction projects. Prerequisite: Grade of C or better in CM 2311.

### **CM 2391. PROBLEMS IN CONSTRUCTION MANAGEMENT. 3 Hours.**

Selected problems in construction management on an individual or group basis. Reference material is assigned and progress conferences are held frequently, by arrangement, with a faculty supervisor. Prerequisite: Permission of the chair of the department.

### **CM 3313. CONSTRUCTION ESTIMATING I. 3 Hours.**

Systems approach to determining required quantities of construction materials; quantification of various types of foundation systems, structural systems and building envelope systems; excerpts of contract documents from a variety of different building projects and materials; plan reading. Prerequisite: Grade of C or better in CM 2311 and CM 2331; Permission of the CE Chair or admission to the CM Professional Program.

### **CM 3315. CONSTRUCTION LAW AND ETHICS. 3 Hours.**

Introduction to basic contract and tort issues and their application in the construction industry; delineation of the various types of contracts and remedies available to parties involved in a construction project; additional related topics including bidding, delays, mechanics liens, site conditions, warranties and the Uniform Commercial Code as it relates to the construction industry. Prerequisite: Grade of C or better in CM 2311 and CM 2313; Permission of the CE Chair or admission to the CM Professional Program.

### **CM 3331. MECHANICAL AND ELECTRICAL SYSTEMS. 3 Hours.**

Mechanical and electrical systems with a major emphasis on estimating and installation, design and control of the electrical, heating, ventilation and cooling system, site planning and acoustical treatments. Prerequisite: Grade of C or better in PHYS 1442; Permission of the CE Chair or admission to the CM Professional Program.

### **CM 3333. CONSTRUCTION DESIGN I. 3 Hours.**

The principles flexure and shear, deflections, buckling are used to consider design/build construction including building systems, building codes, criteria and selection, economic feasibility, value engineering, customer control, and value-added construction services as well as an introduction to Building Information Modeling BIM. Prerequisite: Grade of C or better in CM 2315; Permission of the CE Chair or admission to the CM Professional Program.

### **CM 3335. SOILS AND FOUNDATION IN CONSTRUCTION. 3 Hours.**

Introduction to soil types found on construction projects; properties and classification of soil, embankment control, dewatering, excavation supports, foundations, piers, and pilings. Prerequisite: Grade of C or better in CM 2315; Permission of the CE Chair or admission to the CM Professional Program.

### **CM 3337. CONSTRUCTION ADMINISTRATION AND ECONOMICS. 3 Hours.**

Project planning, cost controls, and construction related financial documents including: schedule of values, labor and operations cost reports, income statements, balance sheets and construction budgets; emphasis on the development of techniques required to ethically and effectively monitor the financial aspects of a construction project. Prerequisite: Grade of C or better in CM 2331 and MATH 1303; Permission of the CE Chair or admission to the CM Professional Program.

### **CM 3339. CONSTRUCTION SAFETY. 3 Hours.**

Examines the application of OSHA 29CFR 1926 for the construction industry along with applicable state and federal construction safety laws pertaining to construction, alterations, or repair work at a construction site. Prerequisite: Grade of C or better in CM 2331; Permission of the CE Chair or admission to the CM Professional Program.

**CM 3341. CONSTRUCTION DESIGN. 3 Hours.**

Application of statics and strength of materials for design and construction of concrete, masonry, steel, and timber building structures. Prerequisite: Grade of C or better in CM 2313 and CM 2315.

**CM 4111. CONSTRUCTION MANAGEMENT CAPSTONE I. 1 Hour.**

This course is the first in the Construction Management capstone series and provides project definition, project planning, scheduling, and results in a presentation and plan for implementing during Capstone II. Prerequisite: Grade of C or better in CM 3333; Permission of the CE Chair or admission to the CM Professional Program.

**CM 4300. ADVANCED TOPICS IN CONSTRUCTION MANAGEMENT. 3 Hours.**

Advanced topics of current interest in any one of the various fields of construction management. The subject title to be listed in the class schedule. May be repeated for credit when topic changes. Prerequisite: Admission to the professional program and consent of the department chair.

**CM 4301. ADVANCED TOPICS IN CONSTRUCTION MANAGEMENT WITH LAB. 3 Hours.**

Advanced topics of current interest in any one of the various fields of construction management. The subject title to be listed in the class schedule. May be repeated for credit when topic changes. Prerequisite: Admission to the professional program and permission of the chair of the department.

**CM 4304. CONSTRUCTION CONTRACTS. 3 Hours.**

Types of construction contracts, contractual relationship between general contractor and owner, contractual relationship between general contractor and subcontractors, legal issues in construction administration, insurance, and concepts in value engineering. Reading and evaluating specifications, CSI Master Format. Prerequisite: Grade of C or better in CM 3315 and CM 3337; Admission to the CM Professional Program.

**CM 4306. BUILDING CONSTRUCTION CONTRACTS. 3 Hours.**

Types of construction contracts, contractual relationship between general contractor and owner, contractual relationship between general contractor and subcontractors, legal issues in construction administration, insurance, and concepts in value engineering. Reading and evaluating specifications, CSI Master Format. Prerequisite: Grade of C or better in CM 3315; Grade of C or better in CM 3337; Admission to the CM Professional Program.

**CM 4313. CONSTRUCTION DESIGN II. 3 Hours.**

Application of statics and strength of materials for construction of steel buildings with computer analysis and design. Prerequisite: Grade of C or better in CM 3333 and Admission to the CM Professional Program.

**CM 4315. CONSTRUCTION ESTIMATING II. 3 Hours.**

Quantification and pricing of direct field costs and general condition costs from construction documents; the preparation of complete lump sum bid package ready for project execution; utilization of complete set of contract documents required; plan reading. Prerequisite: Grade of C or better in ACCT 2301 and CM 3313 and Admission to the CM Professional Program.

**CM 4317. CONSTRUCTION SCHEDULING. 3 Hours.**

An introduction to construction project management scheduling covering concepts of project selection and scheduling, utilizing the estimate to predict the schedule, scheduling subcontracting, cost controls, project documentation, construction bonds, insurance, payments and the elements of close out; development of professional communication skills through student prepared multi-media presentations. Prerequisite: Grade of C or better in CM 3313 and Admission to the CM Professional Program.

**CM 4331. CONSTRUCTION MANAGEMENT CAPSTONE. 3 Hours.**

Utilize information from all previous courses to give an understanding of the construction management profession culminating in a semester project and presentation. A response to an RFP announcement or bid will be prepared for each team project. Prerequisite: Grade of C or better in CM 4315, CM 4317, CM 4351, and CM 4357; Completion of all required 3000 level CM courses; Admission to the CM Professional Program.

**CM 4332. CONSTRUCTION FIELD OPERATIONS. 3 Hours.**

Introduction to the construction industry and the methods, equipment, and management techniques used. Topics include equipment operating characteristics, underground construction, job site safety, and field management. Prerequisite: Grade of C or better in CM 2313 and CM 3335; Admission to the CM Professional Program.

**CM 4335. GEOTECHNICAL ASPECTS OF CONSTRUCTION. 3 Hours.**

Review of engineering geology and soil mechanics; interpretation of geotechnical reports; site preparation; ground improvement; excavation including supports and dewatering; foundations including consideration of deep foundations and expansive soils; tunneling in soils and rock. Prerequisite: Grade of C or better in CM 3335 and admission to the CM Professional Program.

**CM 4337. LAND AND SITE DEVELOPMENT. 3 Hours.**

Introduction to site planning and its process. This course covers important characteristics of Site Planning involved in a construction project including land features, uses, buildings, regulations, local community cultures, and site analysis and planning. Students will work on developing a site plan for the end of semester project. Prerequisite: Grade of C or better in CM 1331 and CM 3335; Admission to the CM Professional Program.

**CM 4351. BUILDING INFORMATION MODELING FOR CONSTRUCTION MANAGEMENT. 3 Hours.**

Introduction to techniques used in development and management of Building Information Models. Emphasis on constructability and management. Prerequisite: Grade of C or better in CM 3341 and admission to the CM Professional Program.

**CM 4353. RESIDENTIAL AND COMMERCIAL CONSTRUCTION. 3 Hours.**

A senior course for students preparing to enter the project management of residential and commercial construction projects, including: aspects of design, bidding/estimating, presentation, value engineering, contracts/negotiation, subcontractor relations, cost controls, management during construction, close out, and post-construction requirements. Prerequisite: Admission to the CM Professional Program.

**CM 4357. SUSTAINABLE BUILDING PRACTICE. 3 Hours.**

Ethics and application of environmental sustainability practice in building construction. Introduction to U.S. Green Building Council LEED program standards, methods, and procedures as applied to construction documents interpretation and construction. Prerequisite: Admission to the CM Professional Program.

**CM 4359. INDUSTRIAL INTERNSHIP I. 3 Hours.**

Program provides for a learning experience in a construction management environment appropriate to the undergraduate level of work with a minimum of 150 hours of work. A written report of the experience and a presentation are required. Prerequisite: Permission of instructor and admission to the CM Professional Program.

**CM 4360. INDUSTRIAL INTERNSHIP II. 3 Hours.**

Student to experience industrial internship under supervision of an industrial mentor and internship instructor. Prerequisite: CM 4359; Admission to the CM Professional Program.

**CM 4391. PROBLEMS IN CONSTRUCTION MANAGEMENT. 3 Hours.**

Selected problems in construction management on an individual or group basis. Reference material is assigned and progress conferences are held frequently, by arrangement, with a faculty supervisor. Prerequisite: Permission of the chair of the department and admission to the CM Professional Program.

**CM 5300. TOPICS IN CONSTRUCTION MANAGEMENT. 3 Hours.**

Topics of current interest in the field of construction management. The subject title is listed in the class schedule and in the student's record. Topics vary. May be repeated for credit when topic changes. Prerequisite: Consent of instructor.

**CM 5301. TOPICS IN CONSTRUCTION MANAGEMENT WITH LAB. 3 Hours.**

Topics of current interest in the field of construction management. The subject title is listed in the class schedule and in the student's record. Topics vary. May be repeated for credit when topic changes. Prerequisite: Consent of instructor.

**CM 5313. GEOTECHNICAL ASPECTS OF CONSTRUCTION. 3 Hours.**

Review of engineering geology and soil mechanics and teaching of the foundation and underground excavation construction solely to graduate students specializing in construction engineering & management. Topics include interpretation of geotechnical reports, embankment construction, foundations on expansive soils, excavation supports, excavation dewatering, deep foundation construction, tunneling in soft ground as well as in soft/hard rock, and trenchless technology piping. Prerequisite: CM 5378.

**CM 5339. STATISTICS FOR CONSTRUCTION. 3 Hours.**

Point estimation, interval estimation, sample size determination, tests of hypothesis, analysis of variance, linear regression, matrix methods for multiple linear regression, polynomial regression, transformations, non-linear regression. Prerequisite: Grade of C or better in CE 3301.

**CM 5340. CONSTRUCTION PROJECT ACQUISITION. 3 Hours.**

Fundamentals of acquiring the required goods and services necessary to fulfill the obligations of the construction contract. Service and subcontractor contracts, negotiating tactics and strategies, material pricing; and dispute resolution. The course includes negotiation practice based on typical construction acquisition situations to help prepare the student with experience of negotiating in the real world of construction and business. Prerequisite: Consent of instructor.

**CM 5342. CONSTRUCTION PROJECT ADMINISTRATION. 3 Hours.**

Topics in construction management and project administration, such as project delivery system, documentation and specification, electronic project administration, construction safety, risk allocation and liability sharing, changes and extra work, claims and disputes, and project closeout. Credit not granted for CE 4303 and CM 5342.

**CM 5343. BUILDING INFORMATION MODELING. 3 Hours.**

Introduction to current Building Information Modeling (BIM); Discussion of the role of BIM in Construction Engineering and Management; Revit Architecture, Structure, and MEP; Creating sets, building elements, structural systems, and MEP systems; BIM and clash detection; BIM and Construction Cost Estimating and Scheduling.

**CM 5344. CONSTRUCTION METHODS: FIELD OPERATIONS. 3 Hours.**

Introduction to the methods, equipment, and management techniques used in the construction industry. Topics include equipment operating characteristics, job site safety, and field management. Credit not granted for CE 4332 and CM 5344.

**CM 5345. INFRASTRUCTURE EVALUATION, MAINTENANCE, AND RENEWAL. 3 Hours.**

This course is designed for engineers and managers involved in infrastructure development, sustainability, and replacement. Topics include asset management, inspection, evaluation, maintenance, and renewal alternatives for waste collection and water distribution systems, surface and subsurface drainage, pavements, bridges, culverts, buildings, and other structures. Prerequisite: Consent of instructor.

**CM 5350. RISK MANAGEMENT. 3 Hours.**

The risk management process including risk identification, monitoring, and control; integrated quantitative cost and schedule risk analysis.

**CM 5355. CONSTRUCTION MATERIALS. 3 Hours.**

Principles of construction related to construction regulations and standards, loads, fire safety, acoustics, joints and sealants. Systems of construction involving concrete, steel, wood, masonry, sealants, and soil, and including excavations, below grade construction, formwork, cladding, joints, windows, doors, roofing, and ceilings.

**CM 5377. CONSTRUCTION FINANCE. 3 Hours.**

Financial aspects and job costing of a construction project. Includes project management principles, budgets, cost codes, cost-to-complete, and financial reports specific to the management of a construction company and project control.

**CM 5378. CONSTRUCTION CONTRACTS, SPECIFICATIONS, & ADMINISTRATION. 3 Hours.**

Types of construction contracts, contractual relationship between general contractor and owner, contractual relationship between general contractor and subcontractors, legal issues in construction administration, insurance, and concepts in value engineering. Reading and evaluating specifications, CSI Master Format. Credit not granted for CE 4304 and CM 5378. Prerequisite: Consent of instructor.

**CM 5379. CONSTRUCTION COST ESTIMATING. 3 Hours.**

Types of estimates, development of unit costs, quantity takeoff, cost estimating using manual methods and computerized cost estimating, budgets, and costs.

**CM 5381. PUBLIC PRIVATE PARTNERSHIP FOR INFRASTRUCTURE PROJECTS. 3 Hours.**

Public-private partnership (P3) arrangements as an innovative approach to deliver public infrastructure projects. Topics include P3 benefits, limitations, contracting and implementation strategies. Prerequisite: Grade of C or better in CE 3310 or IE 2308, or consent of instructor.

**CM 5382. CONSTRUCTION SUSTAINABILITY. 3 Hours.**

Introduction to International Code Council's 2012 International Building Code and USGBC's LEED® New Construction Guidelines v.3 for constructing sustainable/green buildings. Review of building occupancy categories, construction types, allowable height and area, life safety requirements, rated building assemblies, and egress. Site selection, energy and water efficiency, material reuse and indoor air quality. Credit not granted for CE 4307 and CM 5382.

**CM 5386. CONSTRUCTION PLANNING & SCHEDULING. 3 Hours.**

Construction productivity, planning, & scheduling of operations, flow charts, linear programming, critical path method (CPM), program evaluation review techniques (PERT), precedence networks. Computer methods.

**CM 5387. CONSTRUCTION PRODUCTIVITY. 3 Hours.**

Evaluation of construction project management's effectiveness. An investigation of the advanced techniques required for improvement of construction projects including time, cost, quality management, preplanning, field evaluation techniques, time-lapse photograph, safety, human factors, and communications. Prerequisite: CM 5379.

**CM 5388. PIPELINE CONSTRUCTION AND TRENCHLESS TECHNOLOGY. 3 Hours.**

Pipeline and utility design, construction and renewal. Topics include pipeline infrastructure structural considerations, planning and construction considerations, pipe materials, and trenchless technologies. Credit not granted for CE 4305 and CE 5388. Prerequisite: Consent of instructor.

**CM 5389. PIPELINE SYSTEMS ASSET MANAGEMENT. 3 Hours.**

Pipeline systems asset management, inventory, inspection, and life cycle costs. Topics include pipeline deterioration parameters, asset management technologies, risk assessment, government regulations, renewal technologies, and case studies. Credit not granted for CE 4306 and CE 5389. Prerequisite: Consent of instructor.