

Bachelor of Science in Construction Management

Undergraduate Programs

The following sections apply to each student majoring in any undergraduate program housed in the Civil Engineering Department: Architectural Engineering, Civil Engineering, and Construction Management. In these sections, "program" refers to any of these programs and "student" refers to any student (UCOL, Intended, or Professional Program) majoring in any one of these programs.

Refer to the College of Engineering section of this catalog for additional information concerning the following topics: Admission to the College of Engineering, Advising, Admission into the Professional Program, College of Engineering Academic Regulations, Honors Degrees in Engineering, Professional Engineering Licensure, and Cooperative Education.

Admission Requirements

Admission as an Architectural Engineering major, a Civil Engineering major, or a Construction Management major is subject to the relevant requirements and policies of the University of Texas at Arlington and of the UTA College of Engineering. The Civil Engineering Department does not impose additional requirements.

Transfer Credit

When a student transfers, a loss of credit can occur that may require change in academic plans. A course, that appears to be similar, may be different in either content or level of difficulty and, as a result, cannot be used for degree credit. Another course may have no equivalent in a particular degree plan. More than one transferred course may satisfy a degree requirement when only one is required. The UTA Civil Engineering Department encourages students interested in our programs to make early contact with our advisors so that we can help avoid these problems.

A student must earn a grade of C or better for a course to be transferred. Any course that is offered under the Texas Common Course Numbering system is accepted as equivalent to the corresponding UTA course. It is the responsibility of the student to establish the equivalence of any other course or courses to a course required in a program. The student should be prepared to provide a syllabus or similar documents to establish equivalence. To be acceptable as equivalent, at a minimum, a transferred course must have no less credit value than the corresponding course and contain substantially equivalent course content. To be accepted in transfer, junior and senior level courses must be taken at a college or university with the same accreditation as UTA in the area offering the course. For example, a Civil Engineering course must come from an ABET accredited Civil Engineering program.

When a student's record or performance indicates weakness in certain areas of study, they may be required to retake courses or to take additional courses.

Before enrolling in a course at another institution to transfer for credit toward a program degree, a student should consult with a program advisor to verify that the course can be used in the student's degree plan and to obtain the necessary written permission.

Advising

Academic advisement is required for every undergraduate student before class enrollment each semester.

A new student with fewer than 24 hours of transferrable credit, including any student entering directly from high school, is advised in the University Advising Center of University College. After one or more semesters and sufficient progress in the degree program, this student is released by the University Advising Center to the program advisors.

Prior to enrollment, a new student with 24 or more hours of transferrable credit must make an appointment with the transfer advisor of their program. However, if all of the student's transfer credit was earned at a Texas community college, an appointment may be scheduled with any advisor for their program. The advising appointment should be scheduled as soon as possible after admission, but certainly prior to registration. A transfer student should not make an advising appointment with a transfer advisor after the initial evaluation of their transfer credit is complete.

During each long semester, a specified period is set aside for the academic advisement of continuing students. Each continuing student is responsible for meeting with their program advisor during this advising period. Continuing students will receive instructions prior to each advising period related to preparing for and making an advising appointment. Academic advising will be available at other times but a student who does not meet with their program advisor during the regular advising period may have fewer alternatives when selecting courses.

Academic Rules, Regulations, and Policies

In addition to the rules, regulations, and policies established below and in the individual program sections, each student is subject to the rules, regulations, and policies of the University of Texas at Arlington and of the UTA College of Engineering. Each student should become familiar with these. The rules, regulations, and policies of the University of Texas at Arlington and of the UTA College of Engineering are set forth in other sections of this

catalog. It is the responsibility of each student to follow the applicable published rules. Failure to follow these rules may be grounds for dismissal from the program.

CE Department Course Requisites

- A student must have the written approval of their program advisor to register for any course that will satisfy a requirement of their degree program.
- A student must have specific written permission of their program advisor to register at a different institution for any course that will satisfy a requirement of their degree program.
- A student may not attempt a CE Department course without satisfying all current requisite requirements. A prerequisite course requirement is satisfied by earning a grade of C or better. A co-requisite course requirement is satisfied by earning a grade of C or better or by concurrent enrollment in the course at UTA.
- A student may not drop a course which is co-requisite to a CE Department course without also dropping the CE Department course.
- No professional program courses may be attempted until the student is admitted into the professional program or obtains the written permission of the Departmental Chair.

Repeating Courses

A student may not attempt any course more than three times and apply that course toward a program degree. Enrollment in a course for a period of time sufficient for assignment of a grade, including a grade of W, is considered an attempt.

Admission to the Professional Program

Requirements for admission to the professional program in each program are in accordance with those of the College of Engineering with the following added stipulations:

- Application to the professional program is to be made to the CE Department during the semester that the advancement requirements are being completed.
- Each student must complete all pre-professional courses stipulated under "Requirements for a Bachelor of Science Degree in" the program with a minimum grade of C in each course and a minimum GPA of 2.25 in: a) all courses, b) in all math, science, and engineering courses, and c) in all program specific courses.
- Upon receipt of the application, a student's record is individually reviewed including grades, academic and personal integrity, record of drops and course withdrawals, the order in which courses have been taken, the number of times a student has attempted a course for credit, and any other aspect of the student's record that may be deemed pertinent to admission.

The student must be admitted to the professional program and have an approved degree plan on file in order to graduate. The degree plan is generated upon entry to the professional program. Graduating seniors should apply to graduate during the next-to-last semester.

Grounds for Dismissal from the CE Program

A student whom the UTA Office of Student Conduct has found to have violated the UTA Code of Student Conduct a second time is subject to dismissal from the CE program.

Minor Field of Study

The Civil Engineering Department does not support the option of pursuing a minor in Architectural Engineering, in Civil Engineering, or in Construction Management by other engineering or non-engineering majors.

Educational and Professional Career Paths

The construction industry is one of the largest industries in the world, based on either employment or expenditure. A responsible position in construction management requires the ability to apply principles from business, mathematics, science, and engineering to construction projects in a wide variety of nature, type, and scope. Construction managers plan, construct, maintain, and manage facilities essential to modern, civilized human life. Projects requiring construction management expertise include buildings, bridges, tunnels, transportation systems, and facilities utilized in various specialized industrial processes.

Construction management graduates are prepared for advanced graduate degrees and a wide range of career paths in areas including consulting, governmental agencies, and industry. In addition to the traditional careers in construction management, graduates may take advantage of their strong, broad based education to pursue careers in professions such as law, business, or teaching.

Construction Management BS Degree at UT Arlington

At the undergraduate level, the department offers a Bachelor of Science in Construction Management degree designed to provide the necessary foundation in business, science, mathematics, and engineering required for the management of construction projects of all sizes. The program will also instill an understanding of the importance of ethics, safety, professionalism, and socioeconomic concerns in resolving technical problems through synthesis, planning, and design.

The Civil Engineering Department will seek accreditation by the Applied and Natural Science Accreditation Commission of ABET (www.abet.org) and the American Council for Construction Education (ACCE) (www.acce-hq.org (<http://www.acce-hq.org/>)). The Construction Management program is housed in the Civil Engineering Department.

Educational Objectives of the Undergraduate Program

Most alumni of the CM program will attain the following Program Educational Objectives (PEOs) within a few years after graduation:

- To be able to successfully manage the construction process from pre-construction through final completion.
- To be able to apply leadership, team building, and communication skills to effectively solve problems and positively impact the overall construction process.
- To commit to continued professional growth through advanced degrees and/or certifications and be able to take initiative to grow in their positions and assume leadership roles within their chosen profession.

Student Outcomes of the Undergraduate Program

In order to produce graduates who will achieve the Program Educational Objectives a few years after graduation, it is expected that the undergraduate students will attain the following Student Outcomes by the time of graduation:

- an ability to identify, formulate, and solve broadly defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline
- an ability to formulate or design a system, process, procedure or program to meet desired needs
- an ability to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions
- an ability to communicate effectively with a range of audiences
- an ability to understand ethical and professional responsibility and the impact of technical and/or scientific solutions in a global, economic, environmental, and societal contexts
- an ability to function effectively on teams that establish goals, plan task, meet deadline, and analyze risk and uncertainty

Requirements for a Bachelor of Science Degree in Construction Management

Courses Fulfilling the University General Core Requirements (minimum 42 hours required)

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Communication (minimum 6 hours required)

ENGL 1301	RHETORIC AND COMPOSITION I
COMS 1301	FUNDAMENTALS OF PUBLIC SPEAKING ¹
or ENGL 1302	RHETORIC AND COMPOSITION II

Creative Arts (minimum 3 hours required)

Any course which satisfies the University Core Curriculum requirement for Creative Arts is accepted.

Government/Political Science (minimum 6 hours required)

POLS 2311	GOVERNMENT OF THE UNITED STATES
POLS 2312	STATE AND LOCAL GOVERNMENT

Language, Philosophy & Culture (minimum 3 hours required)

Any course which satisfies the University Core Curriculum requirement for Language, Philosophy & Culture is accepted.

Mathematics (minimum 6 hours required)

MATH 1303	TRIGONOMETRY
MATH 1308	ELEMENTARY STATISTICAL ANALYSIS

Life & Physical Sciences (minimum 6 hours required)

PHYS 1441	GENERAL COLLEGE PHYSICS I
PHYS 1442	GENERAL COLLEGE PHYSICS II

Social & Behavioral Sciences (minimum 3 hours required)

Select one of the following:

ECON 2305	PRINCIPLES OF MACROECONOMICS
ECON 2306	PRINCIPLES OF MICROECONOMICS
ECON 2337	ECONOMICS OF SOCIAL ISSUES
FINA 2330	MONEY, FINANCE AND THE MODERN CONSUMER
MANA 2302	COMMUNICATIONS IN ORGANIZATIONS
PSYC 1315	INTRODUCTION TO PSYCHOLOGY
SOCI 1311	INTRODUCTION TO SOCIOLOGY

US History (minimum 6 hours required)

Any courses which satisfies the University Core Curriculum requirement for US History is accepted.

Foundational Component Area Option (minimum 3 hours required)

Any additional course which satisfies the University Core Curriculum requirement in any area is accepted.

Pre-Professional Program Courses**25**

Of the core courses, ENGL 1301, COMS 1301, MATH 1303, MATH 1308, PHYS 1441, PHYS 1442 are part of the CM Pre-Professional Program.

ACCT 2301	PRINCIPLES OF ACCOUNTING I
CM 1311	CONSTRUCTION DRAFTING
CM 1331	CONSTRUCTION SURVEYING
CM 2311	INTRODUCTION TO CONSTRUCTION MANAGEMENT
CM 2313	CONSTRUCTION MATERIALS AND METHODS
CM 2315	INTRODUCTION TO MECHANICS FOR CONSTRUCTION
CM 2331	CONSTRUCTION DOCUMENTS
UNIV 1131 or ENGR 1101	STUDENT SUCCESS ENTRANCE TO ENGINEERING FOR TRANSFER STUDENTS

Select one of the following:

MATH 1302	COLLEGE ALGEBRA
MATH 1315	COLLEGE ALGEBRA FOR ECONOMICS & BUSINESS ANALYSIS

CM Professional Program Courses**51**

MANA 3318	MANAGING ORGANIZATIONAL BEHAVIOR
CM 3313	CONSTRUCTION ESTIMATING I
CM 3315	CONSTRUCTION LAW AND ETHICS
CM 3331	MECHANICAL AND ELECTRICAL SYSTEMS
CM 3335	SOILS AND FOUNDATION IN CONSTRUCTION
CM 3337	CONSTRUCTION ADMINISTRATION AND ECONOMICS
CM 3339	CONSTRUCTION SAFETY
CM 3341	CONSTRUCTION DESIGN
CM 4315	CONSTRUCTION ESTIMATING II
CM 4317	CONSTRUCTION SCHEDULING
CM 4331	CONSTRUCTION MANAGEMENT CAPSTONE II
CM 4351	BUILDING INFORMATION MODELING FOR CONSTRUCTION MANAGEMENT
CM 4357	SUSTAINABLE BUILDING PRACTICE

Select four of the following:

CM 4304	CONSTRUCTION CONTRACTS
CM 4332	CONSTRUCTION FIELD OPERATIONS
CM 4335	GEOTECHNICAL ASPECTS OF CONSTRUCTION
CM 4337	LAND AND SITE DEVELOPMENT
CM 4353	RESIDENTIAL AND COMMERCIAL CONSTRUCTION
CM 4359	INDUSTRIAL INTERNSHIP I
CM 4360	INDUSTRIAL INTERNSHIP II

Total Hours**120**

¹ Completion of COMS 1301 FUNDAMENTALS OF PUBLIC SPEAKING or ENGL 1302 RHETORIC AND COMPOSITION II satisfies the University's communication requirement.

² Completion of CM 1311 CONSTRUCTION DRAFTING satisfies the University's computer proficiency requirement.

More hours may be required to strengthen student's program or demonstrate proficiency. See Prior Preparation and Course Requirements.

Total hours will depend upon prior preparation and academic qualifications. Also, students who do not have two units of high school foreign language will be required to take modern and classical languages courses in addition to the previously listed requirements.

Suggested Course Sequence

A suggested course sequence for the Pre-Professional and Professional Program courses is available on the CE Department's web site.

Prior Preparation and Course Requirements

The undergraduate baccalaureate degree in construction management is a four-year program and requirements for the degree are based upon prior high school preparation through either an honors or college track program. Students who have not had the appropriate prior preparation should contact the departmental advising office for a curriculum guide that will assist them in structuring a study plan that will include leveling courses. Students requiring leveling courses may require a period of time greater than four years to complete their undergraduate degree.

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 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 II. 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 and CM 4317; Completion of all CM 3000 level 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 5379 and CM 5386.

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 granted for CE 4306 and CE 5389. Prerequisite: Consent of instructor.