Department of Civil Engineering and Construction Management

The departmental goals are designed to give students state-of-the-art knowledge for professional career and life-long development skills needed to enter the fields of civil engineering and construction management while meeting all the requirements to earn a Bachelor of Science degree. The department engages in the best practices of teaching, scholarship, and service to ensure that graduates serve as ethical and highly qualified leaders of civil engineering and construction management. Students will find open doors to a dedicated and diverse faculty who are well-educated yet grounded in the practical aspects of “real world” civil engineering design and construction. The CE program is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org . The Construction Management program is accredited by the American Council on Construction Education (ACCE), http://acce-hq.org.

Civil Engineering and Construction Management Majors


CENG 2131 Civil Engineering Fluid Mechanics
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
This course covers basic concepts of fluid mechanics, and the fundamentals and applications of ideal and real fluid flow. Topics include fluid statics, conservation principles, the Bernoulli equation, fluid flow in pipes, fluid flow measurement devices, open channel flow, and basic hydraulic structures.
Prerequisite(s): A minimum grade of "C" in ENGR 2231.

CENG 2231 Surveying
0,3 Credit Hours. 0,2 Lecture Hours. 0,2 Lab Hours.
Principles of the level, theodolite, electronic distance measurement (EDM), total station and global positioning systems, taping, note keeping, coordinate geometry, control surveys, triangulation, trilateration, plane coordinate systems, azimuth and topographic mapping. Laboratory includes use of level, theodolite, EDM, total station, GPS, traverse closure, level net closure, topographic mapping, measuring distances and heights using coordinate geometry calculations.
Prerequisite(s): A minimum grade of "C" in MATH 1112 or MATH 1113 or MATH 1441 and ENGR 1133 or TCM 1232.

CENG 3131 Introduction to Environmental Engineering
0,3 Credit Hours. 0,2 Lecture Hours. 0,2 Lab Hours.
The course is an introduction to environmental engineering. Topics include a review of the role of the United States Environmental Protection Agency (EPA) in environmental protection, mass balance, rainfall and runoff analysis, basic surface water and groundwater hydrology, water quality management, municipal solid waste and hazardous waste management, and air pollution control.
Prerequisite(s): A minimum grade of "C" in CHEM 1147.

CENG 3132 Introduction to Water and Wastewater Treatment
0,3 Credit Hours. 0,2 Lecture Hours. 0,2 Lab Hours.
The course is an introduction to water and wastewater treatment. Topics include sources and characteristics of water and wastewater, treatment standards, selection of different water and wastewater treatment processes, design principles for treatment units in water and wastewater treatment plants, and standard laboratory tests used to control the operation of water and wastewater treatment plants.
Prerequisite(s): A minimum grade of "C" in CENG 2131, CENG 3131.
Cross Listing(s): CENG 3132H.

CENG 3132H Intro to W&WW Treatment Honors
0,3 Credit Hours. 0,2 Lecture Hours. 0,2 Lab Hours.
The course is an introduction to water and wastewater treatment. Topics include sources and characteristics of water and wastewater, treatment standards, selection of different water and wastewater treatment processes, design principles for treatment units in water and wastewater treatment plants, and standard laboratory tests used to control the operation of water and wastewater treatment plants.
Prerequisite(s): A minimum grade of "C" in CENG 2131, CENG 3131.
Cross Listing(s): CENG 3132.

CENG 3133 Transportation Systems
0,3 Credit Hours. 0,2 Lecture Hours. 0,2 Lab Hours.
Overview of transportation engineering with respect to traffic operation and transportation planning, including mainly highway. Emphasis on design and traffic control devices with considerations of economy, safety, and environment. Laboratory involves data measurement and analysis techniques associated with transportation engineering using probability.
Prerequisite(s): A minimum grade of "C" in CENG 2231 and MATH 3337.

CENG 3135 Project Cost Analysis, Planning and Management
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course introduces the long-term contract methods for recognizing revenue and their impact on construction company financial statements. The course also covers the analysis of construction company financial statements and their use in developing budgets, project cash needs, pricing construction projects, and forecasting the impact of business decisions on profit. The project cost control and the contract delivery methods are also discussed, along with ethical guidelines for professional conduct and code of ethics.
Prerequisite(s): A minimum grade of "C" in ECON 2105.

CENG 3232 Soil Mechanics
0,3 Credit Hours. 0,2 Lecture Hours. 0,2 Lab Hours.
This course is an introduction to soil mechanics, including an investigation of the mechanical and physical properties of soils and the relation to soil action in problems of engineering such as soil composition, index properties, classification, exploration, compaction, permeability, stress distribution, consolidation, settlement, shear strength, bearing capacity, and lateral earth pressure.
Prerequisite(s): A minimum grade of "C" in ENGR 3233.

CENG 3233 Civil Engineering Materials
0,3 Credit Hours. 0,2 Lecture Hours. 0,2 Lab Hours.
Introduction to materials science and basic engineering properties of common civil engineering materials including metals, soils, aggregates, Portland cement concrete, asphalt binder and asphalt concrete, wood, and masonry. Written and oral communication skills are an important part of this course.
Prerequisite(s): A minimum grade of "C" in ENGR 3233.

CENG 3311 Fluid Mechanics Lab
1 Credit Hour. 0 Lecture Hours. 2 Lab Hours.
The laboratory includes measurement of water properties including specific weight and dynamic viscosity, use of the Bernoulli equation, pressure measurement, flow rate measurement on a pipe, open channel flow, calibration of flow-measuring, head loss in piping systems, and characteristics of centrifugal pumps.
Corequisite(s): ENGR 3235.
CENG 3331 Structural Analysis
3 Credit Hours. 3 Lecture Hours. 1 Lab Hour.
This course investigates the behavior of common structural systems under various loading conditions. The course focuses on the accurate analysis of statically determinate trusses, beams and frames and uses approximate methods to analyze indeterminate frames. The calculation of deflections and the effects of moving loads are also considered.
Prerequisite(s): MATH 2320 and a minimum grade of "C" in ENGR 3233.

CENG 3333 Reinforced Concrete Design
0.3 Credit Hours. 0.3 Lecture Hours. 0.1 Lab Hours.
Course covers characteristics of concrete materials; introduction to ACI Building Code requirements for reinforced concrete; entrenchment design of slabs, beams, columns and footings.
Prerequisite(s): A minimum grade of "C" in CENG 3331.

CENG 4135 Highway Design
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
This course provides an introduction to highway design based on conventional constraints including: vertical and horizontal geometry, traffic, safety, drainage, economic, and human factors.
Prerequisite(s): A minimum grade of "C" in CENG 2231 or TCM 2233.

CENG 4232 Foundation Design
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
Introduction to foundation design methods, including shallow foundations, slope stability, pile foundation, and retaining walls.
Prerequisite(s): A minimum grade of "C" in CENG 3232.

CENG 4331 Structural Steel Design
0.3 Credit Hours. 0.3 Lecture Hours. 0.1 Lab Hours.
Course includes characteristics of structural steel; introduction to AISC Load and Resistance Factor Design (LRFD) specifications; design of tension members, columns, beams, beam-columns, and connections.
Prerequisite(s): A minimum grade of "C" in CENG 3331.

CENG 4518 Introduction to Senior Project
1 Credit Hour. 1 Lecture Hour. 0 Lab Hours.
This course is the first component of the senior project series of two courses designed to aid the students in successful completion of the capstone project required for the civil engineering curriculum. This first course introduces students to contemporary civil engineering considerations and professional engineering practice in a global, economic, environmental, and societal context. The course prepares students to function on multi-disciplinary teams while completing preliminary tasks required for the senior project. The importance of lifelong learning and professional licensure is also addressed.
Prerequisite(s): Senior standing and Approval of Department Chair.

CENG 4539 Senior Project
3 Credit Hours. 0 Lecture Hours. 6 Lab Hours.
This course is designed to be the culmination of the undergraduate civil engineering education experience. The course draws together diverse elements of the Civil Engineering curriculum to provide an integrating experience and to develop competence in focusing both technical and nontechnical skills in solving problems. The senior project course involves design and analysis of a new or modified civil engineering project or system with demonstrated feasibility.
Prerequisite(s): A minimum grade of "C" in CENG 4518 and Approval of Department Chair.
Cross Listing(s): CENG 4539S.

CENG 4539S Senior Project
3 Credit Hours. 0 Lecture Hours. 6 Lab Hours.
This course is designed to be the culmination of the undergraduate civil engineering education experience. The course draws together diverse elements of the Civil Engineering curriculum to provide an integrating experience and to develop competence in focusing both technical and nontechnical skills in solving problems. The senior project course involves design and analysis of a new or modified civil engineering project or system with demonstrated feasibility.
Prerequisite(s): A minimum grade of "C" in CENG 4518 and Approval of Department Chair.
Cross Listing(s): CENG 4539S.
CENG 5139 Advanced Water and Wastewater Treatment
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
The course covers advanced water and wastewater treatment processes necessary for designing and managing modern drinking water and wastewater treatment plants. Topics include ion exchange, ozonation, adsorption, membrane, Biological Nutrients Removal (BNR), Membrane Biological Reactor (MBR), disinfection, sludge treatment and disposal, wastewater reclamation and reuse, and effluent disposal. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.
Prerequisite(s): A minimum grade of "C" in CENG 3132 or permission of instructor.
Cross Listing(s): CENG 5139G.

CENG 5231 Pavement Analysis and Design
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
This course provides an introduction to different approaches to pavement analysis and design, including flexible and rigid pavement design, preservation, rehabilitation, and management. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.
Prerequisite(s): A minimum grade of "C" in CENG 3232, CENG 3233 or permission of instructor.
Cross Listing(s): CENG 5231G.

CENG 5232 Foundation Design
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
This course provides an introduction to foundation design methods, including shallow foundations, slope stability analysis, pile foundations, and retaining walls. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.
Prerequisite(s): A minimum grade of "C" in CENG 3232 or permission of instructor.
Cross Listing(s): CENG 5232G.

CENG 5234 Asphalt Mix Design
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
This course is an introduction to contemporary materials and engineering properties of asphalt binders, modified binders, and asphalt mixtures including: modern binder and mixture specifications, mix design systems and test methods. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.
Prerequisite(s): A minimum grade of "C" in CENG 3233 or permission of instructor.
Cross Listing(s): CENG 5234G.

CENG 5331 Advanced Structural Analysis
3 Credit Hours. 3 Lecture Hours. 1 Lab Hour.
This course covers the analysis of statically indeterminate structures. Classical methods, such as the slope-deflection and moment distribution techniques are presented. The course additionally covers the matrix-based stiffness method of analysis for indeterminate trusses, beams, and frames. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.
Prerequisite(s): A minimum grade of "C" in CENG 3331, MATH 2331, ENGR 1731 or permission of instructor.
Cross Listing(s): CENG 5331G.

CENG 5332 Prestressed Concrete Design
3 Credit Hours. 3 Lecture Hours. 1 Lab Hour.
This course introduces students to the design of common prestressed concrete elements. It presents historical developments, the properties of constituent materials, prestress losses, and the design of prestressed structural members to support flexural and shear loadings. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.
Prerequisite(s): A minimum grade of "C" in CENG 3333 or permission of instructor.
Cross Listing(s): CENG 5332G.

CENG 5336 Introductory to Finite Elements
3 Credit Hours. 3 Lecture Hours. 1 Lab Hour.
This course provides an introduction to the Finite Element Method, focusing on common elements and problems encountered in civil engineering practice. The course illustrates useful concepts and procedures associated with linearly behaving static structures, modeled by using truss, beam, name, plane and plate elements. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.
Prerequisite(s): A minimum grade of "C" in CENG 5331 or permission of instructor.
Cross Listing(s): CENG 5336G.

TCM 1131 Building Materials and Systems
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
The materials, systems and methods of construction. Topics include material properties, selection and application criteria and construction processes. Covers divisions 7-14 of the CSI Master format, but with an emphasis on divisions 7-9.

TCM 1231 Introduction to Construction Management
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
This course presents an introduction to the construction management profession and the construction industry that it serves. It includes an overview of industry sectors, professional organizations, and the industry’s impact on the economy. The basics of the construction process and delivery systems will be discussed. Students will be introduced to software that is part of the construction manager's day-to-day role. A thorough understanding of the construction management curriculum and the various courses will be provided.
TCM 1232 Construction Graphics
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
This course is a study of construction drawings and specifications. It exposes students to fundamental graphical communication knowledge and print-reading skills. Students will also learn necessary modeling techniques to create basic construction models and generate construction drawings using the most cutting-edge Building Information Modeling (BIM) tools. Topics include print reading, sketching and drafting techniques for the presentation of floor plans, elevations, sections and building components using BIM software.
Prerequisite(s): TCM 1231, MATH 1112, MATH 1113, MATH 1441.

TCM 2233 Construction Surveying
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
Introduction to the equipment and techniques used for construction surveying, including measurement of distances, horizontal and vertical angles, and differences in elevation. Emphasis is placed on accuracy of measurements, precise operation of instruments, completeness in laboratory exercises, and accurate field notes.
Prerequisite(s): A minimum grade of "C" in TCM 1232, MATH 1112 or MATH 1113 or MATH 1441.

TCM 2234 Mechanical and Electrical Equipment and Systems
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course includes a study of mechanical and electrical equipment and systems as related to the construction industry. The course is composed of three basic parts. Part one addresses available energy sources, airflow and ventilation characteristics, and mechanical systems. Part two addresses domestic water and waste systems, fire sprinklers and stand pipe systems and plumbing codes. Part three addresses electrical power, lighting and communication systems and electrical codes.
Prerequisite(s): A minimum grade of "C" in TCM 1232, PHYS 1111, PHYS 1113 or permission of instructor.

TCM 2235 Introduction to Structures
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
This course introduces students to the theory of structural analysis and design and its application to construction. Topics include analysis of coplanar force systems, analysis of trusses and frames, friction, centroids and moment of inertia, stresses and strains, properties of materials, bending, shear, deflections in beams, combined stresses and analysis of columns.
Prerequisite(s): PHYS 1111 or PHYS 2211.

TCM 2333 Building Information Modeling for Construction Management
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.
Introduction to Building Information Modeling (BIM). This course highlights the merits of BIM in promoting productivity and profitability in the construction industry. Topics include the history of information modeling technology and its impacts on construction industry; major BIM software applications and basic modeling techniques; application of BIM authoring and analysis skills for construction projects. The course emphasizes hands-on modeling skills and the utilization of BIM technology to solve construction project problems.
Prerequisite(s): A minimum grade of "C" in TCM 1232.

TCM 2430 Construction Safety
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course includes a study of safe construction practices. Topics include workers' compensation insurance, OSHA regulations, construction disasters, safe construction training and planning, and the hidden costs of accidents. Students are highly encouraged to obtain the OSHA 30-hour safety card as part of this course.
**TCM 3333 Building Codes**  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
This course includes a study of codes applicable to the construction industry with emphasis on the Standard Building Code. An introduction to construction related federal regulations with an emphasis on labor related issues; construction labor unions and the collective bargaining process.  
Prerequisite(s): A minimum grade of "C" in TCM 1131.

**TCM 3890 Special Problems in Construction**  
1-4 Credit Hours. 1-4 Lecture Hours. 0-4 Lab Hours.  
Individualized study in the area of building construction and contracting not otherwise available in the student's program.  
Prerequisite(s): Permission of instructor 6 weeks prior to term course will be taken.

**TCM 4090 Selected Topics in Construction**  
1-3 Credit Hours. 1-3 Lecture Hours. 0-2 Lab Hours.  
Scheduled on an infrequent basis to allow the exploration of undergraduate topics within building construction and contracting. Course shall carry a subtitle for topic identification.  
Prerequisite(s): Permission of instructor.  
Cross Listing(s): TCM 4090H, TCM 4090S.

**TCM 4090H Sel. Topics in Construction**  
1-3 Credit Hours. 1-3 Lecture Hours. 0-2 Lab Hours.  
Scheduled on an infrequent basis to allow the exploration of undergraduate topics within building construction and contracting. Course shall carry a subtitle for topic identification.  
Prerequisite(s): Permission of instructor.  
Cross Listing(s): TCM 4090, TCM 4090S.

**TCM 4090S Sel. Topics in Construction**  
1-3 Credit Hours. 1-3 Lecture Hours. 0-2 Lab Hours.  
Scheduled on an infrequent basis to allow the exploration of undergraduate topics within building construction and contracting. Course shall carry a subtitle for topic identification.  
Prerequisite(s): Permission of instructor.  
Cross Listing(s): TCM 4090, TCM 4090H.

**TCM 4432 Construction Administration**  
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.  
Terms, documents and operations inherent in building construction management. Topics include business ownership, company organization, project bidding/negotiating methods, construction contracts, bonds, insurance and accounting.  
Prerequisite(s): A minimum grade of "C" in TCM 3331 and Junior status.

**TCM 4434 Site Construction**  
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.  
The site development construction process with an emphasis on soils as a construction material. Topics include soils investigation, testing, classification, engineering properties and modification techniques, excavation equipment, construction dewatering, slope stability and support, layout and grade staking, sediment and erosion control, foundations, underground utilities and pavements.  
Prerequisite(s): A minimum grade of "C" in TCM 2233, TCM 3332.

**TCM 4518 Introduction to Senior Project**  
1 Credit Hour. 1 Lecture Hour. 0 Lab Hours.  
Introduction to Senior Project is the first component of the senior project series of two courses dedicated to the successful completion of a final project deliverable. This first course introduces students to contemporary construction management considerations and professional practice in a global, economic, environmental, and societal context. This course prepares students to function on multi-disciplinary teams while completing preliminary tasks required for a larger capstone project.  
Prerequisite(s): Senior Standing and Approval of Department Chair.

**TCM 4530 Senior Project**  
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.  
This course includes an exercise in project management, including estimating and scheduling from construction documents of a project. The assigned project includes developing a fictitious organization, production of a project estimate and schedule and preparing a construction bid and other construction documentation.  
Prerequisite(s): COMM 1110, STAT 2231.  
Corequisite(s): TCM 5431, TCM 5433.  
Cross Listing(s): TCM 4530S, TCM 4530H.

**TCM 4530H Senior Project (Honors)**  
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.  
An exercise in estimating and scheduling from construction documents of an actual building project utilizing major elements of the CM program. Project includes developing a fictitious construction company organization, production of a project estimate and schedule and preparing a construction bid and construction documentation.  
Prerequisite(s): COMM 1110, STAT 2231.  
Cross Listing(s): TCM 4530.

**TCM 4530S Senior Project**  
0.3 Credit Hours. 0.2 Lecture Hours. 0.2 Lab Hours.  
An exercise in estimating and scheduling from construction documents of an actual building project utilizing major elements of the CM program. Project includes developing a fictitious construction company organization, production of a project estimate and schedule and preparing a construction bid and construction documentation.  
Prerequisite(s): COMM 1110, STAT 2231.  
Cross Listing(s): TCM 4530H.

**TCM 4740 Internship**  
4 Credit Hours. 0 Lecture Hours. 0 Lab Hours.  
Designed for students to receive practical work experience with an approved construction firm. A total of 560 contact hours with the construction firm is required.  
Prerequisite(s): A minimum grade of "C" in TCM 4432.

**TCM 5330 Green Building and Sustainable Construction**  
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.  
This course is a study of advanced topics in green construction beginning with the philosophy behind sustainability related technology and its implementation. The course provides a thorough expansion on LEED (Leadership in Energy and Environmental Design) core concepts including construction and design for sustainable sites, water efficiency, energy & atmosphere, materials & resources, indoor environmental quality, and innovation and design. The course also examines sustainable construction methodologies and their associated environmental impacts. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.  
Prerequisite(s): A minimum grade of "C" in TCM 1131, TCM 2234 or permission of instructor.  
Cross Listing(s): TCM 5330G.

**TCM 5431 Construction Cost Estimating**  
3 Credit Hours. 3 Lecture Hours. 1 Lab Hour.  
This course includes methods and procedures for estimating costs of construction projects. Topics include types and purposes of estimates, direct and indirect costs, labor and equipment cost analysis, the CSI Masterformat, approximate estimates, and computerized estimating methods. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.  
Prerequisite(s): A minimum grade of "C" in TCM 3330, TCM 3331 or permission of instructor.  
Cross Listing(s): TCM 5431G.
TCM 5433 Proj Planning/Scheduling
3 Credit Hours. 2 Lecture Hours. 2 Lab Hours.
This course covers the fundamentals and techniques of planning and scheduling for construction projects. Topics include bar charts, Critical Path Method using both arrow and node networks, precedence networks, cost-time trade-offs, PERT, resource leveling, updating schedules during construction, project control, earned value method, lean construction principles and practices, and computerized scheduling techniques. Graduate students will be required to complete individual advanced level research in an area beyond the scope of the undergraduate requirements that demonstrates a higher level of mastery in the subject matter with additional required deliverables representative of graduate level work, as determined by the instructor.
Prerequisite(s): A minimum grade of "C" in STAT 2231, TCM 1231 or permission of instructor.
Cross Listing(s): TCM 5433G.