CE-Civil Engineering Courses

Courses

CE 011. UG Coop/Internship in CE. 0 Hours.
Engineering workplace experience in preparation for the student's intended career.

CE 200. Engineering Geology. 2 Hours.
The Course covers the fundamentals and advanced topics of plate tectonics, mineral formation, sedimentary / igneous / metamorphic rocks, structural deformations, weathering and erosion, groundwater migration, and slope stability.

CE 210. Statics. 3 Hours.
Prerequisites: EGR 200 [Min Grade: C] (Can be taken Concurrently) or HC 111 [Min Grade: C] or EGR 111 [Min Grade: C] (Can be taken Concurrently) and (MA 126 [Min Grade: C] or MA 125 [Min Grade: D]) and (MA 226 [Min Grade: C]) and (PH 221 [Min Grade: C] or PH 221 [Min Grade: P])

CE 220. Mechanics of Solids. 3 Hours.
Prerequisites: CE 210 [Min Grade: C]

CE 221. Mechanics of Solids Laboratory. 1 Hour.
Standard tensile, torsion, bending, and column tests. Strain gage installation and applications. Measurement of forces, displacements, strains, and other variables. Writing is a significant component of this course.
Prerequisites: CE 220 [Min Grade: D] (Can be taken Concurrently)

CE 222. Civil Engineering Materials Laboratory. 1 Hour.
Materials testing laboratory evaluating properties of materials of construction such as cement, aggregates, concrete, asphalt, and masonry. Design of Portland cement concrete mixes. Writing is a significant component of this course.
Prerequisites: CE 220 [Min Grade: D] (Can be taken Concurrently)

CE 230. Plane Surveying. 3 Hours.
Care and use of surveying instruments, surveying methods, error theory, traversing, stadia, mapping techniques, circular and parabolic curves, areas, and volumes. CE 230L must be taken concurrently.
Prerequisites: MA 125 [Min Grade: C]

CE 230L. Plane Surveying Laboratory. 0 Hours.
To provide the student with an understanding of the principles of land measurement, the instruments and techniques used in surveying, theory of errors and mathematical precision in engineering analysis and design. To provide an introduction to route surveying, and the principles of horizontal and vertical curves. Companion to CE 230 and must be taken concurrently.

CE 236. Environmental Engineering. 3 Hours.
Air/water pollution and solid waste. Quality of environment. Environmental health. Regulations and legal considerations. Ethics and Civic Responsibility are significant components of this courses.
Prerequisites: MA 125 [Min Grade: C] (Can be taken Concurrently) or MA 225 [Min Grade: C] (Can be taken Concurrently) and CH 117 [Min Grade: C]

CE 236L. Environmental Engineering Laboratory. 0 Hours.
Laboratory equipment and methods. Chemical, and physical tests to determine characteristics of water and wastewater. Companion lab to CE 236 and must be taken concurrently.

CE 322. Soil Engineering. 4 Hours.
Soil identification and properties, stress concepts, permeability settlement analysis, soil compaction, bearing capacity, shear strength of soil, and slope stability. CE 332L must be taken concurrently.
Prerequisites: CE 200 [Min Grade: D] and CE 220 [Min Grade: D]

CE 332L. Soil Engineering Laboratory. 0 Hours.
Soil classification, strength tests, permeability and consolidation tests. Companion to CE 332 and must be taken concurrently.

CE 337. Hydraulics. 3 Hours.
Fundamentals of hydraulics including properties of water; hydrostatic forces and pressures; flow, head losses, and related phenomena in pipes; river hydograph routing; statistical hydrology; flow in open channels; culvert design; applied hydraulic modeling. Must have a grade of C or better to complete the course.
Prerequisites: MA 126 [Min Grade: C] or MA 226 [Min Grade: C]

CE 344. Civil Engineering Analysis I. 3 Hours.
Inspection and treatment of data using exploratory data analysis. Introduction to probability. Basic data analysis using comparisons and regression, hypothesis testing, and analysis of variance. Quality control and reliability analyses. Quantitative Literacy is a significant component of this course.
Prerequisites: MA 126 [Min Grade: C] or MA 226 [Min Grade: C]

CE 345. Transportation Engineering. 3 Hours.
Function, influence, characteristics and operation of transportation systems and facilities, focusing primarily on highway systems. Geometric design, operations, and transportation planning are covered.
Prerequisites: (MA 125 [Min Grade: C] or MA 225 [Min Grade: C]) and PH 221 [Min Grade: C]

CE 360. Structural Analysis. 3 Hours.
Reactions, shears, moments, and axial forces in determinate and indeterminate structures. Influence lines; moment area and energy methods of computing deflections; methods of truss and frame analysis. Computer applications. Must have a grade of C or better to complete the course.
Prerequisites: CE 220 [Min Grade: D]

CE 371. Engineering Communication. 2 Hours.
Introduces engineering students to the communication skills necessary for their professional development. Topics include forms of technical writing and oral communication, report writing and organization, professional practice, and ethics.
Prerequisites: EH 102 [Min Grade: C] and EGR 111 [Min Grade: C] or EGR 200 [Min Grade: C]
CE 395. Engineering Economics. 3 Hours.
Fundamental concepts of engineering economy. Introduction to cost and revenue estimating and cash flow analysis for engineering projects. Choosing between alternatives taking into account the time value of money, depreciation, inflation, income taxes and risk factors.
Prerequisites: MA 125 [Min Grade: C] or MA 225 [Min Grade: C]

CE 395R. Engineering Economics Recitation. 0 Hours.
An applications-based course designed to reinforce concepts from CE 395.

CE 410. FE Review for Civil Engineers. 0 Hours.
Review concepts of the engineering core and civil engineering in preparation for the Fundamentals of Engineering (FE) exam.

CE 415. Building Information Modeling (BIM). 3 Hours.
This class will be an introduction to the virtual world of design and construction. Topics covered will include uses for technology, what is BIM, and will have a focus on AutoCAD and Revit Software. An emphasis will be placed on the use of these tools and their practical applications to the real world environment. Students will be provided with the software through the Autodesk Student community and will be required to complete a Multi-Step term Project.
Prerequisites: ME 102 [Min Grade: C]

CE 420. Advanced Mechanics. 3 Hours.
Variation of stress at point including determination of principal and maximum shear stresses. Basic problems involving symmetrical deformation; thickwall cylinders and spheres. Torsions of noncircular sections. Curved beams. Failure Theories. Unsymmetrical bending and shear center.
Prerequisites: CE 220 [Min Grade: D]

CE 426. Foundation Engineering. 3 Hours.
Application of principles of soil mechanics to: determine bearing capacity and settlement of spread footings, mats, single piles and pile groups; site investigation, evaluate data from field and tests; estimation of stresses in soil masses; lateral resistance of piles and pile group; retaining walls, sheetpiles, and coffer-dams.
Prerequisites: CE 332 [Min Grade: D] and CE 455 [Min Grade: D]

CE 430. Water Supply/Drainage Design. 3 Hours.
Water requirements; wastewater characteristics. Hydraulics and design of sewers; distribution and reuse of water. Development of water supplies; design considerations.
Prerequisites: CE 337 [Min Grade: C]

CE 431. Energy Resources. 3 Hours.
Overview of the various energy resources: oil, natural gas, coal, nuclear, hydro, solar, geothermal, biomass, wind, and ocean energy resources, in terms of supply, distribution, recovery and conversion, environmental impacts, economies, policy, and technology. Advantages and limitations of various energy resources. Concepts and opportunities for energy conservation; including electric power generation, changing role of electric utilities, transportation applications, and energy use in developing countries. Field trips.
Prerequisites: CE 236 [Min Grade: D]

CE 433. Solid and Hazardous Wastes Management. 3 Hours.
Overview of waste characterizations, regulations, and management options. The course covers fundamentals of landfill design, recycling, incineration, emerging disposal technologies, federal and state laws, and hazardous waste treatment, and ultimate disposal of hazardous waste.
Prerequisites: CE 236 [Min Grade: D]

CE 434. Air Quality Modeling and Monitoring. 3 Hours.
Atmospheric pollutant effects, reactions and sources. Air dispersion modeling. Ambient monitoring.
Prerequisites: ME 251 [Min Grade: C]

CE 440. Civil Engineering Honors Research. 3 Hours.
Departmental honors students work closely with faculty researchers and graduate students in departmental concentration specialties to develop research skills. Enrollment is limited to undergraduate students enrolled in CCEE Departmental Honors Program.

CE 441. Civil Engineering Honors Seminar. 1 Hour.
Seminar focusing on student research and guest presentations of various topics of interest to civil and environmental engineering students.

CE 443. Pavement Design and Construction. 3 Hours.
Analysis of stresses and strains in pavement systems. Design and construction of flexible and rigid pavements, base courses, and subgrades. Effects of loading on pavement life.
Prerequisites: CE 345 [Min Grade: D]

CE 445. Engineering the Built Environment. 3 Hours.
This service learning course explores the effects the built environment has on urban function, connectivity, community health, and the well-being of its residents. Students work directly in Birmingham neighborhoods learning how to assess different components of the built environment, including transportation, green spaces, lighting, and blight, and to estimate their impacts on community health and well-being. Students then work with representatives from the City, neighborhoods, and local industry to propose engineering solutions, develop realistic cost estimates, assess potential benefits, and develop implementation plans.

CE 446. Green Infrastructure and Transportation. 3 Hours.
This course covers policy and technical issues related to sustainable transportation. The course begins by discussing the concepts, viewpoints, and fundamentals essential for understanding sustainable transportation planning. Tools used to assess sustainability of transportation facilities and neighborhoods are introduced next. The course also presents design options in support of green infrastructure and transportation, including livable street design, and traffic calming applications. The course is expected to expand students’ knowledge base on sustainable transportation issues and help them understand the concept of sustainable transportation toward the development of sustainable smart cities.
Prerequisites: CE 345 [Min Grade: C]

CE 447. Principles of Sustainable Development. 3 Hours.
The course presents the concepts, viewpoints and fundamentals essential for understanding the urban sustainable development agenda. Students will review basic earth sciences to better evaluate the impact our anthropogenic activities have on the natural environment and therefore how to minimize adverse future outcomes. Throughout the course case studies of sustainable developments will be used to illustrate the value, challenges and limitations of this concept. In the end, students will possess the knowledge base needed to help advance sustainable smart cities development.
Prerequisites: CE 236 [Min Grade: C]

CE 450. Structural Steel Design. 3 Hours.
Tension members, columns, beams, and beam columns. Simple connections. Load Resistance Factor Design (LRFD) approaches.
Prerequisites: CE 360 [Min Grade: C]
CE 453. Design of Wood Structures. 3 Hours.
This course will give students an understanding of structural wood materials, both sawn lumber and a number of engineered wood materials. The main objective of the course is to learn how to design wood structures using these materials, including the design of beams, columns, connections, roof diaphragms, and shear walls. The requirement of the National Design Specification for Wood Structures will be addressed.
Prerequisites: CE 360 [Min Grade: C]

CE 454. Design of Masonry Structures. 3 Hours.
Design and detailing of masonry structures. Nomenclature, properties, and specifications for components. Design of assemblages, simple masonry structures, unreinforced and reinforced elements, and complex masonry structures.
Prerequisites: CE 360 [Min Grade: C]

CE 455. Reinforced Concrete Design. 3 Hours.
Behavior, strength, and design of reinforced concrete structural members (beams, columns, one-way slabs, and continuous beams) subjected to moment, shear, and axial forces according to the American Concrete Institute Building Code Requirements for Structural Concrete (ACI 318). Crack control and serviceability considerations. Introduction to the design of reinforced concrete structures.
Prerequisites: CE 455 [Min Grade: C]

CE 456. Prestressed Concrete Design. 3 Hours.
Principles and concepts of design in prestressed concrete including elastic and ultimate strength analyses for flexural, shear, bond, and deflection. Principles of concordancy and linear transformation for indeterminate prestressed structures.
Prerequisites: CE 455 [Min Grade: D]

CE 460. Structural Mechanics. 3 Hours.
Elastic beam deflections, beam columns, lateral torsional buckling, column stability, plastic design, plate bending, and yield line theory.
Prerequisites: CE 360 [Min Grade: C]

CE 461. Introduction to the Finite Element Method. 3 Hours.
Prerequisites: CE 360 [Min Grade: C]

CE 462. Advanced Structural Analysis. 3 Hours.
Analysis of indeterminate structures utilizing both classical and matrix methods. Use of large-scale computer programs.
Prerequisites: CE 360 [Min Grade: C]

CE 464. Structural Dynamics. 3 Hours.
Prerequisites: CE 360 [Min Grade: C] and ME 215 [Min Grade: C]

CE 467. Wind and Seismic Loads. 3 Hours.
Methods for calculating loads on structures caused by extreme winds and earthquakes. Calculation of wind loads on various types of structures according to theory and codes. Determination of earthquake loads on structures using structural dynamics and codes.
Prerequisites: CE 360 [Min Grade: C]

CE 468. Bridge Engineering. 3 Hours.
Bridge loads, steel beam bridges, composite beam bridges, bridge bearings, reinforced and prestressed concrete slab and T-beam bridges, bridge evaluations and ratings, and upgrade methodologies; computer applications.
Prerequisites: CE 450 [Min Grade: D] and CE 455 [Min Grade: D](Can be taken Concurrently)

CE 470. International Research Experience. 3 Hours.
The International Research Experience for Students (IRES) program provides the opportunity for undergraduate and graduate students to participate in hands-on engineering research in an international setting. Students perform research on an approved topic related to civil engineering design in an international environment. Students select a topic, perform a detailed literature review, and work with mentors from UAB and the international host institution to develop research objectives and a detailed research plan. The course will culminate in a 6-8 week visit to the international host institution, during which time students will conduct hands-on research with their mentors and prepare final reports.

CE 475. Construction Safety and Health Management. 3 Hours.
This course covers various causes of construction accidents and the adopted strategies to prevent worksite injuries and illnesses. Other topics covered include workers’ compensation, OSHA standards for the construction industry, economics of construction safety management, temporary structures, system safety, ergonomic applications, health hazards, and the development of a safety program.
Prerequisites: CE 497 [Min Grade: C]

CE 480. Introduction to Water and Wastewater Treatment. 3 Hours.
Physical unit operations and chemical/biological unit processes for water and wastewater treatment. Design of facilities for treatment. Treatment and disposal of sludge.
Prerequisites: CE 236 [Min Grade: D]

CE 485. Engineering Hydrology. 3 Hours.
Hydrologic principles including the hydrologic cycle, precipitation data and stream-flow measurements. Applications to engineering problems: stream-flow analysis, and watershed management.
Prerequisites: CE 337 [Min Grade: C]

CE 489. Undergraduate Engineering Research. 0 Hours.
Undergraduate research experiences in civil, construction and/or environmental engineering.
Prerequisites: EGR 110 [Min Grade: C] and EGR 111 [Min Grade: C] or EGR 200 [Min Grade: C] or HC 111 [Min Grade: C] or EGR 100 [Min Grade: C] and MA 125 [Min Grade: C] or MA 225 [Min Grade: C] and PH 221 [Min Grade: C](Can be taken Concurrently)

CE 490. Special Topics in Civil Engineering. 1-3 Hour.
Special Topics in Civil Engineering.

CE 491. Individual Study in Civil Engineering. 1-6 Hour.
Individual Study in Civil Engineering.

CE 497. Construction Engineering Management. 3 Hours.
Study of construction management services that include: project planning, scheduling, estimating, budgeting, contract administration, agreements and ethics. Emphasis is made on the management of manpower, materials, money and machinery.
Prerequisites: CE 395 [Min Grade: D]
CE 498. Capstone Design Project Lab. 0 Hours.
Review of engineering, math, and science topics in preparation for the FE exam. The importance of professional licensure and professional development are also covered. Students must register for and take the FE exam in order to receive credit for this course. CE 499 must be taken concurrently.

CE 499. Capstone Design Project. 3 Hours.
Students work in teams to solve a complex engineering problem that incorporates the major aspects of civil engineering design including structural, geotechnical, environmental, transportation, and construction management components. The course also includes lectures and assignments related to professionalism including engineering ethics, leadership, and management. Normally taken during last term before graduation.

Prerequisites: CE 332 [Min Grade: D] and CE 337 [Min Grade: C] and CE 345 [Min Grade: D] and (CE 450 [Min Grade: D] or CE 455 [Min Grade: D]) and CE 430 [Min Grade: D](Can be taken Concurrently) and CE 497 [Min Grade: D](Can be taken Concurrently)