COURSES FOR CIVIL, CONSTRUCTION AND ENVIRONMENTAL ENGINEERING

Civil, Construction and Environmental Engineering

CE121 Intro Civil Constrctn Envir Eg
Hours 1

Introduce the student to the areas of professional, civil and environmental engineering practices with exposure to faculty members specializing in each area, solving typical problems in each professional area, learning of the activities of service organizations, and the responsibilities of professional practice.

CE260 Civil & Constructn Surveying
Hours 2

Precise measurement of lengths, angles, areas, and elevations in geodetic systems; computation of construction control, including highway alignment and land areas.

Prerequisite(s): (ENGR 161 or ENGR 171 or ART 131) and MATH 115 or (MATH 112 and MATH 113) or ACT 30 or SAT 680 or PLMA 440 or PLAC 565

CE262 Civil & Constructn Engr Matls
Hours 3

Introduction to the engineering properties of structural materials, including steel, wood, aggregate, concrete and asphalt, including experimental testing procedures and interpretation of results.

Prerequisite(s): AEM 201 and

Prerequisite(s) with concurrency: AEM 250

CE270 Field Studies in Water and Climate
EXP, N

Hours 4

Water is one of the most abundant, yet most precious, natural resources on Earth. Processes occurring within and across many geosystems determine water's movement and properties. This course explores how components of Earth's water and climate systems operate and are linked through a combination of lecture and experiential field/lab activities. Fieldtrips and lab activities are designed to expose students to standard and innovative techniques used by engineers and geoscientists to understand water and climate systems, including map interpretation, glacial mass balance analysis, and dendrochronologic (tree ring measurement) analysis to obtain river flow and flood information. Fieldtrips will also help students better understand how humans modify water systems, through processes such as river regulation. Students will reside in Innsbruck (Austria) [with daytrips to King Ludwig II's castles in Bavaria, Stubaier Glacier in Austria, and Bolzano, Italy] and Munich (Germany).

Experiential Learning, Natural Science

CE320 Intro Environmental Engineerg
Hours 3

Introduction to the scientific and engineering principles needed to analyze and solve environmental engineering problems in the practice of environmental engineering related to air, water and waste water management.

Prerequisite(s): CH 101 OR CH 117 min grade of C-

Prerequisite(s) with concurrency: AEM 311 or CHE 304

CE331 Intro to Structural Eng.
Hours 3

Introduction and principles of structural analysis of determinate and indeterminate structures. Computing proficiency is required for a passing grade in this course.

Prerequisite(s): AEM 250 and CE 262

CE340 Geotechnical Engineering
C, W

Hours 4

Static and dynamic interaction of soil and water; theories of stress distribution, consolidation, strength and failures; stability of soil structures. Writing proficiency is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course.

Prerequisite(s): CE 262 and AEM 250

Computer Science, Writing

CE350 Intro. to Transportation Eng
Hours 3

An introduction to different modes of transportation with emphasis on roadway and traffic engineering. Topics include transportation economics and planning, highway geometric and pavement design, drainage, construction, traffic control devices, traffic operations, and management and highway capacity analysis.

Prerequisite(s): CE 260 AND GES 255

CE366 Introduction to Construction Engineering
Hours 3

Applying engineering economic principles to construction and engineering problems; construction management processes and methods in planning, scheduling, and monitoring engineering projects.

Prerequisite(s): CE 262

CE378 Water Resources Engineering
Hours 3

Mechanics of steady and unsteady flow in closed and open conduits, hydrology; water supply and wastewater disposal.

Prerequisite(s): Dynamics (AEM 264) and Fluid Mechanics (AEM 311); or Fluid Flow Operations (CHE 304)

CE382 Architectural Engineering Fundamentals
Hours 3

The course focuses on providing an overview of the Architectural Engineering discipline and the role of an Architectural Engineer in facilitating the development and operation of an efficient built environment. Various building functions, their components, and the integration of building systems in the design, construction, and operation stages are introduced.

Prerequisite(s): CE 262 and ME 216

CE401 Capstone Design Site Development: Civil Engineering
C, EXP, W

Hours 4

Students use of software to design site projects in teams, prepare construction drawings and deliver engineering reports. This class is normally taken during the last term on campus. Writing proficiency is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course. Computer proficiency is required for a passing grade in the course. A student who does not display computer upper-division student skills with Civil 3D and HEC-HMS will not earn a passing grade, no matter how well the student performs in the other areas of the course.

Prerequisite(s): CE 320, CE 331, CE 340, CE 350, CE 366, and CE 378

Prerequisite(s) with concurrency: CE 461 or CE 561; or CE 458 or CE 558; or CE 424 or CE 524; or CE 475 or CE 575; or CE 451 or CE 551; and CE 424 or CE 524; or CE 425 or CE 525; or CE 433 or CE 434 or CE 451 or CE 551; or CE 458 or CE 558; or CE 459 or CE 559; or CE 461 or CE 561; or CE 462 or CE 562; or CE 475 or CE 575

Computer Science, Experiential Learning, Writing

CE402 Capstone Design Site Development: Construction Engineering
C, EXP, W

Hours 4

Students use software to design projects in teams, prepare construction drawings and deliver engineering reports. Writing proficiency within this discipline and computing proficiency are required for a passing grade in this course. Computer proficiency is required for a passing grade in the course. A student who does not display computer upper-division student skills with Civil 3D and HEC-HMS will not earn a passing grade, no matter how well the student performs in the other areas of the course.

Prerequisite(s): CE 340 AND CE 366 AND CE 331

Prerequisite(s) with concurrency: CE 461 or CE 561; and CE 468 or CE 568; and CE 433 or CE 434

Computer Science, Experiential Learning, Writing

CE403 Capstone Design Building Systems: Civil Engineering
C, EXP, W

Hours 4

Students use software to design building projects in teams, prepare construction drawings and deliver engineering reports. The course is normally taken during the last term on campus. Writing proficiency is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course. Computing proficiency is required for a passing grade in this course. All students will use the software program Revit to model their design project.

Prerequisite(s): CE 331 and CE 340 and 3 of (CE 320, CE 350, CE 366, CE 378) and (CE 433 OR CE 434)

Prerequisite(s) with concurrency: CE 424 or CE 524; or CE 425 or CE 525; or CE 433 or CE 434 or CE 451 or CE 551; or CE 458 or CE 558; or CE 459 or CE 559; or CE 461 or CE 561; or CE 462 or CE 562; or CE 475 or CE 575

Computer Science, Experiential Learning, Writing

CE404 Capstone Design Building Systems: Construction Engineering
C, EXP, W

Hours 4

Students use software to design building projects in teams, prepare construction drawings and deliver engineering reports. The course is normally taken during the last term on campus. Writing proficiency is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course. Computing proficiency is required for a passing grade in this course. All students will use the software program Revit to model their design project. A Revit assignment and test will be given during the semester.

Prerequisite(s): CE 340 AND CE 366 AND CE 331 AND (CE 433 OR CE 434)

Prerequisite(s) with concurrency: CE 462 or CE 562; and CE 468 or CE 568

Computer Science, Experiential Learning, Writing

CE405 Capstone Design Site Development: Environmental Engineering
C, EXP, W

Hours 4

Students use of software to design site projects in teams, prepare construction drawings and deliver engineering reports. This class is normally taken during the last term on campus. Writing proficiency is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course. Computer proficiency is required for a passing grade in the course. A student who does not display computer upper-division student skills with Civil 3D and HEC-HMS will not earn a passing grade, no matter how well the student performs in the other areas of the course.

Prerequisite(s): CE 320 AND CE 340 AND CE 378

Prerequisite(s) with concurrency: CE 425 or CE 525; and CE 424 or CE 524; and CE 475 or CE 575

Computer Science, Experiential Learning, Writing

CE406 Capstone Design Building Systems: Architectural Engineering
C, EXP, W

Hours 4

Students use software to design building projects in teams, prepare construction drawings and deliver engineering reports. The course is normally taken during the last term on campus. Writing proficiency is required for a passing grade in this course. A student who does not write with the skill normally required of an upper-division student will not earn a passing grade, no matter how well the student performs in other areas of the course. Computing proficiency is required for a passing grade in this course. All students will use the software program Revit to model their design project.

Prerequisite(s): CE 340 AND CE 366 AND CE 331

Prerequisite(s) with concurrency: CE 462 or CE 562; and CE 433 and CE 434

Computer Science, Experiential Learning, Writing

CE414 Information Systems Design
Hours 3

An overview of management information systems (MIS). The course will focus on the practical aspects, applications and methodology or MIS, particularly from the construction engineer's perspective. Information design methodology and building information modeling (BIM) will be covered in detail.

Prerequisite(s): CE 366

CE415 Transportation Data Science
Hours 3

The course will provide basic examination of processing and analyses of large-scale transportation-related data. The course will prepare the students with programming skills in Python, the understanding of important algorithms and machine learning methods in transportation research and projects, and applying these algorithms and models using transportation data.

Prerequisite(s): CE 350

Prerequisite(s) with concurrency: MATH 227

CE417 Advanced Project Management
Hours 3

This is an engineering management course designed to introduce students to the functions of project engineering and managers. It details the processes of planning and controlling project scope time and cost.

Prerequisite(s): CE 366

Prerequisite(s) with concurrency: GES 255

CE418 Engineering Management
Hours 3

An introduction to management principles and the management functions of planning, organizing, motivating and controlling. Management of engineers in research, design, manufacturing/ construction and quality will be studied.

Prerequisite(s): CE 366

CE420 Environmental Measurements
Hours 3

Environmental Engineering phenomena are explored through conducting laboratory experiments, selecting analytical protocols to achieve an objective, evaluating collected data sets, and discussing the results in well written reports. The course is composed of classroom lectures/ discussions and weekly laboratory activities.

Prerequisite(s): CE 320 and CE 378 and GES 255

CE422 Solid And Hazardous Waste Mgt
Hours 3

Engineering and regulatory requirements for the collection, storage, recycling, treatment and disposal of solid wastes.

Prerequisite(s): CE 320

CE423 Fate Transport & Effects of Hazardous Substances
Hours 3

Study of the fate and transport of chemicals and microorganisms and their adverse effects on health and the environment.

Prerequisite(s): CE 320 and CE 378 and GES 255

CE424 Water And Wastewater Treatment
Hours 3

Physical, chemical and biological principles and design of municipal water and wastewater treatment units.

Prerequisite(s): CE 320

CE425 Air Quality Engineering
Hours 3

This is an introductory course in Air Quality Engineering. We have to major foci. The first is to understand and evaluate our air resources and air quality (as related to human and environmental health) in terms of fundamental principels and design processes. The second is to introduce the student to a varity of air pollution issues and engineered treatment processes.

Prerequisite(s): AEM 311 or CHE 304; and CE 320

CE426 Groundwater Mechanics
Hours 3

To understand the physics and theoretical principles of groundwater flow and transport processes, and apply this knowledge for solving practical groundwater flow and transport problems.

Prerequisite(s): MATH 227 and AEM 311

CE430 Non-Destructive Evaluation and Testing of Civil Engineering Structures
Hours 3

This course covers the state-of-the-art and state-of-the-practice methods of non-destructively evaluating and testing various civil engineering structures and materials such as concrete, asphalt, and steel. Students will use the techniques to solve real-world problems by evaluating and testing various structures across campus.

Prerequisite(s) with concurrency: CE 340 or CE 331

CE432 Matrix Analysis of Structures
Hours 3

Introduction to the matrix-displacement method of analysis for framed structures, including computer implementation of analysis. An introduction to finite-element analysis is also included.

Prerequisite(s): CE 331

CE433 Reinf Concrete Struct I
Hours 3

Concrete materials, placement of concrete and theory and design of reinforced beams, girders, slabs, columns and footings.

Prerequisite(s): CE 331

CE434 Structural Steel Design I
Hours 3

Theory and design of structural steel members and their connections.

Prerequisite(s): CE 331

CE435 Concrete Materials
Hours 3

Portland cement and supplementary cementitious materials, aggregates, properties of fresh and hardened concrete, concrete durability issues, mixture proportioning, concrete construction methods, special concrete materials, test methods.

Prerequisite(s): CE 331 or CE 340

CE436 Wood Structural Design
Hours 3

Modern timber engineering: design of beams, columns, trusses and floor systems.

Prerequisite(s): CE 331

CE437 Reinforced Concrete Struct II
Hours 3

Design of reinforced concrete building components including two-way slabs, slender columns, prestressed beams, slap-on-grade and retaining walls.

Prerequisite(s): CE 433

CE438 Struct Steel Design II
Hours 3

Basic and elementary design procedures for steel structures such as plate girders, mill buildings, multistory buildings, highway bridges and light-gauge steel structures.

Prerequisite(s): CE 434

CE439 Wood & Masonry Structures
Hours 3

Design of wood and masonry components and subassemblies for low-rise residential and commercial buildings according to current design specifications.

Prerequisite(s): CE 331

CE442 Waste Containmnt Facilty
Hours 3

Introduction to the fundamentals of soil behavior as they relate to environmental engineering. Topics include soil behavior, soil compaction, conduction phenomena, geosynthetics and aspects of landfill design.

Prerequisite(s): CE 340 and CE 320

CE444 Foundation Engineering
Hours 3

Analysis and design of soil foundation systems.

Prerequisite(s): CE 340

CE451 Roadway Intersection Dsgn
Hours 3

Application of the principles of geometric design and traffic signal layout: vertical and horizontal alignment, intersections, traffic control, and traffic signal layout. Design projects will be prepared to illustrate standard techniques.

Prerequisite(s): CE 350

CE454 Urban Transportation Planning
Hours 3

The course will provide a foundation in urban transportation planning, including an introduction to the planning process, software associated with transportation modeling and conducting transportation planning and traffic impact studies.

Prerequisite(s): CE 350

CE455 Traffic Flow Theory
Hours 3

This course covers the fundamentals of traffic flow theory. Topics shall include microscopic flow characteristics, macroscopic flow characteristics, microscopic speed characteristics, macroscopic speed characteristics, microscopic density characteristics, macroscopic density characteristics, demand-supply analysis, capacity analysis, traffic stream models, shockwave analysis, queueing analysis, and simulation models.

Prerequisite(s): CE 350

CE458 Traffic Engineering
Hours 3

Vehicle operating characteristics, traffic flow, geometric design of road and intersections, and methods of traffic control.

Prerequisite(s): CE 350

CE459 Pavement Design and Rehab
Hours 3

This course covers two major areas of asphalt and concrete pavements: pavement thickness design and pavement maintenance. Topics include pavement design by the Asphalt Institute and AASHTO methods. Major maintenance will cover overlay design and slab repair, while routine maintenance will cover distress surveys, pothole repair, and crack and joint sealing.

Prerequisite(s): CE 350 or CE 366

Prerequisite(s) with concurrency: CE 340

CE461 Horizontl Construction Methods
Hours 3

Introduction to horizontal construction equipment and methods, design of horizontal construction systems and construction operation analysis and simulation.

Prerequisite(s): CE 366

Prerequisite(s) with concurrency: CE 340

CE462 Vertical Construction Methods
Hours 3

Introduction to vertical construction equipment and methods, design of vertical construction systems and construction operation analysis and management processess.

Prerequisite(s): CE 366

Prerequisite(s) with concurrency: CE 331

CE463 Construction Cost Estimating
Hours 3

Addresses the estimating and cost control function from conceptual planning through project execution. Topics include productivity analysis, organization of estimates, cost forecasting, estimating tools and techniques, contingency planning, and relationship to contract types and project execution strategies.

Prerequisite(s): CE 366

CE464 Safety Engineering and Management
Hours 3

An introduction to safety management and accident prevention, including state and federal laws related to general and construction projects. Topics include accident theories, safety regulations, Construction Safety act, hazards and their control, human behavior and safety and safety management.

Prerequisite(s): GES 255 and CE 366

CE466 Sustainable and Lean Construction
Hours 3

An introduction to sustainable and lean construction, including application of engineering economics principles to sustainable construction problems. Green design, construction, and operations from a project management standpoint. Theoretical concepts and industry practices used to model, evaluate, and enhance construction performance through the design and implementation of effective project schedules, construction operations, and contracting relationships.

Prerequisite(s): CE 366

CE467 Constr. Accounting & Finance
Hours 3

Financial management of construction projects. Topics include alternative selection, life-cycle analysis, applied financial management techniques, insurance/indemnification, risk management and tax implications.

Prerequisite(s): CE 366

CE468 Construction Scheduling
Hours 3

The management structure of construction companies and the laws, regulations, practices, tools and processes used in planning, scheduling and monitoring construction projects. Writing proficiency within this discipline is required for a passing grade in this course.

Prerequisite(s): CE 366

CE470 Water Resou. European Alps
EXP

Hours 4

The course focuses on statistical hydrology, climate, dendrohydrology (tree rings) and glaciers. The classroom lectures and in-class labs include the use of statistical software to analyze hydrologic datasets, the use of remote imagery to evaluate glacier recession, application of empirical equations to estimate glacier mass loss, evaluation of hydrologic (streamflow, snowpack) and climatic datasets, developing skeleton plots and cross dating tree-ring data, and seminars. The field labs consist of hand coring and analyzing tree ring data.

Prerequisite(s): Sophomore status, 2.5 GPA, CE 378

Experiential Learning

CE471 Open Channel Flow
Hours 3

Basic concepts of fluid flow, energy and momentum principles, flow resistance in nonuniform sections, channel controls and transitions, and nonuniform flow computations.

Prerequisite(s): CE 378

CE475 Hydrology
Hours 3

Hydrologic cycle, rainfall-runoff relations, unit hydrograph, statistical hydrology and hydrologic simulation. Includes a class project with application to flood control, water supply and multipurpose projects.

Prerequisite(s): CE 378

CE476 Process Hydrology
Hours 3

This course develops a quantitative approach to understanding and prediction of hydrologic processes. The processes covered include interception, snowmelt, evapotranspiration, infiltration, groundwater flow, overland flow, and streamflow. Relative (dis-)advantages of different model representations will be highlighted. Process couplings and their impact on the integrated hydrologic response will be also discussed.

Prerequisite(s): CE 378

CE480 Forensic Engineering
Hours 3

When failures in the built environment occur, whether during design, construction or in-service, a thorough examination of the causes is essential to both the evolution sound engineering practices and to dispute resolution through the legal system. The role of the engineer in this process is examined.

CE481 Legal Asp. of Eng and Const.
Hours 3

Legal aspects of engineering and construction contracts and specifications; contract formation, interpretation, rights and duties, and changes; legal liabilities and professional ethics of architects, engineers and contractors. Writing proficiency within this discipline is required for a passing grade in this course. This is a three hour survey course covering, primarily, the organization of the federal and state courts, construction contracting, potential tort liability and professionalism for engineers in Alabama.

Prerequisite(s): CE 320, CE 331, CE 340, CE 350, CE 366 or CE 378, and one HU elective (3 credits)

CE485 Const. Site Erosion Control
Hours 3

Nature and magnitude of erosion problems. Erosion plan development. Rainfall energy and erosion predictions. Sediment transport in urban areas. Channel and slope stability. Sedimentation and other controls.

Prerequisite(s): CE 378

CE486 GIS for Civil Engineers
Hours 3

Introduction to geographic information system design and use for civil engineering problem solving.

Prerequisite(s): CE 260 and any CE 300 Level Course

CE491 Special Topics in Civil Engineering
SP

Hours 1-4

Credit is based on the amount of work undertaken. This course is presents developing topics in the Civil Engineering disciplines including: transportation systems, processes and model; site development; architectural & building systems; advances in civil engineering materials and structural design; environmental analysis, modeling, or processes; hydrologist processes, models and water resources advances; next generation construction engineering; sustainability and resilient infrastructure systems.

Prerequisite(s): CE 262 AND One of the following: CE 320, CE 331, CE 340, CE 350, CE 366, CE 378

Special Topics Course

CE492 Independent Study in Civil Engineering Sub-Disciplines
SP

Hours 1-4

Independent study, either as individual students or a group of five students or less working under the guidance and mentorship of an instructor. The independent study will typically focus on: (1) a specific issue, problem, application, design or process in a traditional field of civil engineering OR (2) a specific development, advancement, issue, problem, or challenge in a new or developing specialty area in the fields of civil engineering.

Special Topics Course

CE498 Undergraduate Research Experience
EXP

Hours 1-6

Conduct research under the guidance of a faculty member. Analyze data. Produce and present, submit or publish related scholarly work.

Prerequisite(s): CE 320 or CE 331 or CE 340 or CE 350 or CE 366 or CE 378, and Permission of a department faculty member (research advisor)

Experiential Learning