

# 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.

### CE220 Society Infrastruct & Environm

Hours 3

Permitting, environmental impact statements and other environmental issues associated with human activities and engineering projects.

### CE260 Civil & Construction 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 or ESM 201; and

Prerequisite(s) with concurrency: AEM 250

### CE270 Field Studies in Water and Climate

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, Stubai Glacier in Austria, and Bolzano, Italy] and Munich (Germany).

### CE320 Intro Environmental Engineer

Hours 3

Introduction to the scientific and engineering principles needed to analyze and solve environmental engineering problems, and lab experience in the practice of environmental engineering related to air, water and waste water management. Writing proficiency within this discipline is required for a passing grade in this course.

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

Prerequisite(s) with concurrency: AEM 311 and 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 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)

**CE401 Capstone Design Site Development: Civil Engineering**  
C, 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 340 plus 4 of the following (CE 320, CE 331, CE 350, CE 366, CE 378)

Prerequisite(s) with concurrency: 1 of ((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 and AND and and 1 of ((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, Writing

**CE402 Capstone Design Site Development: Construction Engineering**  
C, 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 AND and CE 468 OR CE 568 and AND and CE 433 OR CE 434

Computer Science, Writing

**CE403 Capstone Design Building Systems: Civil Engineering**  
C, 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: ONE of the following: (CE 424 OR CE 524) or (CE 425 OR CE 525) or and 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, Writing

**CE404 Capstone Design Building Systems: Construction Engineering**  
C, 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 AND and CE 468 OR CE 568

Computer Science, Writing

**CE405 Capstone Design Site Development: Environmental Engineering**  
C, 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 AND and CE 424 OR CE 524 and AND and CE 475 OR CE 575

Computer Science, Writing

**CE406 Capstone Design Building Systems: Architectural Engineering C, 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 AND and CE 433 and AND and CE 434

Computer Science, 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 of 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

**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 or IE 203

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): CE320 and CE378 and GES 255

Prerequisite(s) with concurrency: CE 424

**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

**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 principles and design processes. The second is to introduce the student to a variety 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): CE 340

**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 Design of Wood and 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 Facility**

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 and Intersection Design**

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

**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 Rehabilitation**

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 processes.

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 Resources in the European Alps**

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

**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 Aspects of Engineering and Construction**

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**

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

**CE492 Independent Study in Civil Engineering Sub-Disciplines**

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.

**CE498 Undergraduate Research Experience**

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)

**CE501 Masters Capstone Project-Plan II**

Hours 3

Development of a research paper, professional practice or policy paper, or other equivalent report. Topic to be approved in advance by the student's graduate advisor.

Prerequisite(s): MS Plan II students only

**CE514 Information Systems Design**

Hours 3

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

**CE517 Advanced Project Management**

Hours 3

Not open to students who have credit for CE 417. This is an engineering management course designed to introduce students to the functions of project engineers and managers. It details the processes of planning and controlling project scope, time, and cost.

**CE518 Engineering Mangement**

Hours 3

Not open to students who have credit for CE 418. 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.

**CE521 Environmental Engineering Microbiology**

Hours 3

Fundamentals of microbiology for environmental engineers and application of these principles to natural and engineered systems.

Prerequisite(s): CE 320 or equivalent

**CE522 Solid Hazardous Waste Managmnt**

Hours 3

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

Prerequisite(s): CE 320

**CE524 Water & Wastewater Treatment**

Hours 3

*No description available*

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

**CE525 Air Pollution**

Hours 3

Introduction to the source, characteristics, and effects of air pollution and to air pollution control technology and design.

Prerequisite(s): AEM 311 or CE 320

**CE526 Groundwater Mechanics**

Hours 3

A mechanics course focusing on developing the physical and mathematical principles of groundwater models used for predicting water and contaminant transport processes in subsurface aquifers.

Prerequisite(s): MATH 227 and AEM 311

**CE529 Research Proposal Writing in EWR**

Hours 3

Research funding is essential to a successful academic career. However, few PhD students receive adequate mentoring in how to craft competitive proposals. In this course, graduate students review literature, identify research questions, then draft and submit competitive funding proposals (for example to the EPA P3 program).

**CE530 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): CE 340

**CE531 Structural Dynamics**

Hours 3

Response of civil engineering structures to typical dynamic loads including theory, development of basic equations, and measurement of structure response in the laboratory.

Prerequisite(s): AEM 264 and CE 331

**CE532 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

**CE533 Structural Loads**

Hours 3

Calculation of typical gravity and lateral loads on Civil Engineering structures, identification of load paths for different building systems, and preliminary evaluation of structural adequacy.

Prerequisite(s): CE 331

**CE534 Advanced Structural Mechanics**

Hours 3

Introduction to advanced structural mechanics topics, including elementary elasticity, elementary beam theories, beams on elastic foundations, energy methods, buckling and free vibration of beams, and elementary thin-plate theory.

**CE535 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; MTE 271 for non-CCEE students

**CE536 Wood Structural Design**

Hours 3

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

Prerequisite(s): CE 331

**CE537 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

**CE538 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

**CE542 Waste Containment Facility**

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 320

**CE543 Prestressed Concrete Design**

Hours 3

Analysis and design of prestressed concrete members, review of hardware, stress calculations, prestress losses, section proportioning, flexural design, shear design, deflections, and statically indeterminate structures.

Prerequisite(s): CE 433 or equivalent course on reinforced concrete structures

**CE544 Foundation Engineering**

Hours 3

Analysis and design of soil foundation systems.

Prerequisite(s): CE 340

**CE551 Roadway and Intersection Design**

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

**CE552 Transportation Safety and Security**

Hours 3

This course focuses on major transportation safety and security issues. The course examines how death, injury and property damage and the public perception of risk detract communities from achieving their goals. The specific issues relate to transportation safety and security goals, relevant frameworks, and the selection of safety countermeasures and their evaluation in terms of specific criteria.

Prerequisite(s): CE 350

**CE553 Intelligent Transportation Systems**

Hours 3

This course covers the fundamentals of Intelligent Transportation Systems (ITS). The topics to be covered in the course will include systems engineering approach applied to ITS, ITS deployment and transportation operations, transportation system management, traveler response to technologies and information, ITS planning, evaluation, and institutional issues.

Prerequisite(s): CE 350

**CE554 Urban Transportation Planning**

Hours 3

An introduction to the planning process, software associated with transportation modeling, and conducting transportation planning and traffic impact studies.

**CE555 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

**CE558 Traffic Engineering**

Hours 3

This course covers the fundamentals of traffic engineering, including vehicle operating characteristics, traffic flow, traffic data, traffic hardware, traffic software, geometric design of road and intersections, and methods of traffic control.

Prerequisite(s): CE 350

**CE559 Pavement Design and Rehabilitation**

Hours 3

This course covers two areas concerning care of existing highway asphalt and concrete pavements. Major maintenance includes overlay design, additional drainage, recycling, and slab repair. Routine maintenance includes distress surveys, pothole repair, and crack and joint sealing.

Prerequisite(s): CE 350 or CE 366

**CE561 Horizontal Construction Method**

Hours 3

Introduction to horizontal construction engineering equipment and methods. Design of horizontal construction systems, and construction operation analyses and simulation.

**CE562 Vertical Construction Methods**

Hours 3

Construction of buildings, including mechanical, electrical, plumbing and controls systems, design of temporary structures, and planning and design of lifts.

Prerequisite(s): CE 366

**CE563 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 tolls and techniques, contingency planning and relationship to contract types and project execution strategies.

Prerequisite(s): CE 366

**CE564 Safety Engineering and Management**

Hours 3

Not open to students with credit for CE 464. An exposure to safety engineering 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, CE 366

**CE566 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

**CE567 Constr. Accounting & Finance**

Hours 3

Applications of accounting and financial practice to management of construction projects.

Prerequisite(s): CE366

**CE568 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 is required for a passing grade in this course.

**CE570 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

**CE573 Statistical Applications**

Hours 3

Applications of statistical and probabilistic methodologies for analysis and solution of practical civil engineering problems, including hypothesis testing, simple and multiple regression analysis, analysis of variance for single and multi-factor experiments, forecasting models, simulation, and statistical quality control.

Prerequisite(s): GES 255

**CE575 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

**CE576 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. Evaluation in the course will consist of out-of-class assignments and a term project.

Prerequisite(s): CE 378

**CE578 Analytical Methods in Environmental Engineering**

Hours 3

The field of environmental engineering relies heavily on a number of analytical techniques, which have become the basis for a large amount of the work being conducted. The main objective of this course is to introduce students to the theory and application of many of the analytical instruments that are commonly used by environmental engineers.

Prerequisite(s): CH 101 or CH 117; CE 320 or CHE 255



**CE581 Legal Aspects of Engineering and Construction**

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. 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)

**CE585 Constructn Site Erosion Contrl**

Hours 3

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

**CE586 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

**CE591 Special Problems**

Hours 1-3

Independent study. Credit is based on the amount of work undertaken.

**CE592 Graduate Independent Study in Civil Engineering Sub-Discipline**

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.

**CE593 Practicum**

Hours 1-3

This course allows graduate students to gain classroom and laboratory experience under supervised conditions. Tasks may include grading for selected courses, structured lecturing, laboratory monitoring, and other related pedagogical exercises.

**CE598 Non-Thesis Research**

Hours 1-6

Research Not Related to Thesis. Variable credit.

**CE599 Thesis Research**

Hours 1-12

This independent research course partially fulfills required master's-level research thesis hours toward the master's degree in Civil Engineering/ Environmental Engineering. The course is conducted under the guidance of the thesis advisor. Material covered will be of an advanced nature aimed at providing master's students with an understanding of the latest research and current developments within the field. Discussion and advisor guidance will be directed towards readings of research articles and development of research methodology, with the aim of producing an original research contribution that represents a novel development in the field, or a novel perspective on a pre-existing topic in the field.

**CE631 Experimental Methods in Structural Dynamics**

Hours 3

Introduction to experimental methods in the behavior of structures subjected to dynamic loading. Principles of vibration testing and digital signal processing. Current techniques in modal analysis, system identification, actuator and structural control, structural health monitoring.

Prerequisite(s): CE 531

**CE632 Structural Reliability**

Hours 3

The knowledge taught in this course is to provide the background needed to understand how reliability-based design criteria were developed and to provide a basic tool for structural engineers interested in applying this reliability-based design criteria to other situations.

Prerequisite(s): CE 573 Statistical Applications in Civil Engineering or instructor permission

**CE636 Advanced Infrastructure Materials**

Hours 3

Introduction to advanced and innovative materials used in civil infrastructure systems. An introduction to research methodology in materials is also included.

Prerequisite(s): CE 331

**CE641 Wind Engineering**

Hours 3

This research-oriented class is intended to provide a rational description of the phenomena involved and to develop appropriate analytical and design tools for structural engineering. The course attempts to present a synthesis of the main trends of specialized literature in Wind Engineering.

Prerequisite(s): CE 531

**CE655 Sustainable Transportation**

Hours 3

*No description available*

**CE673 Statistical and Econometrics Practices for Engineers**

Hours 3

This course covers basic and advanced statistical and econometric methods as applied to engineering-related problems. Topics include introduction to ordinary least squares regression, count-data models including Poisson and negative binomial regressions and their extensions, simultaneous equations models, multinomial logit models, ordered probability models, joint discrete/continuous models, and hazard-based duration models.

Prerequisite(s): CE 573

**CE691 Special Problems**

Hours 1-6

Advanced work in some area of specialization. Credit awarded is based on the amount of work completed.

**CE693 Practicum**

Hours 1-3

This course allows graduate students to gain classroom and laboratory experience under supervised conditions. Tasks may include grading for selected courses, structured lecturing, laboratory monitoring, and other related pedagogical exercises.

**CE699 Dissertation Research**

Hours 1-12

This independent research course partially fulfills required doctoral level research dissertation hours toward the Ph.D. in civil engineering. A minimum of 24 dissertation hours are required, at 1-12 hours per semester. The course is conducted under the guidance of the Ph.D. advisor. After completing requirements for admission to candidacy, the student registers for a minimum of 3 hours per semester in this course, each semester, until all dissertation requirements have been approved. Material covered will be of an advanced nature aimed at providing doctoral students with an understanding of the latest research and current developments within the field. Discussion and advisor guidance will be focused on readings of research articles and development of research methodology, with the aim of producing an original research contribution that represents a novel development in the field, or a novel perspective on a pre-existing topic in the field.