Civil, construction and environmental engineers design and build the local communities in which we all live and work. They also work globally to make positive change in the world. Civil, construction and environmental engineers are in high demand and make a difference locally and globally from planning the public parks in our own neighborhoods to providing clean and safe drinking water to children in refugee camps a world away, from designing and constructing modern sports stadiums to environmentally cleaning-up polluted lakes and streams, and from creating new and efficient public transportation networks to developing smart materials for our next generation of infrastructure.

The American Society of Civil Engineers (ASCE) states the following vision for civil, construction and environmental engineers in the year 2025: Entrusted by society to create a sustainable world and enhance the global quality of life, civil engineers serve competently, collaboratively and ethically as master:

- planners, designers, constructors and operators of the built environment
- stewards of the natural environment and its resources
- innovators and integrators of ideas and technology across the public, private and academic sectors
- managers of risk and uncertainty caused by natural events, accidents and other threats
- leaders in discussions and decisions shaping public environmental and infrastructure policy

Civil, construction and environmental engineering provides a full breadth of opportunities for those who, for example, dream of designing and constructing structures from roller coasters to sky scrapers, designing new water purification and distribution systems that provide clean and safe drinking water, or creating tomorrow’s safe and sustainable transportation systems to move people and goods efficiently.

The department’s comprehensive and flexible set of programs provides students with the knowledge, skills and attributes necessary to successfully enter the profession and lead exciting, fulfilling careers. Students may choose between two undergraduate majors, the bachelor of science in civil engineering (BSCE) and the bachelor of science in construction engineering (BSConE). Additionally, students may elect to supplement their degree with one of the department minors: architectural engineering, civil engineering (for non-civil majors), construction engineering (for non-construction majors), environmental and water resources engineering, structural engineering, and transportation engineering.

### Program Objectives

The objectives of The University of Alabama bachelor of science in civil engineering (BSCE) and bachelor of science in construction engineering (BSConE) programs are to graduate students who are in demand by employers and graduate programs and who lead fulfilling professional careers through their abilities to:

- apply foundational knowledge of mathematics, science, humanities and social sciences in the professional practice of civil or construction engineering
- synthesize technical knowledge of engineering analysis and design to identify, formulate and solve civil or construction engineering problems
- demonstrate the professional practice skills needed to be successful in civil or construction engineering

### Student Learning Outcomes

The BSCE and BSConE student learning outcomes are formulated into three categories:

#### Foundational Outcomes

1. Solve problems in mathematics through differential equations, probability and statistics, calculus-based physics, general chemistry, and one additional area of science.
2. Explain the importance of (1) humanities, literature and fine arts, and (2) history and social behavior in the professional practice of civil or construction engineering.

#### Technical Outcomes

1. Analyze and solve problems in material science and engineering mechanics.
2. Select and conduct program-relevant civil or construction engineering experiments to meet a need, and analyze and evaluate the resulting data.
3. Apply relevant knowledge, techniques, skills and modern engineering tools to identify, formulate and solve engineering problems, including:
   - for the BSCE – problems in at least four technical areas appropriate to civil engineering
   - for the BSConE – problems in construction processes, communications, methods, materials, systems, equipment, planning, scheduling, safety, economics, accounting, cost analysis and control, decision analysis, and optimization
4. Explain the impact of historical and contemporary issues on civil or construction engineering.
5. Develop solutions to well-defined project management problems within civil or construction engineering.
6. Design a system or process in more than one program-relevant civil or construction engineering specialty field to meet desired needs, including sustainability and within other realistic constraints such as economic, environmental, social, political, ethical, health and safety, and constructability.
7. Explain key aspects of at least one traditional or emerging program-relevant area of advanced specialization.

### Professional Practice Outcomes

1. Analyze a situation involving multiple conflicting professional, legal and ethical interests to determine an appropriate course of action.
2. Organize and deliver effective written, verbal, graphical and virtual communications.
3. Demonstrate the ability to learn through independent study, without the aid of formal instruction.
4. Demonstrate attributes supportive of the professional practice of engineering, apply leadership principles to direct the efforts of a small group to solve a relatively constrained problem, and function effectively as a member of a multidisciplinary team to solve open-ended engineering problems.
5. Explain the importance of licensure and basic concepts in engineering management, business, law, public administration, public policy and globalization as related to the professional practice of civil or construction engineering.

All students are strongly encouraged to prepare for and pass the Fundamentals of Engineering (FE) examination prior to graduation.

### Architectural Engineering Curriculum

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*Approved natural science (N) elective

**Senior (plan of study) elective

The University of Alabama
Environmental Engineering Curriculum

All architectural engineering students are strongly encouraged to prepare for and pass the Fundamentals of Engineering (FE) examination prior to graduation. A graduate of the program who has passed the FE exam would then be an Engineer Intern under Model Law as maintained by the National Council of Examiners for Engineering and Surveying (ncees.org). It is recommended that the FE be taken the semester prior to graduation. Related department policies and updates of catalog information are posted on the department website and message boards.

Freshman

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Total Hours: 124

1 Recommendations:
- CE 220 Society Infrastr & Envirorn and EC 110 Principles of Microeconomics as an SB
- Foreign language as an HU

Civil Engineering Curriculum

Senior plan of study electives must be CE courses numbered 400 or above or other approved electives. Other courses may be approved by petition. At least six hours of the senior electives must be design-designated (D) courses. In addition, not more than two senior electives may be professional practice (P) courses, including any non-civil engineering courses. See the department for a list of approved senior design electives, including approved design-designated (D), professional practice (P) and general technical (G) electives.

Freshman

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Total Hours: 124

1 Approved natural science (N) electives include CH 102 General Chemistry, BSC 114 Principles Of Biology I /BSC 115 Laboratory Biology I, GEO 101 The Dynamic Earth, GEO 102 The Earth Through Time, GEO 104 Hazardous Earth, GEO 105 Sustainable Earth, GY 101 Atmospheric Proc & Patterns, GY 102 Earth Surface Processes, and GEO 104 Hazardous Earth.

2 A six-hour sequence in either Hi/SB or HU/LFA core classes is required. Students are encouraged to consider EC 110 Principles of Microeconomics as an SB, CE 220 Society Infrastr & Envirorn as an SB, and/or a foreign language as an HU.

3 Senior (plan of study) electives must be CE courses numbered 400 or above or other approved electives. Other courses may be approved by petition. At least six hours of the senior electives must be design-designated (D) courses. In addition, not more than two senior electives may be professional practice (P) courses, including any non-civil engineering courses. See the department list for a list of approved senior design electives, including approved design-designated (D), professional practice (P), and general technical (G) electives.

Students must take either CE 121 Intro Civil Constrctn Envirorn Eg or ENGR 111 Engineering for the Future (1 hour). Prerequisite for ENGR 111 Engineering for the Future is MATH 110 Finite Mathematics (so students are taking MATH 112
Precalculus Algebra or MATH 113 Precalculus Trigonometry or MATH 115 Precalc Algebra & Trig or Calculus or higher).

Related department policies and updates of catalog information are posted on the department website and message boards.

Construction Engineering Curriculum

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Sophomore

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Senior

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Total Hours: 124


2. A six-hour sequence in either HI/SB or HU/L/FA core classes is required. Students are encouraged to consider EC 110 Principles of Microeconomics as an SB, CE 220 Society Infrastruct & Environm as an SB, and/or a foreign language as an HU.

3. Students must complete six hours of systems electives chosen from: ECE 320 Fundmtl Electrical Engr, ME 216 Thermal Engineering Survey and AEM 311 Fluid Mechanics.

4. Please see an adviser prior to enrolling. Co-op experience may be substituted with prior approval. See an adviser for additional information.

5. Senior (plan of study) electives must include at least one course in project management (PM) and at least one course in design (CD); one course may be a general technical elective (GT). See the department for a list of approved electives including approved project management (PM), design (CD) and general technical (GT) electives.

All construction engineering students are strongly encouraged to prepare for and pass the Fundamentals of Engineering (FE) examination prior to graduation. A graduate of the program who has passed the FE exam would then be an Engineer Intern under Model Law as maintained by the National Council of Examiners for Engineering and Surveying (ncees.org). It is recommended that the FE be taken the semester prior to graduation.

Related department policies and updates of catalog information are posted on the department website and message boards.

Departmental Honors Program

The Department of Civil, Construction and Environmental Engineering offers an undergraduate honors program for students who seek to be challenged by both independent and team projects, and who wish to receive additional distinction with their undergraduate degrees. This individually tailored program culminates with awarding of a Department Honors Certificate and recognition at the Honors Day Ceremony in the student’s senior year.

Requirements for the Bachelor of Science Degree with Honors

The requirements for the Bachelor of Science in Civil Engineering with honors and the Bachelor of Science in Construction Engineering with honors are as follows:

1. Completion of the course requirements for the BS degree in civil engineering or construction engineering.

2. Maintenance of at least a 3.3 GPA in all civil engineering courses, as well as a 3.3 cumulative GPA in all undergraduate coursework.

3. Completion of 12 hours of approved civil engineering courses using honors credit by contract. The professor and the honors student enter a contract by which the student agrees to additional work to receive honors credit. The following courses are guaranteed available for honors by contract:

   - CE 260  Civil & Construction Surveying
   - CE 320  Intro Environmental Engineering
   - CE 366  Introduction to Construction Engineering
   - CE 378  Water Resources Engineering
   - CE 433  Reinf Concrete Struct I

4. While the above courses are available for the Departmental Honors Program, they are not required. Other CE courses are available and can be included as part of the required 12 hours of honors credit by contract. Courses other than those listed above taken for honors credit require instructor and departmental approval. Students should contact the instructor for availability.

5. Completion of an honors undergraduate thesis. Students must work directly with a department faculty member on a problem of common interest. Credit for the thesis work is given through completion of three credit hours of the following course: CE 491 Special Problems. Credit for the honors thesis also is accepted as a CE elective within the civil or construction engineering curriculum.

Students enrolled in the Civil, Construction and Environmental Engineering Bachelor of Science Degree with honors are also encouraged to participate in one of the three University-wide honors programs (University Honors Program, Computer-Based Honors Program or International Honors Program).

Students interested in the Civil, Construction and Environmental Engineering Departmental Honors Program should contact the department office or their academic advisers for further details.

Department Minors and Certificates

The department offers a suite of minors and certificate programs. For additional information regarding any of the minors or certificates offered by the department, please contact the Department of Civil, Construction and Environmental Engineering; Room 260, H.M. Comer Hall; (205) 348-6550. Related department policies and updates of catalog information are posted on the department website and message boards.

Requirements for the Minor in Architectural Engineering

<table>
<thead>
<tr>
<th>Required Courses:</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE 331  Intro to Structural Eng.</td>
<td>10</td>
</tr>
<tr>
<td>CE 366  Introduction to Construction Engineering</td>
<td></td>
</tr>
<tr>
<td>CE 401 or CE 403  Capstone Design: Site Development  Capstone Design: Building Systems</td>
<td></td>
</tr>
</tbody>
</table>

The University of Alabama 3
Approved Electives - courses must be approved in at least two of the following areas: structural engineering and design, building mechanical systems and/or construction engineering and management.

**Total Hours:** 22

### Requirements for the Minor in Civil Engineering

**Required Courses:**
- CE 320 Intro Environmental Engineering
- CE 331 Intro to Structural Eng.
- CE 340 Geotechnical Engineering
- CE 350 Intro. to Transportation Eng
- CE 366 Introduction to Construction Engineering
- CE 378 Water Resources Engineering

**Approved Electives — courses must be an approved civil engineering senior (400-level) electives**
- 6

**Total Hours:** 25

### Requirements for the Minor in Construction Engineering

**Required Courses:**
- CE 366 Introduction to Construction Engineering
- CE 464 Safety Engineering
- CE 461 or Horizontl Construction Methods
- CE 462 Vertical Construction Methods
- CE 463 or Construction Cost Estimating
- CE 468 Construction Scheduling

**Approved Electives - courses must be an approved senior (400-level) electives; students may take both CE 461 Horizontl Construction Methods and CE 462 Vertical Construction Methods and/or both CE 463 Construction Cost Estimating and CE 468 Construction Scheduling to satisfy the requirements of the minor**
- 6

**Total Hours:** 18

### Requirement for the Environmental and Water Resources Engineering

**Requirement for minor in Environmental and Water Resources Engineering**

**Required Courses:**
- CE 320 Intro Environmental Engineering
- CE 378 Water Resources Engineering
- CE 422 Solid And Hazardous Waste Mgt
- CE 425 Air Quality Engineering

**Approved electives (minimum of six credit hours) — courses must be an approved civil engineering elective**
- 6

**Total Hours:** 18

### Requirements for the Minor in Structural Engineering

**Required Courses:**
- CE 331 Intro to Structural Eng.
- CE 432 Matrix Analysis of Structures
- CE 433 Reinf Concrete Struct I
- CE 434 Structural Steel Design I

**Approved electives (minimum of three credit hours) — courses must be an approved civil engineering elective**
- 3

**Total Hours:** 15

### Requirements for the Minor in Transportation Engineering

**Required Courses:**
- CE 350 Intro. to Transportation Eng

**Total Hours:** 3

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**Requirements for the Environmental Engineering Certificate**

Engineering students may earn the certificate in environmental engineering in addition to their bachelor of science (BS) degree. Students must complete 12 hours of environmental engineering courses from an approved list. Many of these courses are commonly acceptable for credit toward the BS degree; however, of the 12 hours, at least six must be in addition to the BS degree requirements. Please see an adviser for a list of approved environmental engineering certificate courses. Other courses may be approved by petition.

### Requirements for the Construction Management Certificate

The certificate in construction management is primarily designed for non-engineering majors. The certificate is noted on transcripts and is awarded to students who complete 12 hours of construction management courses from the approved list. Many of these courses are commonly acceptable for credit toward the degree; however, of the 12 hours, at least six must be in addition to the student’s bachelor degree requirements. Please see an adviser for a list of approved environmental engineering certificate courses. Other courses may be approved by petition.

### Faculty

**Department Head**
Back, W. Edward

**Director, Undergraduate Programs**
Williamson, Derek G.

**Director, Graduate Programs**
Graettinger, Andrew

**Director, Environmental Institute**
Ernest, Andrew

**Director, Center for Sustainable Infrastructure**
Back, Edward W.

**Director, University Transportation Center for Alabama**
Lindly, Jay K.

**Director, Large Scale Structures Laboratory**
Kreger, Michael

**Professors**
Amirkhanian, Serji
Back, Edward W.
Batson, Robert G.
Durrans, S. Rocky
Ernest, Andrew
Fridley, Kenneth J.
Johnson, Pauline D.
Kreger, Michael
Lindly, Jay K.
Moynihan, Gary P.

**Associate Professors**
Graettinger, Andrew
Johnson, Philip W.
Jones, Steven, Jr.
Richardson, James A.
Tootle, Glenn
Wang, Jialai
Williamson, Derek G.
Prerequisite(s): CE 262.

CE 220. Society Infrastructure & Environment. 3 sem. hrs.
Permitting, environmental impact statements and other environmental issues associated with human activities and engineering projects.

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.

CE 262. Civil & Construction Engr Matls. 0-3 sem. hrs.
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.

CE 270. Climate Changes: European Alps. 4 sem. hrs.
The course focuses on hydrology, climate, dendrohydrology (tree rings) and glaciers. The classroom lectures and in-class labs include 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.

CE 271. Glaciology. 4 sem. hrs.
Glacier basics, physical properties, mass and energy balance, climate change impacts, streamflow impacts.

CE 320. Intro Environ Engineering. 3 sem. hrs.
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.

CE 331. Intro to Structural Engr. 0-3 sem. hrs.
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.

CE 340. Geotechnical Engineering. 4 sem. hrs.
Static and dynamic interaction of soil and water; theories of stress distribution, consolidation, strength and failures; stability of soil structures. Prerequisite(s): CE 262 and AEM 250.

CE 350. Intro. to Transportation Eng. 3 sem. hrs.
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.

CE 366. Introduction to Construction Engineering. 3 sem. hrs.
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.

CE 378. Water Resources Engineering. 3 sem. hrs.
Mechanics of steady and unsteady flow in closed and open conduits, hydrology; water supply and wastewater disposal. Computing proficiency is required for a passing grade in this course. Prerequisite(s): Dynamics (AEM 264) and Fluid Mechanics (AEM 311); or Fluid Flow Operations (CHE 304).

CE 401. Capstone Design: Site Development. 4 sem. hrs.
Students use 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 within the discipline and computing proficiency are required for a passing grade in this course. Prerequisite(s): Student must satisfy one of the following sets of prerequisite(s): a) CE 320 with a minimum grade of C- And CE 350 with a minimum grade of C- And CE 378 with a minimum grade of C- And Six (6) credit hours of 400- or 500-level CE courses with a minimum grade of C- And Two (2) of the following (may be taken concurrently): CE 424 or CE 524, CE 425 or CE 525, CE 427 or CE 527, CE 442 or CE 542, CE 451 or CE 551, CE 457 or CE 557, CE 459 or CE 559, CE 475 or CE 575, CE 485 or CE 585. b) CE 340 with a minimum grade of C- And CE 366 with a minimum grade of C- And CE 320 or CE 350 or CE 378 with a minimum grade of C- And Six (6) credit hours of 400- or 500-level CE courses with a minimum grade of C- And Two (2) of the following (may be taken concurrently): CE 424 or CE 524, CE 425 or CE 525, CE 427 or CE 527, CE 442 or CE 542, CE 485 or CE 585. c) CE 320 with a minimum grade of C- And CE 340 with a minimum grade of C- And CE 378 with a minimum grade of C- And Six (6) credit hours of 400- or 500-level CE courses with a minimum grade of C- And Two (2) of the following (may be taken concurrently): CE 424 or CE 524, CE 425 or CE 525, CE 427 or CE 527, CE 442 or CE 542, CE 485 or CE 585.

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 within the discipline and computing proficiency are required for a passing grade in this course. Prerequisite(s): Student must satisfy the following set of prerequisite(s): CE 331 with a minimum grade of C- And CE 340 with a minimum grade of C- And CE 366 with a minimum grade of C- And Six (6) credit hours of 400- or 500-level CE courses with a minimum grade of C- And Two (2) of the following (may be taken concurrently): CE 433, CE 434, CE 436 or CE 536, CE 437 or CE 537, CE 438 or CE 538, CE 439 or CE 539, CE 444 or CE 544, CE 462 or CE 562.

CE 414. Information Systems Design. 3 sem. hrs.
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.

CE 417. Advanced Project Management. 3 sem. hrs.
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.

CE 418. Engineering Management. 3 sem. hrs.
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.

CE 420. Environmental Measurements. 3 sem. hrs.
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.

CE 422. Solid And Hazardous Waste Mgt. 3 sem. hrs.
Engineering design and regulatory requirements for the collection, storage, recycling, treatment and disposal of solid wastes. Prerequisite(s): CE 320.

CE 424. Water And Wastewater Treatment. 3 sem. hrs.
Physical, chemical and biological principles and design of municipal water and wastewater treatment units. Prerequisite(s): CE 320.
CE 425. Air Quality Engineering. 3 sem. hrs.
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.
CE 427. Storm Water Management. 3 sem. hrs.
Quality and quantity of urban storm water. Receiving water problems and sources of pollutants. Runoff quality and quantity characteristics, Selection and design of controls; regulations.
Prerequisite(s): CE 378 and CE 475.
CE 432. Matrix Analysis of Structures. 3 sem. hrs.
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.
CE 433. Reinforced Concrete Struct I. 3 sem. hrs.
Concrete materials, placement of concrete and theory and design of reinforced beams, girders, slabs, columns and footings.
Prerequisite(s): CE 331.
CE 434. Structural Steel Design I. 3 sem. hrs.
Theory and design of structural steel members and their connections.
Prerequisite(s): CE 331.
CE 435. Concrete Materials. 3 sem. hrs.
Prerequisite(s): CE 331 or CE 340.
CE 437. Reinforced Concrete Struct II. 3 sem. hrs.
Design of reinforced concrete building components including two-way slabs, slender columns, prestressed beams, slap-on-grade and retaining walls.
Prerequisite(s): CE 433.
CE 438. Structural Steel Design II. 3 sem. hrs.
Basic and elementary design procedures for steel structures such as plate girders, mill buildings, multiistory buildings, highway bridges and light-gauge steel structures.
Prerequisite(s): CE 434.
CE 439. Design of Wood and Masonry Structures. 3 sem. hrs.
Design of wood and masonry components and subassemblies for low-rise residential and commercial buildings according to current design specifications.
Prerequisite(s): CE 331.
CE 442. Waste Containment Facility. 3 sem. hrs.
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.
CE 444. Foundation Engineering. 3 sem. hrs.
Analysis and design of soil foundation systems.
Prerequisite(s): CE 340.
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.
CE 454. Urban Transportation Planning. 3 sem. hrs.
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.
CE 458. Traffic Engineering. 3 sem. hrs.
Vehicle operating characteristics, traffic flow, geometric design of road and intersections, and methods of traffic control.
Prerequisite(s): CE 350.
CE 459. Pavement Design and Rehabilitation. 3 sem. hrs.
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 joint sealing.
Prerequisite(s): CE 350 or CE 366.
CE 460. Front End Planning. 3 sem. hrs.
Principles and applications for effective, early planning of capital facilities including: finance, economics decision-making, risk management, team alignment and front end planning processes and tools.
Prerequisite(s): CE 366.
CE 461. Horizontal Construction Methods. 3 sem. hrs.
Introduction to horizontal construction equipment and methods, design of horizontal construction systems and construction operation analysis and simulation.
Prerequisite(s): CE 386
Prerequisite(s) with concurrency: CE 340.
CE 462. Vertical Construction Methods. 3 sem. hrs.
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.
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.
CE 464. Safety Engineering. 3 sem. hrs.
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): CE 366GES 255 and CE 386.
CE 467. Constr. Accounting & Finance. 3 sem. hrs.
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.
CE 468. Construction Scheduling. 3 sem. hrs.
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.
The course focuses on statistical hydrology, climate, dendroclimatology (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 475. Hydrology. 3 sem. hrs.
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.
CE 480. Forensic Engineering. 3 sem. hrs.
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.
Prerequisite(s): AEM 250.
CE 481. Legal Aspects of Engineering and Construction. 3 sem. hrs.
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).
CE 484. Exp. Design & Field Sampling. 3 sem. hrs.
Experimental design, sensitivity analyses, water sampling and flow monitoring. Receiving water chemical reactions. Field investigations.
Prerequisite(s): CE 320 and GES 255.
CE 485. Const. Site Erosion Control. 3 sem. hrs.
Prerequisite(s): CE 378.

CE 486. GIS for Civil Engineers. 3 sem. hrs.
Introduction to geographic information system design and use for civil engineering problem solving.
Prerequisite(s): CE 260 and any CE 300 Level Course.

CE 491. Special Problems. 1-3 sem. hr.
Credit is based on the amount of work undertaken. Analysis and/or design in any phase of civil engineering. The course is intended to take care of needs not covered by regularly offered courses.

CE 498. Undergraduate Research Experience . 1-6 sem. hr.
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).