CE-Civil Engineering

CE 515. Building Information Modeling (BIM). 3 Hours.
This class provides an introduction to the virtual world of design and construction. Topics covered include uses for technology, what is BIM, and have a focus on AutoCAD and Revit Software. An emphasis is placed on the use of these tools and their practical applications to the real world environment. Students are provided with the software through the Autodesk Student community and are required to complete a Multi-Step term Project.

CE 516. Mechanical Vibrations. 3 Hours.
Free and forced single-degree-of-freedom systems. Multi-degree-of-freedom systems. Damped, forced two-degree-of- freedom systems. Simple continuous systems.

CE 520. Advanced Mechanics. 3 Hours.
Variation of stress at point including determination of principal and maximum shear stresses. Basic problems involving symmetrical deformation; thickwall cylinders, spheres, and rotating disk. Torsions of noncircular sections. Curved beams. Failure Theories. Unsymmetrical bending and shear center.

CE 526. Foundation Engineering. 3 Hours.
Application of principles of soil mechanics to: determine bearing capacity and settlement of spread footings, mats, single piles and pile groups; site investigation, evaluate data from field and laboratory tests; estimation of stresses in soil masses; lateral resistance of piles and pile groups; retaining walls, sheetpiles and coffer-dams.

CE 530. Water Supply/Drainage Design. 3 Hours.
Water requirements; wastewater characteristics. Hydraulics and design of sewers; distribution, and reuse of water. Development of water supplies; design considerations.

CE 531. Energy Resources. 3 Hours.
Overview of the various energy resources: oil, natural gas, coal, nuclear, hydro, solar, geothermal, biomass, wind, and ocean energy resources, in terms of supply, distribution, recovery and conversion, environmental impacts, economies, policy, and technology. Concepts and opportunities for energy conservation; including electric power generation, changing role of electric utilities, transportation applications, and energy use in developing countries. Field trips.

CE 533. Solid and Hazardous Wastes Management. 3 Hours.
Overview of waste characterizations, regulations, and management options.

CE 534. Air Quality Modeling and Monitoring. 3 Hours.
Atmospheric pollutants; effects, reactions, and sources. Air pollution meteorology and dispersion modeling. Ambient monitoring.

CE 537. Environmental Experimental Design and Field Sampling. 3 Hours.
Experimental design, sensitivity analyses, water sampling, and flow monitoring. Receiving water chemical reactions. Field investigations.

CE 537L. Environmental Experimental Design and Field Sampling Lab. 0 Hours.
Lab experiences in environmental experimental design and field sampling.

CE 542. Highway Materials and Construction. 3 Hours.
Properties of materials used in highway construction. Construction methods and management.

CE 543. Pavement Design & Construction. 3 Hours.
Analysis of stresses and strains in pavement systems. Design and construction of flexible and rigid pavements, base courses and subgrades. Effects of loading on pavement life.

CE 544. Civil Engineering Analysis II. 3 Hours.
Sampling and experimental design. Hypotheses testing. Decision Analyses. Multiple regression analyses. Nonparametric methods. Analysis of experimental data in civil engineering research; regression, experimental design, non-parametrical analysis.

CE 545. Engineering the Built Environment. 3 Hours.
This service learning course explores the effects the built environment has on urban function, connectivity, community health, and the well-being of its residents. Students work directly in Birmingham neighborhoods learning how to assess different components of the built environment, including transportation, green spaces, lighting, and blight, and to estimate their impacts on community health and well-being. Students then work with representatives from the city, neighborhoods, and local industry to propose engineering solutions, develop realistic cost estimates, assess potential benefits, and develop implementation plans.

CE 546. Green Infrastructure and Transportation. 3 Hours.
This course covers policy and technical issues related to sustainable transportation. The course begins by discussing the concepts, viewpoints, and fundamentals essential for understanding sustainable transportation planning. Tools used to assess sustainability of transportation facilities and neighborhoods are introduced next. The course also presents design options in support of green infrastructure and transportation, including livable street design, and traffic calming applications. The course is expected to expand students' knowledge base on sustainable transportation issues and help them understand the concept of sustainable transportation toward the development of sustainable smart cities.

CE 547. Principles of Sustainable Development. 3 Hours.
The course presents the concepts, viewpoints and fundamentals essential for understanding the urban sustainable development agenda. Students will review basic earth sciences to better evaluate the impact our anthropogenic activities have on the natural environment and therefore how to minimize adverse future outcomes. Throughout the course case studies of sustainable developments will be used to illustrate the value, challenges and limitations of this concept. In the end, students will possess the knowledge base needed to help advance sustainable smart cities development.

CE 553. Design of Wood Structures. 3 Hours.
This course will give students an understanding of structural wood materials, both sawn lumber and a number of engineered wood materials. The main objective of the course is to learn how to design wood structures using these materials, including the design of beams, columns, connections, roof diaphragms, and shear walls. The requirement of the National Design Specification for Wood Structures will be addressed.

CE 554. Design of Masonry Structures. 3 Hours.
Design and detailing of masonry structures. Nomenclature, properties, and specifications for components. Design of assemblages, simple masonry structures, unreinforced and reinforced elements, and complex masonry structures.

CE 556. Prestressed Concrete Design. 3 Hours.
Principles and concepts of design in prestressed concrete including elasticand ultimate strength analysis for flexural, shear, bond, and deflections. Principles of concordance and linear transformation for indeterminate prestressed structures.

CE 557. Concrete Technology. 3 Hours.
Properties of concrete in relation to specifying, purchasing, and evaluating concrete materials. Fresh and hardened concrete properties. Concrete mix design procedures. Effects of finishing, curing, weather conditions, and various construction procedures. Ready mix concrete production and field placement techniques. Specifications writing to ensure good quality concrete and field inspection procedures. Case studies of problems in concrete construction.

CE 560. Structural Mechanics. 3 Hours.
Elastic beam deflections, beam columns, lateral torsional buckling, column stability, plastic design, plate bending, yield line theory.

CE 561. Introduction to the Finite Element Method. 3 Hours.
Concepts and applications of the finite element method. Development and applications of basic finite elements. Software use.

CE 562. Advanced Structural Analysis. 3 Hours.
Analysis of indeterminate structures using classical and matrix methods. Use of large-scale computer programs.

CE 564. Structural Dynamics. 3 Hours.
Closed form and numerical solutions to single-degree-of-freedom structural models. Analysis of multistory frames. Computer application and seismic analysis. Techniques of modal analysis.

CE 565. CE Construction Documents. 3 Hours.
Introduction to Civil Engineering design and construction documents including drawings, specifications, contracts, and testing reports. Overview of civil infrastructure and project types, including the civil engineer's role in the preparation, certification, and use of construction documents. Construction topics include measurement, quantity estimating, and engineering budgets.

CE 567. Wind and Seismic Loads. 3 Hours.
Methods for calculating loads on structures caused by extreme winds and earthquakes. Calculation of wind loads on various types of structures according to theory and codes. Determination of earthquake loads on structures using structural dynamics and codes.

CE 568. Bridge Engineering. 3 Hours.
Bridge loads, steel beam bridges, composite beam bridges, bridge bearings, reinforced and prestressed concrete slab and T-beam bridges, bridge evaluations and ratings, upgrade methodologies, computer applications.

CE 570. International Research Experience. 3 Hours.
The International Research Experience for Students (IRES) program provides the opportunity for undergraduate and graduate students to participate in hands-on engineering research in an international setting. Students perform research on an approved topic related to civil engineering design in an international environment. Students select a topic, perform a detailed literature review, and work with mentors from UAB and the international host institution to develop research objectives and a detailed research plan. The course will culminate in a 6-8 week visit to the international host institution, during which time students will conduct hands-on research with their mentors and prepare final reports.

CE 575. Construction Safety and Health Management. 3 Hours.
This course covers various causes of construction accidents and the adopted strategies to prevent worksite injuries and illnesses. Other topics covered include workers' compensation, OSHA standards for the construction industry, economics of construction safety management, temporary structures, system safety, ergonomic applications, health hazards, and the development of a safety program.

CE 580. Introduction to Water and Wastewater Treatment. 3 Hours.
Physical unit operations, and chemical/biological unit processes for water and wastewater treatment. Design of facilities for treatment. Treatment and disposal of sludge.

CE 585. Engineering Hydrology. 3 Hours.
Hydrologic principles including hydrology cycle, precipitation data, and stream-flow measurements. Applications to engineering problems; stream-flow analysis and watershed management.

CE 590. Special Topics in Civil Engineering. 1-6 Hour.
Special Topic in Civil Engineering.

CE 591. Individual Study in Civil Engineering. 1-6 Hour.
Individual Study in Civil Engineering.

CE 597. Construction Engineering Management. 3 Hours.
Study of construction management services that include: project planning, scheduling, estimating, budgeting, contract administration, agreements, and ethics. Emphasis is made on the management of manpower, materials, money and machinery.

CE 600. Sustainable Construction. 3 Hours.
Study of sustainable construction techniques and best practices. Provides an understanding of the interdependencies between planning, designing, building, operating, and demolishing the built environment and their impacts on the natural environment. Course topics will include: (1) issues of recourse efficiency, economics, ethics, waste, human health, environmental justice, and industrial ecology; (2) alternative practices that significantly reduce adverse environmental impacts of built infrastructure, and (3) explore past and present thinking of engineering practitioners in this newly emerging discipline.

CE 605. Project Management. 3 Hours.
Presents the theory and practice of project management as a distinct discipline with applications in time, cost, and performance management. Managerial, organizational, behavioral and cost benefit aspects of project management are covered, as well as various applied models for organizing, executing, and monitoring a project. Basic estimating techniques to determine cost and time for construction work packages are discussed followed by scheduling model techniques to include the Critical Path Method (CPM), Precedence Diagramming Method (PDM), Program Evaluation and Review Technique (PERT), and Gantt charts.

CE 607. Engineering Entrepreneurship. 3 Hours.
Course focuses on the entrepreneurial engineer--a new type of engineer who needs a broad range of business skills and knowledge above and beyond a strong science and engineering background. The course will introduce engineering students to the key aspects of engineering entrepreneurship including business planning, solving problems, risk taking, financing, marketing, and entrepreneurial leadership. The students will also be introduced to the many opportunities and challenges that accompany starting and operating an entrepreneurial venture. Entrepreneurial company leaders will present their experiences and share their leadership styles as part of the course.

CE 608. Green Building Design. 3 Hours.
Quantitative introduction to the principles of "Green Building Design". Provides students an understanding of the interdependencies between economics, technology, design, building occupation and the subsequent impact on the natural environment. Course will emphasize green building materials, new technologies, and sustainable construction methods. Course also includes LEED Case Studies (industrial, commercial, residential, and institutional examples).

CE 610. The Engineered Environment. 3 Hours.
Fundamentals of environmental engineering as they apply to the construction of the built environment and contemporary issues faced by engineers in developing nations such as Egypt. Topics include air pollution, solid waste management, water treatment, environmental ethics, etc.

CE 612. Theory of Elasticity. 3 Hours.
Equations of linear reduction to plane stress, plane strain, and generalized plane strain. Airy and love stress functions in solution of problems.

CE 615. Theory of Elastic Stability. 3 Hours.
Static stability of bars, beams, trusses, and rigid frames. Dynamic stability of bars. Energy method applied to bucking problems. General theory of elastic stability.

CE 617. Theory of Plates and Shells. 3 Hours.
Linear theory and solutions of plates and various shapes. Large deflection theory and solutions of rectangular and circular plates. Membrane and bending theories of shells. Solutions of problems in conical, cylindrical, and spherical shell.

CE 621. Transportation Engineering Seminar. 1 Hour.
Seminar focusing on student research and guest presentations of various topics of interest to graduate transportation engineering students.

CE 622. Traffic Flow Theory. 3 Hours.
Microscopic and macroscopic traffic flow characteristics. Traffic flow analytical techniques including car-following models, traffic stream models, shock wave analysis, queuing analysis and gap acceptance. Simulation models for network analysis.

CE 623. Non-Motorized Transportation Design and Planning. 3 Hours.
Urban planning principles that support non-motorized transportation, local bicycle or pedestrian plans, non-motorized transportation safety related considerations, non-motorized transportation design including traffic calming techniques, procedures for capacity analysis of pedestrian facilities.

CE 624. Simulation Models for Transportation Applications. 3 Hours.
Basic concepts of simulation models for analysis and optimization of transportation systems. Experimentation with planning simulation models and traffic models for signal timing and capacity analysis.

CE 625. Intelligent Transportation Systems. 3 Hours.
Legal, institutional and planning issues related to intelligent transportation systems. System architecture, communication techniques, advanced user services, intermodal systems, connected and autonomous vehicles applications.

CE 631. Environmental Law. 3 Hours.
Law as it applies to the practicing environmental engineer. New and emerging regulations.

CE 632. Industrial Waste and Wastewater Treatment. 3 Hours.
Solid wastes and wastewaters from various industries. Assessment of treatability, system design, and equipment selection.

CE 633. Solid and Hazardous Waste Management. 3 Hours.
Provides students a quantitative introduction to solid and hazardous waste characterizations, international regulations, and management options. Course topics to include (1) Solid waste management hierarchy (reduce, reuse, recycle, recovery, responsible disposal); (2) Dry tomb landfill design; and (3) Hazardous waste identification and treatment/disposal.

CE 636. Stormwater Pollution Management. 3 Hours.
Quality and quantity of stormwater. Receiving water problems and sources of pollutants. Runoff quality and quantity characterizations. Erosion control. Selection and design of controls; regulations.

CE 638. Water and Wastewater Chemistry. 3 Hours.
Aquatic chemistry. Chemical behavior of pollutants in receiving waters. Fate of common pollutants. Chemical kinetics in natural waters. Photochemical reactions. Modeling of wastewater discharges.

CE 639. Sediment Sources and Controls. 3 Hours.
Erosion and sediment transport areas; design of common erosion control practices.

CE 640. Wastewater Treatment Engineering. 3 Hours.
Wastewater sources and characteristics. Design and operation of wastewater treatment facilities, including grit removal, oil and grease removal, dissolved air flotation, activated sludge process, trickling filters, and rotating biological contractors, stabilization ponds and aerated lagoons, anaerobic processes for wastewater treatment and sludge digestion. Ultimate disposal of wastewater residues and considerations of discharge criteria.

CE 643. Pavement Design and Construction. 3 Hours.
Design and construction of flexible and rigid pavements. Topics include stress and strain responses, design parameters, AASHTO and NAPA design procedures, pavement construction, pavement rehabilitation, and maintenance techniques.

CE 646. Traffic Engineering Operations. 3 Hours.
Highway and intersection capacity analysis, traffic signal timing and phasing, signal coordination, freeway operations, non-signalized traffic control techniques.

CE 648. Urban and Transportation Planning. 3 Hours.
Land use planning for transportation systems; trip generation, trip distribution, modal split, and traffic assignment.

CE 649. Engineering Liability. 3 Hours.
Laws related to liability for engineering design in the context of product liability and construction projects; roles and liabilities between various parties involved in construction projects.

CE 650. Advanced Structural Steel. 3 Hours.
Beams, columns, tension members, and connections; current research.

CE 655. Advanced Reinforced Concrete. 3 Hours.
Beam, column, and slab actions; current research.

CE 658. Engineering Management. 3 Hours.
Management techniques for the practicing engineer.

CE 663. Finite Element Methods. 3 Hours.
Theory and applications in structural mechanics. Plane stress, plane strain, axisymmetric problems, solids, plates, shells, nonlinear systems.

CE 681. Environmental Chemistry. 3 Hours.
Chemical equilibrium, acid/base, chemical concepts in pollutant behavior. Chemical kinetics, redox system, hydrolysis, pesticides, chemical wastes.

CE 682. Water Treatment Engineering. 3 Hours.
Water sources and characteristics. Design and operations of water treatment facilities. Topics Include lime softening operations, coagulation, flocculation, clarification dissolved air flotation, filtration, disinfection, absorption, ion exchange and sludge management.

CE 683. Water and Wastewater Treatment Processes Lab. 3 Hours.
Construction and evaluation of bench-scale treatment processes. Treatability of water and wastewater. Coagulation of sedimentation, settleability of biological sludge, aerobic biological treatment, chemical treatment, water softening toxicity, disinfection, and sludge treatment processes.

CE 685. Engineering Hydrology. 3 Hours.
Hydrologic principles including hydrologic cycle, precipitation data, and stream-flow measurements. Applications to engineering problems; stream-flow analysis and watershed management.

CE 686. Engineering Hydrogeology. 3 Hours.
Groundwater movement, natural quality, contamination, and restoration. Physical and chemical properties of groundwater. Well hydraulics and flow net analyses. Prevention and control of groundwater contamination.

CE 687. Stormwater Detention Pond Design. 3 Hours.
Stormwater problems and control methods. Urban hydrology prediction procedures for drainage and water quality studies. Detention pond design basics, limitations and multiple benefits.

CE 688. Strategic Management and Leadership Applications in a Global Environment. 3 Hours.
This course is designed to prepare students to face the demanding management and leadership challenges facing construction and engineering industry leaders as competition becomes ever more globalized. The necessity to personally remain trained and relevant in the changing business environment is emphasized. Strategic planning, management and leadership in the built environment requires savvy leaders with exceptionally developed analytical and communications skills suitable for multi-disciplinary and multi-national ventures. Every individual and organization must continually innovate and reinvent to stay competitive. In a competitive environment, a strong working knowledge of the financial markets is essential and students are exposed to multiple lessons presented by financial industry practitioners. Students participate in a group project designed to reinforce the methodology associated with preparing and presenting a dynamic business plan. This course provides the opportunity for students to discuss and research these concepts and to recognize the necessity to think independently, challenge conventional thinking, and visualize alternatives.
Prerequisites: CE 669 [Min Grade: C]

CE 689. Building Information modeling (BIM) Techniques. 3 Hours.
This course provides students with an overview of the evolution of BIM technology in the construction industry followed by hands-on training in the basic application of contemporary BIM software. Students will learn basic modeling skills and how to produce graphical presentations. Advanced applications of BIM technology are discussed and demonstrated. Students will be provided with BIM software and are required to complete a multi-step BIM model as a term project.

CE 690. Special Topics in (Area). 1-3 Hour.
Special Topics (Area).

CE 691. Individual Study in (Area). 1-4 Hour.
Individual Study (Area).

CE 692. CE Capstone Project. 3 Hours.
This course covers specific contemporary topics related to civil engineering practice and knowledge. Capstone project using case studies to apply skills, knowledge, techniques, and concepts developed in prior courses.

CE 693. Applied Research in Civil, Construction, and Environmental Engineering. 3-9 Hours.
Research tools, including elements of experimental design and proposal preparation. Effective communication, literature searches, and exploratory data analysis.

CE 695. International Construction Contracts/Liability. 3 Hours.
Provides an overview of the fundamental aspects of the law that affects construction and engineering companies as well as the project owners. Particular emphasis is placed on contract forms and provisions related to liability for engineering design and construction companies, the roles of the typical participation in the process, and dispute resolution.

CE 697. Master's Project. 3-9 Hours.
A UAB Master's Project must demonstrate evidence of scholarly study and writing that ultimately contributes to the scientific knowledge base. This course is designed to allow students the opportunity to develop original ideas or seek to advance knowledge through theory, conceptualization, design, testing of tools, instruments, or procedures relevant to the practice of civil engineering.

CE 698. Non-Thesis Research. 1-12 Hour.

CE 699. Thesis Research. 1-12 Hour.
Prerequisites: GAC M

CE 712. Theory of Elasticity. 3 Hours.
Equations of linear reduction to plane stress, plane strain, and generalized plane strain. Airy and love stress functions in solution of problems.

CE 715. Theory of Elastic Stability. 3 Hours.
Static stability of bars, beams, trusses, and rigid frames. Dynamic stability of bars. Energy method applied to buckling problems. General theory of elastic stability.

CE 717. Theory of Plates and Shells. 3 Hours.
Linear theory and solutions of plates of various shapes. Large deflection theory and solutions of rectangular and circular plates. Membrane and bending theories of shells. Solutions of problems in conical, cylindrical, and spherical shells.

CE 721. Transportation Engineering Seminar. 1 Hour.
Seminar focusing on student research and guest presentation of various topics of interest to graduate transportation engineering students.

CE 722. Traffic Flow Theory. 3 Hours.
Microscopic and macroscopic traffic flow characteristics. Traffic flow analytical techniques including car-following models, traffic stream models, shock wave analysis, queuing analysis and gap acceptance. Simulation models for network analysis.

CE 723. Non-Motorized Transportation Design and Planning. 3 Hours.
Urban planning principles that support non-motorized transportation, local bicycle or pedestrian plans, non-motorized transportation safety related considerations, non-motorized transportation design including traffic calming techniques, procedures for capacity analysis of pedestrian facilities.

CE 724. Simulation Models for Transportation Applications. 3 Hours.
Basic concepts of simulation models for analysis and optimization of transportation systems. Experimentation with planning simulation models and traffic models for signal timing and capacity analysis.

CE 725. Intelligent Transportation Systems. 3 Hours.
Legal, institutional and planning issues related to intelligent transportation systems. System architecture, communication techniques, advanced user services, intermodal systems, connected and autonomous vehicles applications.

CE 731. Environmental Law. 3 Hours.
Law as it applies to the practicing environmental engineer. New and emerging regulations.

CE 732. Industrial Waste and Wastewater Treatment. 3 Hours.
Solid wastes and waste waters from various industries; assessment of treatability, system design, and equipment selection.

CE 736. Stormwater Pollution Management. 3 Hours.
Quality and quantity of stormwater. Receiving water problems and sources of pollutants. Runoff quality and quantity characterizations. Erosion control. Selection and design of controls; regulations.

CE 738. Water and Wastewater Chemistry. 3 Hours.
Aquatic chemistry. Chemical behavior of pollutants in receiving waters. Fate of common pollutants. Chemical kinetics in natural waters. Photochemical reactions. Modeling of wastewater discharges.

CE 739. Sediment Sources and Controls. 3 Hours.
Erosion and sediment transport in urban areas, design of common erosion control practices.

CE 740. Wastewater Treatment Engineering. 3 Hours.
Wastewater sources and characteristics. Design and operation of wastewater treatment facilities, including grit removal, oil and grease removal, dissolved air flotation, activated sludge process, trickling filters, and rotating biological contractors, stabilization ponds and aerated lagoons, anaerobic processes for wastewater treatment and sludge digestion. Ultimate disposal of wastewater residues and considerations of discharge criteria.

CE 749. Engineering Liability. 3 Hours.
Laws related to liability for engineering design in the context of product liability and construction projects; roles and liabilities between various parties involved in construction projects.

CE 750. Advanced Structural Steel. 3 Hours.
Beams, columns, tension members, and connections; current research.

CE 755. Advanced Reinforced Concrete. 3 Hours.
Beam, column, and slab actions; current research.

CE 758. Engineering Management. 3 Hours.
Management techniques for practicing engineers.

CE 763. Finite Element Methods. 3 Hours.
Theory and applications in structural mechanics. Plane stress, plane strain, axisymmetric problems, solids, plates, shells, nonlinear systems.

CE 781. Environmental Chemistry. 3 Hours.
Chemical equilibrium, acid/base, chemical concepts in pollutant behavior. Chemical kinetics, redox system, hydrolysis, pesticides, chemical wastes.

CE 782. Water Treatment Engineering. 3 Hours.
Water sources and characteristics. Design and operation of water treatment facilities including lime softening operations, coagulation, flocculation, clarification, dissolved air flotation, filtration, disinfection, absorption, ion exchange, and sludge disposal.

CE 783. Water and Wastewater Treatment Processes Lab. 3 Hours.
Construction and evaluation of bench-scale treatment processes. Treatability of water and wastewater. Coagulation of sedimentation, settleability of biological sludge, aerobic biological treatment, chemical treatment, water softening toxicity, disinfection, and sludge treatment processes.

CE 786. Engineering Hydrogeology. 3 Hours.
Groundwater movement, natural quality, contamination, and restoration. Physical and chemical properties of groundwater. Well hydraulics and flow net analyses. Prevention and control of groundwater contamination.

CE 787. Stormwater Detention Pond Design. 3 Hours.
Stormwater problems and control methods. Urban hydrology prediction procedures for drainage and water quality studies. Detention pond design basics, limitations and multiple benefits.

CE 790. Special Topics in (Area). 1-3 Hour.
Special Topics in (Area).

CE 791. Individual Studies (In Area). 1-4 Hour.
Individual Studies in (Area).

CE 793. Applied Research in Civil and Environmental Engineering. 3 Hours.
Research tools, including elements of experimental design and proposal preparation. Effective communication, literature searches, and exploratory data analysis.

CE 797. Civil, Construction, and Environmental Engineering Internship. 6 Hours.
Off-campus internship experience working with industries, utilities, or government agencies. Students taking this course will not be allowed to apply Special Topics or Individual Studies courses toward degree requirements.

CE 798. Non-Dissertation Research. 1-12 Hour.

CE 799. Dissertation Research. 1-12 Hour.
Prerequisites: GAC Z