CIVIL ENGINEERING (CE)

Civil Engineering (CE) Courses

CE 5001. Process and Ethics in Thesis/Dissertation Research Development. (1-0) 1 Credit Hour.
Course discusses the process and the ethical issues involved in conducting research and developing a thesis or dissertation. It covers research organizational skills, literature searches, technical writing, honesty in writing and plagiarism issues. This course has Differential Tuition.

CE 5033. Experiential Learning in Civil Engineering. (3-0) 3 Credit Hours.
Students may obtain credit for professional work experiences outside of UTSA that align with areas of graduate study in Civil Engineering. Students must develop a portfolio of work demonstrating that they have achieved learning objectives established by a faculty advisor. The portfolio will be evaluated by the faculty advisor, and if approved, the student must pass a proficiency exam evaluating his/her proficiency in the course learning outcomes. This course has Differential Tuition.

CE 5043. Advanced Civil Engineering Statistics. (3-0) 3 Credit Hours.
Statistical analysis methods include descriptive statistics, interval estimation and hypothesis testing, analysis of variance, design of experiments, regression analysis, and time series analysis. Additional topics covered include probabilistic methods, decision analysis and reliability analysis applied to civil engineering systems. This course has Differential Tuition.

CE 5093. Geographic Information Systems (GIS). (3-0) 3 Credit Hours.
Introduces vector, raster and tabular concepts, emphasizing the vector approach. Topics include spatial relationships, map features, attributes, relational database, layers of data, data ingesting, digitizing from maps, projections, output, applications, and availability of public data sets. Focus will be placed on spatial/temporal data analyses using digitized maps and database information in an area of CE specialization. (Formerly CE 5293. Credit cannot be earned for both CE 5093 and CE 5293.) This course has Differential Tuition.

CE 5103. Advanced Steel Design. (3-0) 3 Credit Hours.
Connection design, welded and bolted, moment-resistant connections, plate girders, column stability, bracing design, and seismic design of frames. (Formerly CE 5343 Topic 4: Advanced Steel Design. Credit cannot be earned for both CE 5103 and CE 5343 Advanced Steel Design.) This course has Differential Tuition.

CE 5123. Bridge Engineering. (3-0) 3 Credit Hours.
Design loads, load distribution, design of superstructures and substructures, and evaluation and load rating capacity of bridges. (Formerly CE 5343 Topic 8: Bridge Engineering. Credit cannot be earned for both CE 5123 and CE 5343 Bridge Engineering.) This course has Differential Tuition.

CE 5133. Advanced Reinforced Concrete. (3-0) 3 Credit Hours.
Curved beams, torsion design, retaining walls and shear walls, stairs, two-way slabs, yield-line theory, biaxial load on columns, slenderness effects, joint design, strut-and-tie methods, and concrete elasticity and failure criteria. (Formerly CE 5343 Topic 2: Advanced Reinforced Concrete Structures. Credit cannot be earned for both CE 5133 and CE 5343 Advanced Reinforced Concrete Structures.) This course has Differential Tuition.

CE 5143. Numerical Methods in Civil Engineering. (3-0) 3 Credit Hours.
Mathematical equation root finding and optimization methods, matrix equations, solution methods, eigenvector and eigenvalue solution methods, finite difference methods, curve-fitting methods, numerical integration and differentiation techniques, and introduction to finite element formulations. This course has Differential Tuition.

CE 5153. Prestressed Concrete. (3-0) 3 Credit Hours.
Overview of prestressed concrete development; design properties of materials; analysis and design of pre-tensioned and post-tensioned concrete members; full and partial prestressing; serviceability and strength requirements, code criteria for prestressed continuous beams, statically indeterminate frames and other structures. (Formerly CE 5343 Topic 3: Prestressed Concrete. Credit cannot be earned for both CE 5153 and CE 5343 Prestressed Concrete.) This course has Differential Tuition.

CE 5163. Advanced Structural Analysis. (3-0) 3 Credit Hours.
The class covers the matrix analysis method applied to structural analysis. The course will cover all the facets of the structural analysis method including the assembly of element and structure stiffness matrices, fixed end force and moment vectors, and nodal displacements. This course has Differential Tuition.

CE 5173. Dynamics and Vibrations. (3-0) 3 Credit Hours.
The class covers the fundamentals of structural dynamics, including single-degree-of-freedom and multi-degree-of-freedom systems. The course presents common analysis techniques used to calculate the dynamic response of structures to different types of time-varying loads. This course has Differential Tuition.

CE 5183. Experimental Stress Analysis. (3-0) 3 Credit Hours.
The course covers basic principles of experimental measurements, including basic modeling theory, similitude laws, and dimensional analysis. The course will also cover basic principles of commonly-used sensors for measuring strain, displacement, and load. Students will learn to build and operate sensors through experiments. This course has Differential Tuition.

CE 5193. Finite Element Methods. (3-0) 3 Credit Hours.
Derivation and computer implementation of the finite element method for the solution of civil engineering boundary value problems. (Formerly CE 5023. Same as ME 5483. Credit cannot be earned for more than one of the following: CE 5023, CE 5193, or ME 5483.) This course has Differential Tuition.

CE 5253. Introduction to Masonry Design. (3-0) 3 Credit Hours.
Design philosophy and methodology for masonry structures.
Flexure design, axial load design, and shear design of basic masonry components. This course has Differential Tuition.

CE 5263. Design of Buildings for Lateral Loads. (3-0) 3 Credit Hours.
The class will cover methods to calculate lateral loads for the design of buildings and their application to the design of steel, concrete, wood and masonry structures. This course has Differential Tuition.

CE 5303. Hydrometeorology. (3-0) 3 Credit Hours.
The main objective of this course is to familiarize the student with the local and global distribution of freshwater. Conceptualizations of the water balance/budget are developed using principles of physical hydrology and meteorology. Emphasis will be on recent research and modern methods for data analysis and modeling. Real life events and phenomena will be discussed. In addition to the text, material will be presented from other sources. Guest instructors will give presentations on some case studies. This course has Differential Tuition.

CE 5363. Coastal Engineering. (3-0) 3 Credit Hours.
This course introduces coastal engineering principles. This course will cover various fundamental and applied aspects of coastal engineering, including: wave mechanics, wave-structure interaction, coastal water level fluctuations, coastal zone processes, and design considerations for coastal structures and beach nourishment projects. This course has Differential Tuition.

CE 5403. Advanced Characterization of Highway Materials. (3-0) 3 Credit Hours.
Basic and advanced level of the fundamentals of material response to static and repeated loading; emphasis on the deformation and fatigue behavior of asphalt mixtures, constitutive modeling for mixtures, microstructure characterization for mixtures, nondestructive testing of pavements, asphalt binder characterization, unbound materials (base and sub-base materials) evaluation and characterization. This course has Differential Tuition.

CE 5423. Advanced Pavement Analysis and Design. (3-0) 3 Credit Hours.
Asphalt concrete and portland concrete pavement analysis and design. Layered elastic, nonlinear, and viscoelastic analysis. Slabs under environmental and traffic stresses. Software for layer analysis and slab analysis. AASHTO 1993 design method. Asphalt Institute and Portland Cement Association method. NCHRP 1-37A developed mechanistic-empirical design method. (Formerly CE 5513 Topic 5: Pavement Design. Credit cannot be earned for both CE 5423 and CE 5513 Pavement Design.) This course has Differential Tuition.

CE 5433. Advanced Geometric Design. (3-0) 3 Credit Hours.
Course deals with the geometric design of highways and streets. Topics include highway functions, design controls and criteria, elements of design, local roads and streets, freeways, and intersections. (Formerly CE 5513 Topic 6: Advanced Geometric Design. Credit cannot be earned for both CE 5433 and CE 5513 Advanced Geometric Design.) This course has Differential Tuition.

CE 5443. Pavement Management. (3-0) 3 Credit Hours.
Pavement evaluation and performance, evaluation of pavement distress condition surveys, evaluation of pavement roughness ride quality, skid resistance of pavements, evaluation of pavement structural capacity, maintenance and rehabilitation, prioritization and optimization of pavement maintenance, and rehabilitation needs. (Formerly CE 5513 Topic 4: Pavement Management Systems. Credit cannot be earned for both CE 5443 and CE 5513 Pavement Management Systems.) This course has Differential Tuition.

CE 5453. Transportation Engineering. (3-0) 3 Credit Hours.
Study of the Highway Capacity Manual, traffic stream parameters and relationships, analytical techniques in traffic engineering such as capacity analysis, queuing theory, and traffic simulation. Design and operation of advanced traffic management systems including signalization, real-time motorist information, urban incident management, and ITS concepts. (Formerly CE 5513 Topic 8: Principles of Traffic Engineering. Credit cannot be earned for both CE 5453 and CE 5513 Principles of Traffic Engineering.) This course has Differential Tuition.

CE 5463. Foundation Engineering. (3-0) 3 Credit Hours.
Shallow and deep foundations, including footings, slabs on-grade, cofferdams, sheet-pile walls, drilled shafts, piles and retaining walls. (Formerly CE 5353 Topic 2: Advanced Foundation Engineering. Credit cannot be earned for both CE 5463 and CE 5353 Advanced Foundation Engineering). This course has Differential Tuition.

CE 5473. Transportation Planning. (3-0) 3 Credit Hours.
An introductory course in urban transportation planning. It includes, an overview of highway capacity concepts, trip generation, trip distribution, modal split and trip assignments. Course gives hands-on exposure to software implementing these steps and discusses case studies of San Antonio's 2020 master plan. Finally, it extends this approach to air passenger and road freight transportation. This course has Differential Tuition.

CE 5483. Urban Transportation. (3-0) 3 Credit Hours.
This course is an introduction to urban passenger transportation planning in the USA with a sustainability focus. It is structured around three components: (1) History, theory, and problem definition; (2) The planning process; and (3) Solutions and analytical techniques. The course will help to understand the planning process comprehensively along with its multiple dimensions, how our current transportation systems has evolved over time, what is a sustainable system, policies and planning approaches that help to achieve it, and challenges related to planning. The course provides opportunities to hear from local and regional planners about their work, and learn from their experience about the methods they use in practice. This course has Differential Tuition.

CE 5493. Traffic Engineering. (3-0) 3 Credit Hours.
This course will introduce to students the theories that seek to describe the interactions between the vehicles, drivers, and the infrastructure. The models and theories that characterize the flow of highway traffic, signalized and unsignalized intersections will also be presented. The course will also provide opportunity to learn emerging techniques and to apply them for traffic and incident management. This course has Differential Tuition.

CE 5523. Retaining Structures. (3-0) 3 Credit Hours.
This course covers lateral earth pressure theories and their applications in various retaining wall designs. The included types of retaining walls are mechanically stabilized earth (MSE) wall, soil nail wall, tie-back wall, soldier pile wall, and drilled shaft wall. Students will be required to design and analyze different types of retaining structures using the learned theories. In addition, popular computer software packages will also be introduced in this course as design tools. This course has Differential Tuition.

CE 5533. Slope Stability. (3-0) 3 Credit Hours.
The course includes advanced theories of soil strength and failure, theories of lateral earth pressure with applications, infinite slope analysis, limit equilibrium slope analysis, finite element slope analysis, and mechanics and analysis of reinforced slopes using finite element software and spreadsheet applications. This course has Differential Tuition.

CE 5543. Ground Improvement. (3-0) 3 Credit Hours.
This course covers the fundamental principles and concepts of ground improvement methods. How to use these concepts for design and analysis of various ground improvements. The content of this course focus on the applicability of various ground improvement, design and analysis methods and construction details. This course has Differential Tuition.

CE 5553. Advanced Soil Mechanics. (3-0) 3 Credit Hours.
Permeability and seepage analysis involving dams and sheet piles, stress distribution in earth masses, advanced study of drained and undrained shear strength of soil, behavior of unsaturated soil, and laboratory and field methods for evaluation of soil properties in design practice. This course has Differential Tuition.

CE 5563. Foundation Engineering. (3-0) 3 Credit Hours.
Shallow and deep foundations, including footings, slabs on-grade, cofferdams, sheet-pile walls, drilled shafts, piles and retaining walls. (Formerly CE 5463. Credit cannot be earned for both CE 5463 and CE 5563.) This course has Differential Tuition.

CE 5613. Environmental Chemistry. (3-0) 3 Credit Hours.
This course explores the chemistry of the environment, the chemistry underlying environmental problems and solutions to environmental problems. Emphasis is placed on thermodynamics and kinetics of reaction cycles; sources, sinks and transport of chemical species; and quantitation of chemical species. Examples are selected from the chemistry of natural and contaminated air, water, and soil. This course has Differential Tuition.

CE 5623. Advanced Treatment Processes for Water Quality Control. (3-0) 3 Credit Hours.
Principles, modeling and design aspects of physical chemical treatment processes in drinking water, wastewater and groundwater remediation applications. (Formerly CE 5233 Topic 1: Physical and Chemical Treatment Operations. Credit cannot be earned for both CE 5623 and CE 5233 Physical and Chemical Treatment Operations.) This course has Differential Tuition.

CE 5643. Sustainable Energy Systems. (3-0) 3 Credit Hours.
Course explores various facets of sustainable energy systems and their role in securing America's energy future. It covers national and global energy trends, social, political, regulatory, technical/economic constraints and policy considerations. The course uses a systems approach in examining the technology and economics behind each alternative energy source and the major qualitative and quantitative factors affecting their large-scale deployment. (Same as ME 5273. Credit cannot be earned for both CE 5643 and ME 5273.) This course has Differential Tuition.

CE 5683. Biological Principles of Environmental Systems. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing or consent of instructor. This course covers the basic microbial processes that are critical to environmental engineering. Students will gain a fundamental understanding of microbiology as it pertains to natural systems, drinking water, wastewater treatment, and bioremediation. (Formerly CE 5213. Credit cannot be earned for both CE 5683 and CE 5213.) This course has Differential Tuition.

CE 5703. Special Topics in Hydraulics and Hydrology. (3-0) 3 Credit Hours.
Course deals with special aspects of hydraulics and hydrology. May be repeated for credit as topics vary. This course has Differential Tuition.

CE 5713. Special Topics in Structures. (3-0) 3 Credit Hours.
Course deals with special aspects of structural engineering. May be repeated for credit as topics vary. This course has Differential Tuition.

CE 5723. Special Topics in Transportation. (3-0) 3 Credit Hours.
Course deals with special aspects of transportation engineering. May be repeated for credit as topics vary. This course has Differential Tuition.

CE 5733. Special Topics in Environmental Engineering. (3-0) 3 Credit Hours.
Course deals with special aspects of environmental engineering. May be repeated for credit as topics vary. This course has Differential Tuition.

CE 5743. Special Topics in Geotechnical Engineering. (3-0) 3 Credit Hours.
Course deals with special aspects of geotechnical engineering. May be repeated for credit as topics vary. This course has Differential Tuition.

CE 5973. Special Project. (0-0) 3 Credit Hours.
Work carried out by nonthesis Master's students under the direction of their Advisory Committee to fulfill the project requirement of their degree. It may involve applied or theoretical work and a report documenting the findings. This course has Differential Tuition.

CE 5981. Master's Thesis. (0-0) 1 Credit Hour.
Prerequisite: Approval of the student's Advisory Committee. Thesis research and preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Enrollment is required each term in which the thesis is in progress. (Formerly CE 6983.) This course has Differential Tuition.

CE 5982. Master's Thesis. (0-0) 2 Credit Hours.
Prerequisite: Approval of the student's Advisory Committee. Thesis research and preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Enrollment is required each term in which the thesis is in progress. (Formerly CE 6983.) This course has Differential Tuition.

CE 5983. Master's Thesis. (0-0) 3 Credit Hours.
Prerequisite: Approval of the student's Advisory Committee. Thesis research and preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Enrollment is required each term in which the thesis is in progress. (Formerly CE 6983.) This course has Differential Tuition.

CE 5991. Graduate Seminar. (1-0) 1 Credit Hour.
Graduate seminar may be repeated for credit up to 3 semester credit hours. The grade report for this course is either "CR" (satisfactory performance) or "NC" (unsatisfactory performance). This course has Differential Tuition.

CE 6123. Theory of Plates and Shells. (3-0) 3 Credit Hours.
The class covers the fundamentals of plate and shell theories, formulation of finite element analysis using plate and shell elements, and basic solutions for various types of loading and boundary conditions in plate and shell structures. This course has Differential Tuition.

CE 6133. Advanced Behavior of Reinforced Concrete Members. (3-0) 3 Credit Hours.
The class covers the behavior of reinforced concrete members under the effects of flexure, axial load, and shear. Technical references are presented that provide the foundation for modern reinforced concrete analysis theories and reinforced concrete design codes. The references discussed in the class provide a basic understanding of the intent and limitations of design code provisions as well as introduce students to techniques for modeling the behavior of reinforced concrete structures in the nonlinear range of response. This course has Differential Tuition.

CE 6143. Engineering Reliability Analysis. (3-0) 3 Credit Hours.
This course introduces students to the use of statistical and computational techniques for uncertainty quantification and propagation, and for reliability assessment of engineering systems. This course provides insights and perspectives on the use of these tools in engineering decision-making, based on exemplar applications and case studies on engineering systems. This course will cover topics related to probability theory, random variables and probability distributions, functions of random variables, Monte-Carlo simulations, first-order reliability analysis, Markov chain and time-dependent reliability, and Bayesian updating. This course has Differential Tuition.

CE 6163. Non-linear Finite Element Analysis. (3-0) 3 Credit Hours.
The class covers the modeling, formulation, and application of the finite element method for nonlinear problems in structural mechanics. This course has Differential Tuition.

CE 6173. Earthquake Engineering. (3-0) 3 Credit Hours.
The class presents an introduction to engineering seismology including the most important characteristics of earthquake ground motions. The class will also cover methods to simulate the response of structures to strong earthquakes, methodologies employed by seismic design codes, and performance-based design. This course has Differential Tuition.

CE 6263. Repair and Rehabilitation of RC Structures. (3-0) 3 Credit Hours.
Prerequisite: CE 5163 and CE 6173 or equivalents. Condition assessment of existing structures. Evaluation of in-situ capacity of structures using advanced modeling and numerical simulation techniques. Methods for repair and rehabilitation of deficient structures. This course has Differential Tuition.

CE 6313. Hydrologic Modeling and Analysis. (3-0) 3 Credit Hours.
This course will address hydrological modeling (both theory and practical applications with focus on the latter) and related issues. Multimedia and advanced visualization will be used in lectures and class work. Most of the course is dedicated to hands-on, problem-oriented applications using a variety of practical techniques. It will provide students with the knowledge and tools necessary to use data derived from geographical information systems (GIS) to develop hydrologic estimates needed for different applications. (Formerly CE 6013. Credit cannot be earned for both CE 6313 and CE 6013.) This course has Differential Tuition.

CE 6343. Water Resources Systems Analysis. (3-0) 3 Credit Hours.
Systems Analysis methods use algorithmic and mathematical approaches for problem-solving. These are powerful methods that can be applied to solve complex design and management problems for water resources systems and other engineering areas. This class will focus on optimization methods, such as linear programming, integer programming, nonlinear programming, genetic algorithms, and dynamic programming, and their application to water resources systems. This course has Differential Tuition.

CE 6363. Advanced Fluid Mechanics. (3-0) 3 Credit Hours.
This course will be theory oriented with advanced mathematical and physical concepts. Starting with basic conservation laws and constitutive equations of fluid mechanics and flow kinematics, the course will first cover ideal (inviscid) flows and then viscous flows of incompressible fluids. Two-dimensional potential flows will be covered as part of ideal fluid flows. Exact solutions and low-Reynolds number approximate solutions of Navier-Stokes equations will be covered as part of viscous fluid flows. This course has Differential Tuition.

CE 6383. Global Change. (3-0) 3 Credit Hours.
Changes in the global distribution of plants and animals and the causes of the changes will be examined. Factors that are apparently coupled to changes in the atmosphere and environmental temperature will be examined. (Formerly CE 6113. Same as ES 5043. Credit can be earned for only one of the following: CE 6383, CE 6113, or ES 5043.) This course has Differential Tuition.

CE 6453. Pavement Sustainability. (3-0) 3 Credit Hours.
This course provides design tools that will encourage the use of sustainable pavement materials and structures, such as permeable pavements, rubber asphalt, recycled asphalt pavement (RAP), recycled asphalt shingles (RAS) and alternative cement binders. The course covers potential multiple use of asphalt pavement roadways to have a considerable impact on energy production, fuel consumption, reduced greenhouse gas (GHG) emissions, and life-cycle costs. This course has Differential Tuition.

CE 6503. Landfill Design. (3-0) 3 Credit Hours.
The course will include principles of waste disposal, sanitary landfill site assessment, in-depth design, construction, operation and maintenance of sanitary landfill including landfill gas and leachate management and groundwater monitoring issues close to landfills. This course has Differential Tuition.

CE 6513. Advanced Foundation Engineering. (3-0) 3 Credit Hours.
This course is an extension of CE 5563 Foundation Engineering and covers advanced foundation theories and analytical methods. In addition, this course will cover latest advancements in foundation testing such as statnamic test and Osterberg tests. The concept of sustainability in foundation design will also be introduced in this course. This course has Differential Tuition.

CE 6533. Remediation Geotechnics. (3-0) 3 Credit Hours.
Application of geotechnical engineering to the disposal of wastes, remediation of polluted sites containing contaminated soil and groundwater. Topics include subsurface exploration techniques and geotechnically-oriented remedial action technologies including pump and treat method, soil vapor extractions, air sparging, PRBs, etc. This course has Differential Tuition.

CE 6603. Fate and Transport of Contaminants in the Environment. (3-0) 3 Credit Hours.
The course deals with the hydrodynamics of mixing and transport, as well as the interaction of mixing and various reaction rate processes. Applications in the course will include water and wastewater treatment, groundwater pollution, and transport and mixing in rivers, lakes and reservoirs. (Formerly CE 6103 and CE 6053 Topic 1: Fate and Transport of Contaminants in Environmental System. Credit can be earned for only one of the following CE 6603, CE 6103, or CE 6053 Fate and Transport of Contaminants in Environmental System.) This course has Differential Tuition.

CE 6613. Air Pollution. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing or consent of instructor. This course will discuss the sources and consequences of air pollution and solutions for it. It will cover conventional pollutants and greenhouse gases alongside physical and chemical treatment methods. It will also cover atmospheric chemistry and dispersion processes. Pollution from mobile and stationary sources will be investigated. The course will primarily consider ambient air quality, but indoor air will also be discussed. This course has Differential Tuition.

CE 6621. Graduate Seminar in Environmental Science and Engineering. (1-0) 1 Credit Hour.
Will include presentations of current research by faculty and invited guests who are experts in various aspects of research in the environmental sciences and engineering, and advanced graduate students who are about to complete their dissertation research. The grade report for the course is either "CR" (satisfactory) or "NC" (unsatisfactory). May be repeated for credit. (Formerly CE 6221. Same as ES 5981.) This course has Differential Tuition.

CE 6951. Independent Study. (0-0) 1 Credit Hour.
Prerequisite: Written permission from the instructor and the student's Advisory Committee. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the student's program of study. This course has Differential Tuition.

CE 6952. Independent Study. (0-0) 2 Credit Hours.
Prerequisite: Written permission from the instructor and the student's Advisory Committee. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the student's program of study. This course has Differential Tuition.

CE 6953. Independent Study. (0-0) 3 Credit Hours.
Prerequisite: Written permission from the instructor and the student's Advisory Committee. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the student's program of study. This course has Differential Tuition.

CE 6961. Comprehensive Examination. (0-0) 1 Credit Hour.
Prerequisite: Written permission from the student's Advisory Committee. The comprehensive examination course is intended as a 1 semester credit hour substitute for the Master of Science degree in Civil Engineering thesis or the Master of Civil Engineering graduate seminar. Students may register for this course in a semester in which the examination is to be taken, if they are not enrolled in other courses. The grade report for the course is either "CR" (satisfactory performance on the Comprehensive Examination) or "NC" (unsatisfactory performance on the Comprehensive Examination). This course has Differential Tuition.

CE 6991. Graduate Seminar in Civil Engineering. (1-0) 1 Credit Hour.
Will include presentations of current research by faculty and invited guests who are experts in various aspects of research in civil engineering, and advanced graduate students who are about to complete their dissertation research. May be repeated for credit. This course has Differential Tuition.

CE 7211. Doctoral Research. (0-0) 1 Credit Hour.
Prerequisite: For CE Ph.D. students, consent of advisor; for ESE Ph.D. students, admission to Doctoral candidacy; consent of the student's Dissertation Committee and consent of the DSC. Research work carried out by the student under the supervision of their Dissertation Committee. May be repeated as necessary, but no more than 15 hours may be applied to the Doctoral degree. This course has Differential Tuition.

CE 7212. Doctoral Research. (0-0) 2 Credit Hours.
Prerequisite: For CE Ph.D. students, consent of advisor; for ESE Ph.D. students, admission to Doctoral candidacy; consent of the student's Dissertation Committee and consent of the DSC. Research work carried out by the student under the supervision of their Dissertation Committee. May be repeated as necessary, but no more than 15 hours may be applied to the Doctoral degree. This course has Differential Tuition.

CE 7213. Doctoral Research. (0-0) 3 Credit Hours.
Prerequisite: For CE Ph.D. students, consent of advisor; for ESE Ph.D. students, admission to Doctoral candidacy; consent of the student's Dissertation Committee and consent of the DSC. Research work carried out by the student under the supervision of their Dissertation Committee. May be repeated as necessary, but no more than 15 hours may be applied to the Doctoral degree. This course has Differential Tuition.

CE 7311. Doctoral Dissertation. (0-0) 1 Credit Hour.
Prerequisite: For CE Ph.D. students, successful defense of comprehensive exam; for ESE Ph.D. students, successful defense of the oral defense; consent of the student's Dissertation Committee and consent of the DSC. Dissertation work carried out by the student under the supervision of their Dissertation Committee. May be repeated as necessary, but not more than 15 hours may be applied to the Doctoral degree. This course has Differential Tuition.

CE 7312. Doctoral Dissertation. (0-0) 2 Credit Hours.
Prerequisite: For CE Ph.D. students, successful defense of comprehensive exam; for ESE Ph.D. students, successful defense of the oral defense; consent of the student's Dissertation Committee and consent of the DSC. Dissertation work carried out by the student under the supervision of their Dissertation Committee. May be repeated as necessary, but not more than 15 hours may be applied to the Doctoral degree. This course has Differential Tuition.

CE 7313. Doctoral Dissertation. (0-0) 3 Credit Hours.
Prerequisite: For CE Ph.D. students, successful defense of comprehensive exam; for ESE Ph.D. students, successful defense of the oral defense; consent of the student's Dissertation Committee and consent of the DSC. Dissertation work carried out by the student under the supervision of their Dissertation Committee. May be repeated as necessary, but not more than 15 hours may be applied to the Doctoral degree. This course has Differential Tuition.