CIVIL ENGINEERING (CIVE)

CIVE 810 Sustainable Infrastructure
Crosslisted with: CIVE 410
Prerequisites: Sophomore or higher standing
Description: Introduction to infrastructure sustainability. Overview of the Envision framework for evaluating infrastructure sustainability. Use of the Envision framework for evaluation of real-world projects to improve their sustainability.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Grading Option: Grade Pass/No Pass Option
Offered: SPRING

CIVE 819 Flow Systems Design
Crosslisted with: CIVE 419
Prerequisites: CIVE 321; parallel CIVE 351.
Description: Application of hydraulic principles to the design of water distribution systems, wastewater and stormwater collection systems, channelized flow systems, and treatment facilities.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 821 Environmental Engineering Chemistry
Prerequisites: CIVE 321
Description: Concepts from inorganic and organic chemistry. Thermodynamics and kinetics of acid and base reactions, carbonate chemistry, air-water exchange, precipitation, dissolution, complexation, oxidation-reduction, and sorption. Chemical speciation in aquatic systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 822 Pollution Prevention: Principles and Practices
Crosslisted with: BSEN 422, BSEN 822, CIVE 422
Prerequisites: Permission.
Description: Introduction to pollution prevention (P2) and waste minimization methods. Practical applications to small businesses and industries. Legislative and historical development of P2 systems analysis, waste estimation, P2 methods, P2 economics, and sources of P2 information.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 823 Physical and Chemical Treatment Processes in Environmental Engineering
Prerequisites: CIVE 420
Description: Evaluation and analysis of physical and chemical unit operations and processes applied to the treatment of water, wastewater, and hazardous wastes.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 824 Solid and Hazardous Waste Management
Crosslisted with: CIVE 424
Prerequisites: CIVE 321
Description: Planning, design and operation of solid and waste collection processing, treatment, and disposal systems including materials, resources and energy recovery systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 825 Design of Water Treatment Facilities
Crosslisted with: CIVE 425
Prerequisites: Parallel with CIVE 420
Description: Analysis of water supplies and design of treatment and distribution systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 826 Design of Wastewater Treatment and Disposal Facilities
Crosslisted with: CIVE 426
Prerequisites: Parallel with CIVE 420
Description: Analysis of systems for wastewater treatment and disposal.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 829 Biological Waste Treatment
Prerequisites: CIVE 326
Description: Principles of biological processes and their application in the design of waste treatment systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 830 Fundamentals of Water Quality Modeling
Crosslisted with: CIVE 430
Prerequisites: CIVE 321
Description: Comprehensive study of water quality and the effects of various water pollutants on the aquatic environment; modeling of water quality variables.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 831 Advanced Soil Mechanics
Prerequisites: CIVE 331.
Description: Application of the effective stress principle to shear strength of cohesive soil; analysis of stability of slopes. Development of continuum relationships for soil; solutions for stresses and displacements for an elastic continuum. Solution of the consolidation equation for various initial and boundary conditions.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 833 Earth Retaining Systems and Slope Stability
Prerequisites: CIVE 334 or appropriate background
Description: Design and analysis of earth retaining and slope stability systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 836 Foundation Engineering
Crosslisted with: CIVE 436
Prerequisites: CIVE 331
Description: Subsoil exploration and interpretation; selection of foundation systems; determination of allowable bearing capacity and settlement; design of deep foundations; pile driving analysis; control of groundwater.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 839 Introduction to Bridge Engineering
Prerequisites: CIVE 440/840, CIVE 441, CIVE 443/843; CIVE 850 or parallel
Notes: CIVE 850 co-requisite.
Description: Types of Bridges, Site Design Overview, Highway Bridge Loading, Bridge Analysis, Bridge Deck Slabs, Prestressed Concrete Bridge Design, Steel Bridge Design, Substructure Design, Fatigue and Bridge Rating.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: FALL/SPR

CIVE 842 Structural Dynamics
Prerequisites: CIVE 443
Description: Concepts of Newtonian and Lagrangian mechanics for dynamical systems. Free and forced vibration of linear single-degree-of-freedom systems and multiple degree-of-freedom systems. Harmonic, periodic, pulse, arbitrary, and earthquake response. Numerical evaluation of dynamic response and linear response spectrum concepts. Introduction to non-linear system response. Dynamic response of continuous beams.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: CIVE 945; CIVE 948

CIVE 843 Advanced Structural Analysis
Crosslisted with: CIVE 443
Prerequisites: CIVE 341.
Description: Matrix analysis methods and computer solutions for indeterminate structures. Additional topics: static condensation, shear deformations, and non-prismatic members in matrix-based analyses, moment distribution method, load cases and load combinations for buildings and bridges, and influence lines and analysis for moving loads.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: CIVE 839; CIVE 849

CIVE 844 Structural Design and Planning
Crosslisted with: CIVE 444
Prerequisites: CIVE 440 and CIVE 441.
Notes: CIVE 444/844 is not available for graduate credit for civil engineering students.
Description: Principles of design of steel and reinforced concrete structural building systems, planning of building vertical and horizontal load resisting systems, and bridge systems. Several design projects involve indeterminate analysis and design concepts for both steel and reinforced concrete.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 846 Steel Design II
Crosslisted with: CIVE 446
Prerequisites: CIVE 441
Notes: A continuation of the topics covered in CIVE 441.
Description: The principles and procedures used in design of steel buildings, design of plate girders, design and analysis of building systems, design and analysis of composite steel-concrete building systems, innovative building systems, introduction to seismic design of steel buildings. Plate buckling, beam, column and beam-column design, and frame stability. Introduction to connection design.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 847 Reinforced Concrete Design II
Crosslisted with: CIVE 447
Prerequisites: CIVE 440
Notes: A continuation of topics covered in CIVE 440
Description: Shear friction theory, strut-and-tie modeling, anchorage, deflection, slender and bi-axially loaded members, torsion, two-way action and punching shear, and footing design. Excel spreadsheets are developed and used for various design tasks.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 848 Reliability of Structures
Crosslisted with: CIVE 448
Prerequisites: CIVE 341.
Description: Fundamental concepts related to structural reliability, safety measures, load models, resistance models, system reliability, optimum safety levels, and optimization of design codes.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 849 Introductory Finite Element Analysis in Solid Mechanics
Prerequisites: CIVE 443/843
Description: Matrix methods of analysis. The finite element stiffness method with a focus on solid mechanics. Isoparametric elements formulation based on energy principles. Perform finite element analyses using commercial software.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded
Offered: FALL/SPR
Course and Laboratory Fee: $25

CIVE 850 Prestressed Concrete
Prerequisites: CIVE 341 and CIVE 440
Description: Analysis and design of prestressed concrete members. Axial force, bending, shear, torsion, prestress losses, initial and long-term deflection, partial prestressing, statically indeterminate structures.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: CIVE 839

CIVE 852 Water Resources Development
Crosslisted with: CIVE 452
Prerequisites: CIVE 351
Description: Theory and application of systems engineering with emphasis on optimization and simulation techniques for evaluating alternatives in water resources developments related to water supply, flood control, hydroelectric power, drainage, water quality, water distribution, irrigation, and water measurement.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 853 GIS in Water Resources
Prerequisites: Graduate standing in Engineering or a related discipline in Natural Resources or Earth Science
Description: Familiarization with a wide range of spatial information and used in hydrologic and water resources analysis. Development of expertise in GIS systems, especially ArcGIS. Digital mapping and analysis of water resources information. Hydrologic terrain analysis using digital elevation models. Integration of time series and geospatial data. Hydrologic Information Systems. River and watershed networks. Evapotranspiration, Precipitation (PRISM), Soil, and Landuse maps, and databases. Use of Remote Sensing tools.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 854 Hydraulic Engineering
Prerequisites: CIVE 351 or equivalent
Description: Fundamentals of hydraulics with applications of mechanics of solids, mechanics of fluids, and engineering economics to the design of hydraulic structures. Continuity, momentum, and energy principles are applied to special problems from various branches of hydraulic engineering.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: CIVE 954

CIVE 855 Nonpoint Source Pollution Control Engineering
Crosslisted with: BSEN 455, BSEN 855, CIVE 455
Prerequisites: BSEN 321/CIVE 321 or BSEN 355; AGEN/BSEN 350 or CIVE 351 as prerequisite or parallel.
Description: Identification, characterization, and assessment of nonpoint source pollutants; transport mechanisms and remediation technologies; design methodologies and case studies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: FALL

CIVE 856 Surface Water Hydrology
Crosslisted with: CIVE 456
Prerequisites: CIVE 351
Description: Stochastic analysis of hydrological data and processes including rainfall, runoff, infiltration, temperature, solar radiation, wind, and non-point pollution. Space-time hydrologic modeling with emphasis on the application of techniques in the design of engineering projects.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 857 Applied Structural Analysis
Prerequisites: CIVE 851
Description: Review of basic concepts. Mesh generation using a preprocessor. 2D and 3D Model generation. Boundary conditions. Implicit and explicit solution algorithms. Interpretation of analysis results using a post-processor. Solution of problems using existing FE software.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 858 Groundwater Engineering
Crosslisted with: BSEN 458, BSEN 858, CIVE 458
Prerequisites: CIVE 351 or AGEN 350 or BSEN 350
Description: Application of engineering principles to the movement of groundwater. Analysis and design of wells, well fields, and artificial recharge. Analysis of pollutant movement..
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 861 Urban Transportation Planning
Crosslisted with: CIVE 461
Prerequisites: CIVE 361.
Description: Development of urban transportation planning objectives and goals. Data collection procedures, land use and travel forecasting techniques, trip generation, trip distribution, modal choice analyses, and traffic assignment. Site development and traffic impact analysis.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: CIVE 864

CIVE 862 Highway Design
Crosslisted with: CIVE 462
Prerequisites: CIVE 361
Notes: Has an emphasis on design projects.
Description: Design of roadways, intersections, interchanges, parking facilities, and land development site access and circulation. Emphasis on design projects.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: CIVE 865

CIVE 863 Traffic Engineering
Crosslisted with: CIVE 463
Prerequisites: CIVE 361
Notes: Emphasizes design projects.
Description: Design of signalized intersections, arterial street and network signal systems, and freeway control systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: CIVE 866

CIVE 864 Analysis and Estimation of Transportation Demand
Prerequisites: CIVE 461/861
Description: Introduction to conceptual, methodological, and mathematical foundations of analysis and design of transportation services. Review of probabilistic modeling. Application of discrete choice models to demand analysis.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 865 Highway Geometrics
Prerequisites: CIVE 462/862
Description: Principles of highway geometrics. Sight distance, design vehicles, vehicle characteristics, horizontal and vertical alignment, cross section elements, and at-grade intersections and interchanges.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 866 Transportation Characteristics
Prerequisites: CIVE 463/863 and MATH/STAT 380
Description: Use of the concepts of volume, speed, density, and capacity to describe the characteristics and performance of surface, air, and water transportation systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Prerequisite for: CIVE 964

CIVE 867 Transportation Safety Engineering
Prerequisites: Permission
Description: Safety criteria in the planning, design, and operation phases of highway, rail, airport, mass transit, pipeline, and waterway transportation systems. Background of safety legislation and funding requirements. Identification of high accident locations and methods to determine cost/effectiveness of improvements.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 868 Airport Planning and Design
Crosslisted with: CIVE 468
Prerequisites: CIVE 361.
Description: Planning and design of general aviation and air carrier airports. Land-side components include vehicle ground-access systems, vehicle circulation parking, and terminal buildings. Air-side components include aircraft apron-gate area, taxi-way systems, runway system, and air traffic control facilities and airspace. Emphasis on design projects.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 872 Pavement Design and Evaluation
Crosslisted with: CIVE 472
Prerequisites: CIVE 331, CIVE 378
Description: Thickness design of flexible and rigid pavement systems for highways and airports; design of paving materials; evaluation and strengthening of existing pavements.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Course and Laboratory Fee: $30

CIVE 873 Bituminous Materials and Mixtures
Crosslisted with: CIVE 473
Prerequisites: CIVE 371
Description: Understanding of the physical, chemical, geometrical, and mechanical characteristics and practical applications of bituminous materials and mixtures. Fundamental mechanics for elastic and inelastic materials and basic theories associated with mechanical data analyses and designs. Recent advances and significant research outcomes for further discussions. Applications of theories to laboratory and field testing.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Course and Laboratory Fee: $15

CIVE 875 Water Quality Strategy
Crosslisted with: NRES 475, NRES 875, SOIL 475, PLAS 475, AGRO 875, CIVE 475, CRPL 475, CRPL 875, GEOL 475, GEOL 875, AGST 475, AGST 875
Prerequisites: Senior undergraduate or graduate student status.
Notes: Capstone course.
Description: Introduces methods to identify, analyze, strategize, justify and develop planning approaches to protect water quality from nonpoint source contamination. Focuses on identifying present water quality issues and situations, investigating adverse impacts on whole systems and subsystems over time, developing effective planning strategies, and assessing strategy effectiveness.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: SPRING

CIVE 881 Computational Problem Solving In Civil Engineering
Crosslisted with: CIVE 481
Prerequisites: MATH 221 and CSCE 155A or 155E or 155H or 155N
Description: Introduction of numerical methods to solve problems in civil engineering, including finding roots of equations, solving linear algebra equations, optimization, curve fitting, numerical differentiation and integration, and finite difference method. Computational methods in numerical integration, matrix operations and ordinary differential equations as they apply to civil engineering problems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 891 Special Topics in Civil Engineering
Prerequisites: Permission
Description: Special topics in emerging areas of civil engineering which may not be covered in other courses in the civil engineering curriculum.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 12
Grading Option: Graded

CIVE 894 Independent Study in Civil Engineering
Prerequisites: Permission
Description: Individual study at the masters level in a selected area of civil engineering under the supervision and guidance of a Civil & Environmental Engineering faculty member.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 9
Grading Option: Grade Pass/No Pass Option

CIVE 898 Independent Research in Civil Engineering
Prerequisites: Permission
Description: Independent research work and written findings, other than thesis or dissertation work, in a selected area of civil and environmental engineering under the supervision and guidance of a Civil & Environmental Engineering faculty member.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Graded

CIVE 899 Masters Thesis
Prerequisites: Admission to masters degree program and permission of major adviser
Credit Hours: 1-10
Min credits per semester: 1
Max credits per semester: 10
Max credits per degree: 99
Grading Option: Grade Pass/No Pass Option

CIVE 910 Research Writing in Civil and Environmental Engineering
Prerequisites: Instructor permission
Description: Discipline-specific training in proposal and manuscript writing and the opportunity to complete a full journal manuscript draft with peer and instructor feedback. Students enrolling in this class are expected to have already completed the research they wish to use for manuscript development.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: SPRING

CIVE 916 Environmental Law and Water Resource Management Seminar
Crosslisted with: NRES 916
Prerequisites: Permission
Description: An interdisciplinary seminar with the Department of Civil Engineering. Contemporary environmental issues and water resource management.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 935 Geoenvironmental Engineering
Prerequisites: CIVE 331
Description: Design and analysis of the geotechnical systems with a focus on waste containment systems. Contaminant transport theory and application, design of drainage layers, landfill stability, and waste settlement.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 945 Structural Analysis and Design for Dynamic Loads
Prerequisites: CIVE 443/843 and CIVE 842
Description: Behavior of structural materials and systems under dynamic loads. Analysis and design for dynamic loads. Computational and analytical techniques. Selected laboratory demonstrations of the dynamic behavior of structural systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 948 Blast-resistant Structural Design
Prerequisites: CIVE 842
Description: Introduction to explosion effects. Air-blast. Fragmentation. Single-Degree-of-Freedom (SDOF) analysis. Equivalent SDOF systems. Pressure-impulse diagrams. Energy solutions. Steel design. Reinforced concrete design. Masonry design. Progressive collapse. Windows and doors.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 950 Statistical Hydrology
Prerequisites: CIVE 351; STAT 380 or MECH 321 or equivalents
Description: Application of statistics and probability to uncertainty in the description, measurement, and analysis of hydrologic variables and processes, including extreme events, error models, simulation, and sampling.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Graded

CIVE 954 Advanced Hydraulics
Prerequisites: CIVE 854 and permission
Description: Advanced studies involving pipe and culvert hydraulics, rapidly-varied flow in open channels, sediment transport, river mechanics, control, and design.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 957 Modeling Vadose Zone Hydrology
Crosslisted with: AGEN 957, BSEN 957, GEOL 957
Prerequisites: MATH 221/821 or equivalent. AGEN/BSEN 350 or NRES 453/853 or equivalent.
Notes: Typically offered spring semester in even years.
Description: Principles and modeling of fluid flow and solute transport in the vadose zone. Topics include hydraulic properties of variably saturated media, application of Darcy's Law in variably saturated media, hydrologic and transport processes in the vadose zone, and solution of steady and unsteady flow problems using numerical techniques including finite element methods. Contemporary vadose zone models will be applied to engineering flow and transport problems. Review and synthesis of classic and contemporary research literature on vadose zone hydrology will be embedded in the course.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option
Offered: SPRING

CIVE 963 Highway Safety Data Analysis
Prerequisites: STAT 801A and permission
Description: Highway safety issues and appropriate accident data analyses. Quantify changes in safety when modifications are made to highways in an effort to enhance safety. Judge reported safety improvements and carry out appropriate analyses for assessing the effectiveness of safety improvements.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 964 Theory of Traffic Flow
Prerequisites: STAT 801A and CIVE 866
Description: Analysis of traffic characteristics as applied to traffic engineering facility design and flow optimization. Capacity of expressways, ramps, weaving sections, and intersections. Analytical approaches to flow analysis, queueing theory, flow density relationships, and traffic simulation.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 965 Traffic Control Systems
Prerequisites: Permission
Description: Principles of traffic control. Design an analysis of intersection, arterial street, network, and freeway control systems. Traffic surveillance and driver information systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 967 Analysis and Design of Transportation Supply Systems
Prerequisites: Permission
Description: Operations research techniques for modeling system performance and design of transportation services. Routing and scheduling problems. Network equilibration and partially distributed queuing systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 990 Civil Engineering Seminar
Description: Frontiers of an area of civil engineering.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 6
Grading Option: Grade Pass/No Pass Option

CIVE 990E Civil Engineering Seminar in Environmental Engineering
Description: Frontiers of an area of environmental engineering.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 6
Grading Option: Graded

CIVE 990M Civil Engineering Seminar in Geotechnical and Materials Engineering
Description: Frontiers of an area of geotechnical and materials engineering.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 6
Grading Option: Grade Pass/No Pass Option

CIVE 990R Civil Engineering Seminar in Structural Engineering
Description: Frontiers of an area of structural engineering.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 6
Grading Option: Grade Pass/No Pass Option

CIVE 990T Civil Engineering Seminar in Transportation Engineering
Description: Frontiers of an area of transportation engineering.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 6
Grading Option: Grade Pass/No Pass Option

CIVE 990W Civil Engineering Seminar in Water Resources Engineering
Description: Frontiers of an area of water resources engineering.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 6
Grading Option: Grade Pass/No Pass Option

CIVE 991 Advanced Special Topics in Civil Engineering
Prerequisites: Permission
Description: Advanced special topics in emerging areas of civil and environmental engineering which may not be covered in other courses in the civil engineering curriculum.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 12
Grading Option: Graded

CIVE 994 Advanced Independent Study in Civil Engineering
Prerequisites: Permission
Description: Advanced individual study at the doctoral level in a selected area of civil engineering under the supervision and guidance of a Civil & Environmental Engineering faculty member.
Credit Hours: 1-3
Min credits per semester: 1
Max credits per semester: 3
Max credits per degree: 3
Grading Option: Grade Pass/No Pass Option

CIVE 998 Advanced Independent Research in Civil Engineering
Prerequisites: Permission
Description: Advanced independent research work and written findings, other than thesis or dissertation work, in a selected area of civil engineering under the supervision and guidance of a Civil & Environmental Engineering faculty member.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Grading Option: Grade Pass/No Pass Option

CIVE 999 Doctoral Dissertation
Prerequisites: Admission to doctoral degree program and permission of supervisory committee chair
Credit Hours: 1-24
Min credits per semester: 1
Max credits per semester: 24
Max credits per degree: 99
Grading Option: Grade Pass/No Pass Option