CIVIL ENGINEERING (CIVE)

CIVE 112 Introduction to Civil Engineering
Description: Introduction to civil engineering as a career by use of case studies; alternate approaches to engineering designs illustrated by use of engineering principles.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LEC

CIVE 125 Ecology, the Environment, and the Engineer
Description: Investigation into the nature of ecology, man's relation with the environment and man's chance of survival in that environment, and the potential influence, for good or bad, of modern man's activities.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CIVE 130 Computer-Aided Design
Crosslisted with: BSEN 130
Description: Use of computer-aided design software to communicate engineering ideas. Specifications, dimensioning, tolerancing, 2- and 3-D model development, topographic mapping, and process layout with environmental, bioprocess, and biomedical emphases.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LEC

CIVE 221 Geometric Control Systems
Crosslisted with: CONE 221
Prerequisites: MATH 106/106B/108H.
Description: Introduction to the theory and application of mensuration and geometric information processing in civil engineering. Measurement of distance, direction, elevation, and location using mechanical, electronic, and satellite systems. Collection of field data and error propagation. Elementary geometric data bases for design, construction, operation, and control of civil works.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LAB
Prerequisite for: CIVE 361

CIVE 252 Construction Materials Laboratory
Prerequisites: MATH 106/106B/108H; CNST 251 or parallel.
Description: Introduction to ASTM and AASHTO standard procedures used to measure soil and concrete properties; common modifications to soil and concrete mixes are discussed and analyzed.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LAB
Prerequisite for: BSEN 455, BSEN 855, CIVE 455, CIVE 855

CIVE 310 Fluid Mechanics
Prerequisites: MECH 373 and MATH 221
Description: Fluid statics, equations of continuity, momentum, and energy dimensional analysis and dynamic similitude. Applications to: flow meters; fluid pumps and turbines; viscous flow and lubrication; flow in closed conduits and open channels. Two-dimensional potential flow.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Offered: FALL/SPR
Prerequisite for: AGEN 325, BSEN 325; AGEN 344, BSEN 344; AREN 412; BSEN 425, CIVE 425; CIVE 319; CIVE 352; MECH 446

CIVE 310H Honors: Fluid Mechanics
Prerequisites: Good standing in the University Honors Program or by invitation; MECH 373, MATH 221
Description: Honor students required to study beyond levels expected of students in normal sections and prepare a special report.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: AGEN 325, BSEN 325; AGEN 344, BSEN 344; AREN 412; CIVE 319; CIVE 352; MECH 311; MECH 446

CIVE 319 Hydraulics Laboratory
Prerequisites: MECH 310 or CIVE 310 or parallel
Description: Hydraulics experiments and demonstrations. Velocity, pressure and flow measurements; pipe flow, open channel flow; hydraulic structures and machinery, hydrologic and sediment measurements and student projects.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LAB

CIVE 326 Introduction to Environmental Engineering
Crosslisted with: BSEN 326
Prerequisites: CHEM 109 or 110 or 111 or 113, and MATH 221
Description: Introduction to principles of environmental engineering including water quality, atmospheric quality, pollution prevention, and solid and hazardous wastes engineering. Design of water, air, and waste management systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: BSEN 327, CIVE 327; BSEN 425, CIVE 425; BSEN 455, BSEN 855, CIVE 455, CIVE 855; CIVE 431, CIVE 831
CIVE 326H Honors: Introduction to Environmental Engineering
Crosslisted with: BSEN 326H
Prerequisites: Good standing in the University Honors Program or by invitation: CHEM 109 or 110 or 111 or 113, MATH 221
Description: Introduction to principles of environmental engineering including water quality, atmospheric quality, pollution prevention, and solid and hazardous wastes engineering. Design of water, air, and waste management systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: BSEN 327, CIVE 327, BSEN 455, BSEN 855, CIVE 455, CIVE 855, CIVE 431, CIVE 831

CIVE 327 Environmental Engineering Laboratory
Crosslisted with: BSEN 327
Prerequisites: CIVE/BSEN 326 or parallel
Notes: Parallel or prereq: CIVE/BSEN 326.
Description: Environmental engineering experiments, demonstrations, field trips, and projects. Experiments include the measurement and determination of environmental quality parameters such as solids, dissolved oxygen, biochemical and chemical oxygen demand, and alkalinity.
Credit Hours: 1
Max credits per semester: 1
Max credits per degree: 1
Format: LAB

CIVE 328 Concrete Materials
Prerequisites: CHEM 111 and MECH 223.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LEC

CIVE 334 Introduction to Geotechnical Engineering
Prerequisites: MECH 325; Parallel CIVE 310
Notes: Parallel: CIVE 310.
Description: Soil composition, structure and phase relationships; soil classification. Principles of effective stress; loading induced subsurface stresses; load history; deformation and failure of soils. Elastic and limit analysis with applications to design for bearing capacity, settlement, retaining walls, and slope stability. Steady-state seepage.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

CIVE 341 Introduction to Structural Engineering
Prerequisites: MECH 325.
Description: Introduction to the analysis and design of structural systems. Analyses of determinate and indeterminate trusses, beams, and frames, and design philosophies for structural engineering. Laboratory experiments deal with the analysis of determinate and indeterminate structures.
Credit Hours: 4
Max credits per semester: 4
Max credits per degree: 4
Format: LEC

CIVE 352 Introduction to Water Resources Engineering
Prerequisites: CIVE/MECH 310.
Description: Introduction to water resources engineering design and planning, surface hydrology, ground water hydraulics, reservoirs, and other control structures. Introduction to field measurement and computational methods in water resources.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: CIVE 456, CIVE 856

CIVE 361 Highway Engineering
Prerequisites: CIVE/CONE 221 (CONE 2210 (UNO)) MECH 223.
Description: Introduction to the principles of highway engineering and traffic operations and control.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CIVE 378 Materials of Construction
Prerequisites: CHEM 111 and MECH 223.
Credit Hours: 2
Max credits per semester: 2
Max credits per degree: 2
Format: LEC

CIVE 385 Professional Practice and Management in Civil Engineering
Prerequisites: Junior standing and CIVE major.
Description: Basic elements of civil engineering practice. Roles of all participants in the process-owners, designers, architects, contractors, and suppliers. Basic concepts in business management, public policy, leadership, and professional licensure. Professional relations, civic responsibilities, and ethical obligations for engineering practice. Project management, contracts, allocation of resources, project estimating, planning, and controls.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CIVE 401 Civil Engineering Systems
Crosslisted with: CIVE 801
Prerequisites: MATH 221.
Description: Systems analysis approach to civil engineering problems. Systems model elements and principles of systems theory with applications to civil engineering.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
CIVE 419 Flow Systems Design
Crosslisted with: CIVE 819
Prerequisites: CIVE 326 or CIVE 327; parallel CIVE 352.
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
Format: LEC

CIVE 421 Hazardous Waste Management and Treatment
Crosslisted with: CIVE 821
Prerequisites: CIVE 326/BSEN 326.
Description: Survey of the hazardous waste management system in
the USA. State and federal hazardous waste regulations. Chemical
characteristics of hazardous waste and unit operations and precesses
used for treatment of soil, water, and air.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CIVE 422 Pollution Prevention: Principles and Practices
Crosslisted with: BSEN 422, BSEN 822, CIVE 822
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
Format: LEC

CIVE 424 Solid Waste Management Engineering
Crosslisted with: CIVE 824
Prerequisites: CIVE 326, CIVE 334.
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
Format: LEC

CIVE 425 Process Design in Water Supply and Wastewater Treatment
Crosslisted with: BSEN 425
Prerequisites: CIVE/BSEN 326 and CIVE/MECH 310.
Description: Design of unit operations and processes associated with
drinking water and wastewater treatment facilities.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CIVE 426 Design of Water Treatment Facilities
Crosslisted with: CIVE 826
Prerequisites: CIVE 425.
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
Format: LEC

CIVE 427 Design of Wastewater Treatment and Disposal Facilities
Crosslisted with: CIVE 827
Prerequisites: CIVE 425.
Description: Analysis of systems for wastewater treatment and disposal.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CIVE 430 Fundamentals of Water Quality Modeling
Crosslisted with: CIVE 830
Prerequisites: CIVE 326.
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
Format: LEC

CIVE 431 Small Treatment Systems
Crosslisted with: CIVE 831
Prerequisites: CIVE/BSEN 326 or CIVE/BSEN 326H
Description: Design of small and decentralized waste water management
systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CIVE 432 Remediation of Hazardous Wastes
Crosslisted with: CIVE 832
Prerequisites: CIVE/BSEN 326 and CIVE/MECH 310.
Description: Principles, applications, and limitations of remediation of
hazardous wastes and design of some remediation systems.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CIVE 434 Soil Mechanics II
Crosslisted with: CIVE 834
Prerequisites: CIVE 334.
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
Format: LEC
CIVE 436 Foundation Engineering
Crosslisted with: CIVE 836
Prerequisites: CIVE 334.
Notes: Optional lab CIVE 436L/CIVE 836L.
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
Format: LEC
Prerequisite for: CIVE 949

CIVE 444 Structural Design and Planning
Crosslisted with: CIVE 844
Prerequisites: CIVE 440 and CIVE 441.
Notes: CIVE 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
Format: LEC
ACE: ACE 10 Integrated Product

CIVE 446 Steel Design II
Crosslisted with: CIVE 846
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
Format: LEC
Prerequisite for: CIVE 940; CIVE 949

CIVE 447 Reinforced Concrete Design II
Crosslisted with: CIVE 847
Prerequisites: CIVE 440/840
Notes: A continuation of topics covered in CIVE 440/840.
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
Format: LEC

CIVE 449 Steel Design I
Prerequisites: CIVE 341.
Description: Introduction to the design concepts for structural steel building components. Design of tension members, bolted and welded connections, column members, and beam members. Limit states design concepts used throughout, and emphasis on behavior of members and code design procedures.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: CIVE 447, CIVE 847

CIVE 443 Advanced Structural Analysis
Crosslisted with: CIVE 843
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
Format: LEC
Prerequisite for: CIVE 839; CIVE 849

CIVE 440 Reinforced Concrete Design I
Crosslisted with: CIVE 840
Prerequisites: CIVE 341.
Description: Introduction to the design concepts of reinforced concrete building components. The design of flexural and compression members, simple walls, foundations, and floor systems using the latest American Concrete Institute (ACI) design requirements.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CIVE 441 Steel Design I
Prerequisites: CIVE 341.
Description: Introduction to the design concepts for structural steel building components. Design of tension members, bolted and welded connections, column members, and beam members. Limit states design concepts used throughout, and emphasis on behavior of members and code design procedures.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: CIVE 447, CIVE 847

CIVE 452 Water Resources Development
Crosslisted with: CIVE 852
Prerequisites: CIVE 352.
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
Format: LEC
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<tbody>
<tr>
<td>CIVE 454</td>
<td>Hydraulic Engineering</td>
<td>CIVE 352</td>
<td>Description: Fundamentals of hydraulics with applications of mechanics of</td>
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<td>solids, mechanics of fluids, and engineering economics to the design of</td>
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<td>CIVE 455</td>
<td>Nonpoint Source Pollution Control Engineering</td>
<td>BSEN 455, BSEN 855, CIVE 855</td>
<td>Prerequisites: BSEN 326/CIVE 326 or BSEN 355; AGEN/BSEN 350 or CIVE 352 as</td>
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<td>CIVE 456</td>
<td>Surface Water Hydrology</td>
<td>CIVE 856</td>
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<td>including rainfall, runoff, infiltration, temperature, solar radiation,</td>
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<td>wind, and non-point pollution. Space-time hydrologic modeling with</td>
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<td>emphasis on the application of techniques in the design of engineering</td>
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<td>CIVE 458</td>
<td>Groundwater Engineering</td>
<td>BSEN 458, BSEN 858, CIVE 858</td>
<td>Prerequisites: CIVE 352 or AGEN 350 or BSEN 350 or equivalent.</td>
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<td>groundwater. Analysis and design of wells, well fields, and artificial</td>
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<td>CIVE 459</td>
<td>Reliability of Structures</td>
<td>CIVE 859</td>
<td>Prerequisites: CIVE 341</td>
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<td>safety measures, load models, resistance models, system reliability,</td>
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<td>optimum safety levels, and optimization of design codes.</td>
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<td>CIVE 460</td>
<td>Urban Transportation Planning</td>
<td>CIVE 461</td>
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<td>and goals. Data collection procedures, land use and travel forecasting</td>
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<td>techniques, trip generation, trip distribution, modal choice analyses, and</td>
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<td>traffic assignment. Site development and traffic impact analysis.</td>
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<td>CIVE 461</td>
<td>Airport Planning and Design</td>
<td>CIVE 463</td>
<td>Prerequisites: CIVE 358</td>
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<td>Description: Planning and design of general aviation and air carrier</td>
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<td>airports. Land-side components include vehicle ground-access systems,</td>
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<td>vehicle circulation parking, and terminal buildings. Air-side components</td>
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<td>include aircraft apron-gate area, taxi-way systems, runway system, and</td>
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<td>air traffic control facilities and airspace. Emphasis on design projects.</td>
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<td>CIVE 462</td>
<td>Traffic Engineering</td>
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<td>network signal systems, and freeway control systems.</td>
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<td>Highway Design</td>
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CIVE 471 Bituminous Materials and Mixtures
Crosslisted with: CIVE 871
Prerequisites: CIVE 378
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
Format: LEC

CIVE 472 Pavement Design and Evaluation
Crosslisted with: CIVE 872
Prerequisites: CIVE 334.
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

CIVE 475 Water Quality Strategy
Crosslisted with: NRES 475, NRES 875, SOCI 475, SOCI 875, SOIL 475, WATS 475, AGRO 475, AGRO 875, CIVE 875, CRPL 475, CRPL 875, GEOL 475, GEOL 875, MSYM 475, MSYM 875, POLS 475, POLS 875
Prerequisites: Senior standing.
Notes: Capstone course.
Description: Holistic approach to the selection and analysis of planning strategies for protecting water quality from nonpoint sources of contamination. Introduction to the use of methods of analyzing the impact of strategies on whole systems and subsystems; for selecting strategies; and for evaluating present strategies.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CIVE 476 Construction Cost Controls
Prerequisites: ACCT 306 or 201 and 202
Description: Development of cost accounting principles and financial controls appropriate for construction contractors. Includes purchasing policies and procedures, labor and equipment cost reporting techniques, accounting procedures for control of materials and supplies, billing methods, principles of financial reporting and analysis.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

CIVE 481 Computational Problem Solving In Civil Engineering
Crosslisted with: CIVE 881
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
Format: LEC

CIVE 489 Senior Design Project
Prerequisites: Senior standing and CIVE 385.
Notes: Requires the formulation and completion of a civil engineering design project.
Description: Course provides senior civil engineering students with the opportunity to apply engineering concepts and principles to a comprehensive design project of multiple sub-disciplinary nature. The principal objectives are for students to develop an understanding of the entire life-cycle of civil engineering projects with emphasis on the development of a unified and sustainable design that addresses the client’s needs; project team work; strong engineer-client relationships; and effective project communications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product

CIVE 489H Honors: Senior Design Project
Prerequisites: Senior standing; parallel CIVE 385; good standing in the University Honors Program or by invitation.
Notes: Requires study beyond the level expected of non-honors section and requires the preparation of a special report.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
ACE: ACE 10 Integrated Product

CIVE 498 Special Topics in Civil Engineering
Crosslisted with: CIVE 898
Prerequisites: Permission.
Description: Special problems, topics, or research in civil engineering.
Credit Hours: 1-6
Min credits per semester: 1
Max credits per semester: 6
Max credits per degree: 6
Format: LEC
CIVE 499H Honors Thesis

**Prerequisites:** Senior standing in civil engineering and admission in the University Honors Program.

**Description:** Honors thesis research project meeting the requirements of the University Honors Program. Independent research project executed under the guidance of a member of the faculty of the Department of Civil Engineering which contributes to the advancement of knowledge in the field. Culminates in the presentation of an honors thesis to the Department and College.

**Credit Hours:** 1-3

**Min credits per semester:** 1

**Max credits per semester:** 3

**Max credits per degree:** 3

**Format:** IND