## Civil Engineering Courses

### Courses

**CE 5191. Individual Studies.**
Individual Studies (0-0-1) Individual variable-credit research design analysis on advanced phases of Civil Engineering problems conducted under the direct supervision of a faculty member. A maximum of six credit hours may be applied towards the M.S. degree.

1 Credit Hour  
1 Total Contact Hour  
0 Lab Hour  
0 Lecture Hour  
1 Other Hour

**CE 5194. Graduate Research.**
Graduate Research (0-0-1) Individual variable-credit research of contemporary topics in Civil Engineering. Cannot be used to satisfy minimum degree requirements. Based on a pass/fail grading mode.

1 Credit Hour  
1 Total Contact Hour  
0 Lab Hour  
0 Lecture Hour  
1 Other Hour

**CE 5291. Individual Studies.**
Individual Studies (0-0-2) Individual variable-credit research design or analysis on advanced phases of Civil Engineering problems conducted under the direct supervision of a faculty member. A maximum of six credit hours may be applied towards the M.S. Degree.

2 Credit Hours  
2 Total Contact Hours  
0 Lab Hours  
0 Lecture Hours  
2 Other Hours

**CE 5294. Graduate Research.**
Graduate Research (0-0-2) Individual variable-credit research of contemporary topics in Civil Engineering. Cannot be used to satisfy minimum degree requirements. Based on a pass/fail grading mode.

2 Credit Hours  
2 Total Contact Hours  
0 Lab Hours  
0 Lecture Hours  
2 Other Hours

**CE 5302. Groundwater Hydrology and Pollution.**
A general course in groundwater hydrology, emphasizing fundamental principles and their applications to practical problems. Topics included are hydrologic cycles, geologic environments and controls, unsaturated (Vadose) and saturated zones, Darcy’s law, continuity and energy principles, Navier-Stokes equations, flow equations, steady and unsteady hydraulics, aquifer tests, pollutant transport, analytical and numerical models, and computer codes.

3 Credit Hours  
3 Total Contact Hours  
0 Lab Hours  
3 Lecture Hours  
0 Other Hours

**CE 5303. Engineering Analysis.**
Advanced engineering mathematics dealing with linear algebra, vector calculus, and the formulation and solution of initial and boundary value problems arising in engineering.

3 Credit Hours  
3 Total Contact Hours  
0 Lab Hours  
3 Lecture Hours  
0 Other Hours
Advanced Design of Structural Systems Behavior and design concepts for concrete, steel, and composite structural systems. Topics include a detailed review of design specifications, detailing of frames, floor systems, and bracing components. Students will also be exposed to computational design tools.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
Prerequisite(s): (CE 4335 w/C or better ) AND (CE 4361 w/C or better)

CE 5305. Advanced Structural Analysis.
Linear and nonlinear analysis of structural systems; plastic analysis; introduction to structural stability; and computational aspects of linear and nonlinear structural analysis.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
Prerequisite(s): (CE 3343 w/C or better)

CE 5307. Finite Element Method (3-0).
Theory of the Finite Elements Method and its application to the solution of engineering problems. Topics include the strong and weak formulation, boundary conditions, basis functions and error estimates. Concepts will be applied to the solution of one, two and three-dimensional boundary-value steady-state problems in linear elasticity, heat conduction, and flow. Students will also be exposed to the use of commercial FE software.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
Prerequisite(s): (CE 3343 w/C or better)

Risk and Reliability Analyses of Engineering Systems (3-0) Quantitative risk and reliability analyses in engineering. Reliability methods applicable to design, component reliability, system reliability, parallel systems, series system, extreme value theory, fault tree and decision analysis, approximate methods for risk and reliability, selected applications to civil engineering.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5311. Structural Buckling/Stability.
Structural Buckling and Stability (3-0) Buckling of columns, frames, arches, rings, plates, and shells, lateral and torsional buckling of beams. Numerical methods of buckling analysis, stability analysis of complex systems using specialized computer programs.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
Prerequisite(s): (CE 3343 w/C or better)
CE 5312. Environmental Processes.
Environmental Processes (3-0) Critical study of fundamental theories and modeling approaches for physical, chemical and biological processes that affect the fate of chemicals in the environment. Mass flow and diffusion, kinetics and equilibrium, solubility and precipitation, volatilization, oxidation-reduction, types of sorption, complexation, radiodecay and biotransformation. Applications focus on waste disposal, soil and groundwater reclamation, and advanced water and wastewater treatment operations.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Understand the basic concepts and issues involved in wastewater reclamation, recycling and reuse, treatment technologies and procedures for planning and managing water reclamation projects.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5317. Stats Methods for Civil Eng.
Applications of statistical analysis to civil engineering problems. Topics covers include point and interval estimations, confident intervals, non-parametric test, linear and non-linear regressions and analysis of variance.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5318. Bridge Engineering.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5319. Civil & Environmental Syst Eng.
Introduction to the fundamental concepts associated with civil engineering systems design from needs assessments to implementation. Topics covered will include basic design principles, system analysis and modeling, evaluation (on basis of benefit-cost, environmental impacts, etc.), resource allocation, optimization, and decision analysis. The course applies the concepts to problems in the various areas of civil engineering disciplines, such as transportation networks, queuing systems, environmental systems, and structures.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5320. Advanced Geotechnical Eng.
Advanced treatment of topics in geotechnical engineering, including the engineering response to loading, shear settlement analysis, and dynamic soil properties strength of sands and clays, consolidation and including liquefaction.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Prerequisite(s): (CE 4348 w/D or better)
CE 5322. Wastes Management (3-0).
Wastes Management (3-0). A study of waste management from cradle to grave; generation, storage, transportation, treatment, disposal, exchanges and minimization. The program emphasizes legislative and technical aspects with focus on treatment and disposal technologies. Analysis and design covers physical, chemical, thermal or biological processes with general applications in the industrial and energy-producing sectors. Special wastes, such as high-technology, infectious and radioactive, are addressed as case studies.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5323. Prestressed Concrete.
Prestressed Concrete (3-0) Theory, advantages, and limitations; various systems of prestressing; composite construction; continuous span theory.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5324. Construction Management.
Construction Management (3-0) Planning and management of construction or engineering organizations, including formation, organization, legal factors, marketing, financing, and human resource management.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Vibration theory, behavior of structures and foundation members under dynamic loads. Design of structures and foundations for dynamic loads, wind loads, earthquakes and machine vibration.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5326. Air Pollution Control.
Air Pollution Control (3-0) Effect of air pollution, classification of wastes, meteorological factors, sampling and analysis, abatement, and statistical analysis.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5329. Air Pollution Modeling.
Air Pollution Modeling (3-0) Atmospheric boundary layer, atmospheric turbulence, air pollution meteorology, turbulent diffusion in the atmosphere, Eulerian diffusion equations, Gaussian models, USEPA regulatory air pollution models, modeling considerations, urban air pollution, and recent developments in air pollution modeling.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
Modern Methods of Engineering Computations (3-0) Methods of iterations, approximations, and numerical procedures used in solution of complex problems and optimizations such as occur in Engineering Design and Scientific Analysis.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5333. Plates and Shells.
Plates and Shells (3-0) The theory and designs of plates and shell structures by the membrane and bending stress theories.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5340. Surface Water Hydrology.
This course emphasizes engineering applications of hydrologic science and the relationship of water with the environment. Emphasis is on quantitative aspects of surface water.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

This course links hydrological and hydraulic theory with real-world engineering applications. Objective of this course is to introduce the student to modern tools used in the analysis and design of hydraulic and hydrologic projects. This course provides hands-on lab exercises that feature Bentley's Haestad Methods, as well as using ESRI GIS as a basis for HEC-HMS and HEC-RAS modeling with GeoHMS and GeoRAS.
5 Total Contact Hours
3 Lab Hours
2 Lecture Hours
0 Other Hours

CE 5344. Biol Unit Operations/Processes.
Biological Unit Operations and Processes (3-0) Design course for biological waste treatment systems. Both anaerobic and aerobic processes such as activated sludge and its variants, bio-towers, RBC's, sequencing batch reactors, fluidized bed reactors and anarobic digestion. The course will also address the biological removal and control of nitrogen and phosphorous for nutrient and ammonia toxicity control.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Advanced Physical-Chemical Water Treatment Processes. Design course focusing on the development of treatment trains for the removal of contaminants from water. Advanced design process development for filtration, adsorption, disinfection, ion exchange, membrane processes and inorganic residuals disposal. Class includes relevant field trips to advanced treatment facilities and a process design project.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
CE 5349. Design-Filtrat’n/Membrane Proc.
Design of Filtration and Membrane Processes (3-0) Fundamentals of particulate and ion removal/rejection are reviewed and then applied to engineered systems. The design of multi-media filtration systems, ultra and nano filtration processes, reverse osmosis (RO), electrodialysis, are covered in depth. Brine concentrate disposal methods such as deep well injection, irrigation, and enhanced evaporation are examined. Products such as membranes and brine concentration systems and availability from manufacturers are reviewed. Site visits to industrial application sites, an engineering design office, and an Original Equipment Manufacturer (OEM) may be included.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5351. Mech Pavement Design/Analysis.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5352. Foundation Design II.
Foundation Design II (3-0) Determination of lateral earth pressure. Design of traditional retaining structures, mechanically stabilized retaining walls and cofferdams. Stability of slopes, and dewatering.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Prerequisite(s): (CE 4348 w/D or better)

Geotechnical Site Investigation (3-0) Scope of site investigation. Subsurface data requirements. Conduct of investigation. Field Mapping. Engineering Geophysics. Laboratory and field investigation. Compilation and Presentation of Geotechnical Information.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Prerequisite(s): (CE 4348 w/D or better)

Advanced Mechanical Electrical Construction This course provides an understanding of mechanical and electrical systems in building construction.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Advanced topics in civil engineering materials, design characterization and construction of Portland cement including high performance concrete, design, characterization, and construction of asphalt concrete mixtures; and design, characterization, and construction of base and subgrade materials.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Prerequisite(s): (CE 3336 w/C or better)
CE 5356. Sustainable Engr Design.
Sustainable Engineering Design Fundamentals from engineering and science to develop an in-depth understanding of sustainable design principles. Students will be exposed to emerging concepts such as zero energy and net positive energy engineering systems. The course will focus on the areas of sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality and innovation and design processes.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Structural Loads Models Comprehensive review of the most common models and modeling processes for the loads affecting buildings, bridges, and other civil engineering structures, including dead and live loads, wind and earthquake loads, and snow and temperature loads.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5358. Traffic Engineering.
Traffic Engineering Human, vehicular, and traffic characteristics as they relate to driver-vehicle roadway operational systems, traffic studies, and methods of analysis and evaluation. Traffic flow theory and application of traffic control, signalization, and freeway operations. Intelligent transportation systems.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5359. Foundation Design I.
Foundation Design I (3-0) Subsurface exploration, spread footings, mat foundations, pile foundations, drilled shaft, mechanics of laterally and axially loaded piles.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5360. Highway Geometric Design.
Highway Geometric Design (3-0) This course will provide students with an understanding of the basic principles and techniques of highway design. This will include laying out potential routes, detailed design of the alignment, and evaluation of drainage, earthwork, and intersection requirements. The student should be able to understand and apply these principles to highway design problems. The student will use existing computer tools to generate and analyze designs. Upon completion, students should be prepared to work in the field of highway design and to study advanced topics in roadway design.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Prerequisite(s): (CE 4340 w/C or better)

Traffic Flow and Simulation Modeling (3-0) This is a comprehensive introductory course to traffic flow and simulation modeling. Topics include: basic microscopic; meso-scopic and macroscopic traffic flow theories; advanced traffic flow theories such as high-order traffic flow theories; analytical and simulation based traffic flow modeling; traffic simulation models and their applications.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
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CE 5362. Urban Transportation Planning.
Urban Transportation Planning (3-0) This course introduces the student to transportation planning and provides the student with an understanding of transportation planning models, including travel demand models of trip generation, trip distribution, mode choice, and traffic assignment. Practical problems are assigned to provide familiarity with models used and experience in data handling and estimation.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5363. Adv Travel & Infra Demand Anal.
Advanced Travel and Infrastructure Demand Analysis (3-0) This course addresses new developments in the econometric and behavioral aspects of demand analysis and forecasting, through a number of model-estimation methods that are used in transportation data analysis, economic analysis, and other subject areas that deal with data analysis. Applications include passenger travel, urban activity decisions, user responses to information, freight transportation as well as the demand for other types of infrastructure facilities and services. It is important to note that the methods presented can be used in wide variety of data-analysis applications and go well beyond the techniques typically covered in statistics courses.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Infrastructure Network Flow Analysis and Optimization (3-0). The primary focus of this course is on the use of quantitative techniques of operations research to model system performance, design transportation services, and analyze transportation network problems through the design, analysis and implementation of algorithms. Topics include introductions to data structures, memory management and complexity analysis; application of graph theory and network analysis to transportation problems (including shortest path, vehicle routing and other problems arising in connection with scheduled and unscheduled systems); analytical approaches to the formulation of network equilibrium assignment problems and solution algorithms.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5365. Infrastruct Syst Design & Eval.
Decision Making in Infrastructure System Design and Evaluation (3-0) This course is aimed at providing students with methodologies and applications for complex decision making in infrastructure system design and evaluation in the presence of multiple criteria/objectives, multiple actors and uncertainty. In addition to the conceptual, mathematical and algorithmic aspects of the various approaches, limitations, implementation issues and case studies are addressed.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5371. Construction Dispute Resolutn.
Construction Dispute Resolution (3-0). This course introduces students to how and why disputes occur, how they need to be handled under the contract, how they can be avoided, and how they can be resolved through negotiation, mediation, arbitration or litigation.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours
CE 5374. Temporary Construction Methods.  
Temporary Construction Methods (3-0). Students are provided an understanding of temporary structures used during construction to support oils, concrete and structural members. Site access ground support systems, scaffolding, concrete support structures, underpinning systems, dewatering systems, slurry walls, cofferdams, and concrete caisson sinking.  
3 Credit Hours  
3 Total Contact Hours  
0 Lab Hours  
3 Lecture Hours  
0 Other Hours  

CE 5381. Sustainable Construction.  
Sustainable Construction Students will learn about the origins of sustainable design, the ecological structure of matter, and the physical laws that govern it. They will understand the sustainable construction roadmap with practical rules to follow to attain the goal of building sustainability in both commercial and residential applications.  
3 Credit Hours  
3 Total Contact Hours  
0 Lab Hours  
3 Lecture Hours  
0 Other Hours  

Students will learn advanced methods and software tools for developing detailed estimates of construction costs, preparing bid packages, preparing budgets, and monitoring and controlling costs for construction projects.  
3 Credit Hours  
3 Total Contact Hours  
0 Lab Hours  
3 Lecture Hours  
0 Other Hours  

CE 5383. Engl-Span for Const Managers I.  
Introductory course for learning to communicate in both English and Spanish on construction jobsites.  
3 Credit Hours  
3 Total Contact Hours  
0 Lab Hours  
3 Lecture Hours  
0 Other Hours  

CE 5384. Engl-Span for Const Mangrs II.  
Intermediate course for learning how to communicate in both English and Spanish on construction job sites.  
3 Credit Hours  
3 Total Contact Hours  
0 Lab Hours  
3 Lecture Hours  
0 Other Hours  

Prerequisite(s): (CE 5383 w/C or better)  

CE 5385. Construction Internship.  
An internship consisting of a minimum of 12 weeks (480 hours) of work in a construction company or government agency that is involved in construction management and engineering, and is approved by UTEP.  
3 Credit Hours  
3 Total Contact Hours  
0 Lab Hours  
0 Lecture Hours  
3 Other Hours  

Prerequisite(s): (CE 5324 w/C or better AND CE 5382 w/C or better) AND (CE 5383 w/C or better) OR (CE 5384 w/C or better)
Advanced Construction Law and Ethics (3-0). This course is designed to give students a working knowledge of various forms of construction contracts, roles, and responsibilities of the parties to the contract licensing and regulatory requirements, lien laws and contractor rights, national and local labor law, procedures to avoid disputes, and how to work with each of the important terms of a contract. Students are required to complete and present a report on a project consisting of a complete review and risk analysis of an actual construction project dispute or litigation.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5387. Adv Construction Scheduling.
Advanced Construction Scheduling (3-0). Students in this course will gain a working understanding of parameters affecting project planning, how to present schedule information, network diagramming, procurement practices, critical path method scheduling, resource allocation and management, impacts caused by changes, and computer applications using state of the art software systems. Students are required to complete and present a report on a project consisting of a complete critical path scheduling analysis of an actual project using a state-of-the-art software system.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5388. Advanced Construction Safety.
Advanced Construction Safety (3-0). Students in this course will be provided an understanding of safe work practices, mandatory training, record keeping and maintenance of records, compliance with OSHA worker safety and environmental safety laws inspection procedures, and penalties for lack of conformance to safety laws. Students will also learn procedures for recognizing hazards, CPR, site safety meetings, and accident investigations. Students are required to complete and present a report on a project consisting of a complete corporate safety plan and a site-specific safety plan containing a hazard analysis of an actual project.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Advanced Construction Methods and Materials (3-0). This course covers the composition and properties of materials, terminology and units of measure; standard designations, sizes and graduations; conformance references and testing techniques; products, systems and interface issues; equipment applications and utilization; comparative cost analysis; assembly techniques and equipment selection; and building codes and standards. Students are required to study an actual construction production system or method, present a report on the review and analysis, and arrange a visit to the actual site operation or method being analyzed.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5390. Special Topics Civil Engr.
Special Topics in Civil Engineering (3-0) Advanced topics of contemporary interest in civil engineering. May be repeated for credit when topic varies.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5391. Individual Studies.
Individual Studies (0-0-3) Individual variable-credit research design analysis on advanced phases of Civil Engineering problems conducted under the direct supervision of a faculty member. A maximum of six credit hours may be applied towards the M.S. degree.

3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours
CE 5392. Earth Construction.
Earth Construction (3-0). This course will allow students to understand how a site needs to be managed from the start of a project, how to protect the land, and how to manage soil and water issues during construction. Topics to be covered include specialized construction materials for managing soils and associated techniques that can save money and reduce construction time.
3 Credit Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5393. Residential Construction.
Residential Construction (3-0). This course provides a detailed review of construction approaches and procedures unique to residential construction projects and development work. Delivery method issues, production efficiency, materials, contract procedures, environmental and energy efficiency issues, and alternative energy source designs are covered.
3 Credit Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5394. Graduate Research.
Graduate Research (0-0-3) Individual variable-credit research of contemporary topics in civil engineering. Cannot be used to satisfy minimum degree requirements. Grade P or F.
3 Credit Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

CE 5395. Construction Claims.
Construction Claims (3-0). This course presents how claims occur, evaluations of claim validity, claim prevention approaches, claim analysis, claim preparation, and development of proof of claim damages for negotiation, arbitration or litigation.
3 Credit Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5396. Graduate Projects.
Graduate Projects (0-0-3) Individual research, design or analysis on advanced phases of civil engineering problems conducted under the direct supervision of a faculty member. The courses, including a written report, are required of all students in the non-thesis option.
3 Credit Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

CE 5397. Graduate Projects.
Graduate Projects (0-0-3) Individual research, design, or analysis on advanced phases of civil engineering problems conducted under the direct supervision of a faculty member. The courses, including a written report, are required of all students in the non-thesis option.
3 Credit Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

Prerequisite(s): (CE 5396 w/P or better)
CE 5398. Thesis.
Thesis (0-0-3).
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

CE 5399. Thesis.
Thesis (0-0-3).
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

Prerequisite(s): (CE 5398 w/P or better)

CE 5409. Environmental Eng Chemistry.
Environmental Engineering Chemistry (3-3) Study and evaluation of the chemical characteristics of ground water, surface water, municipal waste waters, and industrial effluents. Acid base reactions, oxidation reduction reactions, gas solubility, absorption, precipitation, and dissolution. Laboratory covers analysis of physical, chemical, and biological properties of water. Learn applications of ICP, LC, XRD, IC, TOC, and other instrumentation for water analysis.
4 Credit Hours
6 Total Contact Hours
3 Lab Hours
3 Lecture Hours
0 Other Hours

CE 5494. Graduate Research.
Graduate Research (0-0-9) Individual Variable-credit research of contemporary topics in Civil Engineering. Cannot be used to satisfy minimum degree requirements. Grade P (Pass) or F (Fail).
4 Credit Hours
4 Total Contact Hours
0 Lab Hours
0 Lecture Hours
4 Other Hours

CE 5694. Graduate Research.
Graduate Research (0-0-6) Individual Variable-credit research of contemporary topics in Civil Engineering. Cannot be used to satisfy minimum degree requirements. Grade P or F.
6 Credit Hours
6 Total Contact Hours
0 Lab Hours
0 Lecture Hours
6 Other Hours

CE 6195. Civil Engineering Seminar.
Civil ENgineering Seminar (1-0) Presentation and discussion of topics in infrastructure engineering by graduate students, faculty and visitors.
1 Credit Hour
1 Total Contact Hour
0 Lab Hour
1 Lecture Hour
0 Other Hour

CE 6296. Doctoral Research.
Doctoral Research (0-0-2). Directed research on topics in civil and infrastructure engineering related to the dissertation or conducted as a component of the student’s overall graduate program.
2 Credit Hours
2 Total Contact Hours
0 Lab Hours
0 Lecture Hours
2 Other Hours
CE 6301. Infrastructure Management.
Infrastructure Management (3-0) Fundamental Concepts of infrastructure management including core elements and analytical methods to support decision making. Data required for managing infrastructure assets; performance models, budget needs, maintenance and rehabilitation strategies, and impact analysis are covered in the course. Case studies with hands-on applications using practical tools for the implementation of infrastructure management systems.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 6303. Engineering Analysis (3-0).
Engineering Analysis (3-0). Advanced engineering mathematics dealing with linear algebra, vector calculus and the formulation and solution of initial and boundary value problems arising in engineering.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 6306. Infrastructure Engineering.
Infrastructure Engineering (3-0) This course introduces the common mathematical concepts and tools in engineering civil infrastructure. The topics are grouped into 3 parts: infrastructure location; infrastructure capacity analysis; and decision analysis. The infrastructure location analysis addresses the issue on where to locate/site an infrastructure facility (e.g. transportation terminals, water/wastewater treatment plants, schools, and etc.). The capacity analysis covers the analysis of a facility's capacity and for infrastructure systems that spread over a network (e.g. transportation, water distribution, sewage, storm water), the capacity and distribution of materials across a network.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 6313. Water Resources Mgmt.
Water Resources Management (3-0) Technological and institutional approaches for managing water resources; the planning process; systems analysis methods; comprehensive integration of engineering, economic, environmental, legal and political considerations in water resources development and management; issues and future directions.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Advanced Traffic Engineering (3-0) Human, vehicular, and traffic characteristics as they relate to driver-vehicle-roadway operational systems; traffic studies and methods of analysis and evaluation. Advanced theory and application of traffic control; signalization; and freeway operations.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 6315. Infrastructure Planning.
Infrastructure Planning (3-0) Master planning of infrastructure including methods and tools to develop and analyze infrastructure alternatives. Infrastructure performance and prioritization, financial and economic analysis, life-cycle cost analysis, risk assessment techniques, and operations research methods for modeling infrastructure planning problems.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

Prerequisite(s): (CE 6301 w/C or better)
CE 6316. Intermodal Transportation Sys.
Intermodal Transportation Systems (3-0) The primary focus of this course is on the design and strategic planning of intermodal transportation systems (infrastructure and rolling stock); that is, how strategic planning pertains to freight transportation. Freight logistics, intermodal technology, and intermodal terminal operations. Intermodal freight transportation policy, planning, and operations systems and programs. Applications include inland and bi-national (border region) planning and design.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 6332. Mod Methods/Engr Computation.
Modern Methods of Engineering Computation (3-0) Methods of iterations, approximations, and numerical procedures used in solution of complex problems and optimizations such as occur in Engineering Design and Scientific Analysis.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
3 Lecture Hours
0 Other Hours

CE 6396. Doctoral Research.
Doctoral Research (0-0-3) Directed research on topics in civil and infrastructure engineering related to the dissertation or conducted as a component of the student's overall graduate program.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

CE 6398. Dissertation.
Dissertation (0-0-3) Taken when preparation of the dissertation is begun. One enrollment permitted.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

Dissertation (0-0-3) Taken continuously during preparation of the dissertation.
3 Credit Hours
3 Total Contact Hours
0 Lab Hours
0 Lecture Hours
3 Other Hours

Prerequisite(s): (CE 6398 w/P or better)