

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. Prerequisite: Department approval.

Department: Civil Engineering

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 to M.S. Degree. Prerequisite: Department approval.

Department: Civil Engineering

2 Credit Hours

2 Total Contact Hours

0 Lab Hours

0 Lecture Hours

2 Other Hours

CE 5302. Grndwtr Hydro & Polltn.

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. Prerequisite: Department Approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5304. Adv Design of Struct Systms.

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. Prerequisite: CE 4335 and CE 4361.

Department: Civil Engineering

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. Prerequisite: CE 3343

Department: Civil Engineering

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. Prerequisites: CE 3343 or equivalent and instructor approval.

Department: Civil Engineering

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 5310. Risk/Reliability Anal-Engr Sys.

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. Prerequisite: Department approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

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. Prerequisite: Department approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5313. Water Reclamation & Reuse.

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

Department: Civil Engineering

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. Prerequisite: Department Approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5318. Bridge Engineering.

Bridge Engineering (3-0) General considerations for design and load capacity evaluation of highway bridges. Introduction to load and resistance factor design (LRFD) philosophy. Bridge loads. Influence lines. Grillage analysis of bridges. Reinforced and prestressed concrete bridges. Composite steel bridges. Bridge substructures. Load rating. Introduction to seismic analysis and design. Prerequisite: Department approval.

Department: Civil Engineering

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. Prerequisite: Department Approval.

Department: Civil Engineering

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 5323. Prestressed Concrete.

Prestressed Concrete (3-0) Theory, advantages, and limitations; various systems of prestressing; composite construction; continuous span theory. Prerequisite: Department approval.

Department: Civil Engineering

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. Prerequisite: Department approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5325. Design for Dynamic Loads.

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. Prerequisite: Department Approval.

Department: Civil Engineering

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. Prerequisite: Department approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5331. Soil Stabilization.

Soil Stabilization: This course covers theoretical concepts and practical design procedures for stabilization of granular soils. The topics include general overview of ground improvement techniques including mechanical compaction, geosynthetics, fibers, and calcium-based stabilizers such as cement, lime, fly ash, and CCBs to improve the strength properties of foundations and mitigate moisture susceptibility of construction platforms. This course also provides available procedures for the mixture design of asphalt emulsions, and foamed asphalt in civil engineering practice.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

Prerequisite(s): (CE 3348 w/C or better)

CE 5332. Methods Engineering Computatio.

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. Prerequisite: Department approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5334. Unsaturated Soil Mechanics.

Unsaturated Soil Mechanics: This course covers theoretical concepts and practical aspects pertaining to the role moisture in natural and engineered soils, and its influence on the load bearing capacity and stability of soil platform supporting civil engineering structures. The topics include apparent cohesion concept, matric suction, field suction profile, hysteresis behavior, and extended failure criteria for soils. The second part of the course provide analysis and design of shallow foundations and retaining structures considering the moisture variations during the service life of geostructures.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

Prerequisite(s): (CE 3348 w/C or better)

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.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5341. Hydraulic Computer Application.

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.

Department: Civil Engineering

3 Credit Hours

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 anaerobic digestion. The course will also address the biological removal and control of nitrogen and phosphorous for nutrient and ammonia toxicity control. Prerequisite: Department approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5345. Adv Phy-Chem Water Treat.

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. Prerequisite: Department Approval.

Department: Civil Engineering

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. Prerequisite: Department approval

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5351. Mech Pavement Design/Analysis.

Mechanistic Pavement Design and Analysis (3-0) Stresses and deformations in flexible and rigid pavements. Traffic loading and volume. Material characterization. Drainage design. Definition of pavement performance. Application of reliability to pavement design. Flexible and rigid pavement design. Design of overlays. Prerequisite: Department approval.

Department: Civil Engineering

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. Prerequisite: CE 4348 or department approval. .

Department: Civil Engineering

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 5353. Geotech. Site Investigation.

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. Prerequisites: CE 4348 and instructor approval.

Department: Civil Engineering

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 5354. Adv Mech Electrical Construct.

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

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5355. Advanced Civil Eng. Materials.

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.

Prerequisite: Department Approval.

Department: Civil Engineering

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.

Prerequisite: Departmental approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5357. Structural Loads Models.

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. Prerequisite:

Departmental approval.

Department: Civil Engineering

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. Prerequisite: Departmental approval.

Department: Civil Engineering

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.

Department: Civil Engineering

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. Prerequisites: Satisfactory completion of CE 4340 or equivalent and department approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

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

CE 5361. Traffic Flow/Simulation Modeling.

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. Prerequisite: Department Approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

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. Prerequisite: Department Approval.

Department: Civil Engineering

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. Prerequisites: Satisfactory completion of CE 3373 or equivalent and department approval.

Department: Civil Engineering

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. Prerequisite: Department Approval.

Department: Civil Engineering

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.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5382. Adv Constr Cost Analysis & Bid.

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. Prerequisites: Departmental approval and CE 5324. Restricted to Graduate students.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

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. Prerequisites: Departmental approval and CE 5324, CE 5382, and CE 5383 or CE 5384. Restricted to Graduate students.

Department: Civil Engineering

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)

CE 5386. Adv Construction Law & Ethics.

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. Prerequisite: Department Approval.

Department: Civil Engineering

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. Prerequisite: Department Approval.

Department: Civil Engineering

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. Prerequisite: Department Approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

3 Lecture Hours

0 Other Hours

CE 5389. Adv Constr Methods & Materials.

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. Prerequisite: Department Approval.

Department: Civil Engineering

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. Prerequisite: Department approval.

Department: Civil Engineering

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. Prerequisite: Department approval.

Department: Civil Engineering

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. Prerequisite: Department Approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact 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. Prerequisite: Department approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact 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. Prerequisite: Department Approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact 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. Prerequisite: Department approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact 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. Prerequisite: CE 5396 and department approval.

Department: Civil Engineering

3 Credit Hours

3 Total Contact 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)

Department: Civil Engineering**3 Credit Hours****3 Total Contact Hours**

0 Lab Hours

0 Lecture Hours

3 Other Hours

CE 5399. Thesis.

Thesis (0-0-3) Prerequisite: CE 5398

Department: Civil Engineering**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. Prerequisite: Department approval.

Department: Civil Engineering**4 Credit Hours****6 Total Contact Hours**

3 Lab Hours

3 Lecture Hours

0 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. Prerequisite: Department approval.

Department: Civil Engineering**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.

Prerequisites: Permission of the CE program director and department approval.

Department: Civil Engineering**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. Prerequisite: Departmental approval.

Department: Civil Engineering**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. Prerequisite: Department Approval.

Department: Civil Engineering

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.

Department: Civil 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.

Department: Civil Engineering

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. Prerequisite: Department approval.

Department: Civil Engineering

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. Prerequisite: Department Approval.

Department: Civil Engineering

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. Prerequisites: Admission to the CE program or permission of the CE Program Director and department approval.

Department: Civil Engineering

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. Prerequisite: Completion of comprehensive examination.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

0 Lecture Hours

3 Other Hours

CE 6399. Dissertation.

Dissertation (0-0-3) Taken continuously during preparation of the dissertation. Prerequisite: CE 6398.

Department: Civil Engineering

3 Credit Hours

3 Total Contact Hours

0 Lab Hours

0 Lecture Hours

3 Other Hours

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