CIVIL & ENVIRONMENTAL ENGR (CE)

Courses

CE 218. Numerical Methods for Engineer. 3 Credits.
Foundational concepts of numerical integration, numerical differentiation, and numerical approximation and solution of differential and partial differential equations of the type encountered in the analysis of engineering problems and data processing. Prerequisites: MATH 271, CS 020; MATH 122 or MATH 124. Cross-listed with: ME 218.

CE 220. Intro to Finite Element Anyl. 3 Credits.
Introduction to finite element analysis: applications in solid mechanics, hydrodynamics, and transport: analysis of model behavior: Fourier analysis. Computer project required. Prerequisites: CS 020; MATH 122 or MATH 124.

CE 226. Civil Engineering Systems Anyl. 3 Credits.
Linear programming, dynamic programming, network analysis, simulation; applications to scheduling, resource allocation, routing, and a variety of civil engineering problems. Prerequisites: Senior/Graduate standing in Civil & Environmental Engineering. Cross-listed with: CSYS 226.

CE 238. Design/Planning for Bikes/Peds. 3 Credits.
Interdisciplinary introduction to design/planning concepts for bikes/pedestrians from a systems view. Examines current best practices on how effectively they address social, environmental, economic, and health related transportation issues. Prerequisite: Senior or Graduate standing.

CE 241. Traffic Operations & Design. 3 Credits.
Advanced concepts of traffic engineering and capacity analysis; highway and intersection capacity; traffic analysis and simulation software; design and application of controls. Prerequisite: CE 133.

CE 245. Intelligent Transportation Sys. 3 Credits.
Introduction to Intelligent Transportation Systems (ITS), ITS user services, ITS applications, the National ITS architecture, ITS evaluation, and ITS standards. Pre/co-requisites: CE 133. Cross-listed with: CSYS 245.

CE 248. Hazardous Waste Mgmt Engr. 3 Credits.
Management of hazardous and industrial waste from generation to disposal; emphasis on pollution prevention within industry; waste minimization, recovery, reuse, treatment technologies; environmental regulations, risk assessment, costs and public policy; group projects. Prerequisite: Senior standing in engineering or sciences.

CE 250. Fate/Transport Organic Chem. 3 Credits.
Chemical transfers between environmental media; molecular structure-reactivity models; chemical, photochemical and biochemical transformation rates; emphasis on predicting environmental concentrations and risk. Graduate student independent modeling project. Prerequisites: CHEM 031, CHEM 032, CE 132.

CE 251. Envr Facility Dsgn/Wastewater. 3 Credits.
Design of wastewater conveyance and treatment facilities; sewage treatment plant design; equipment selection. Prerequisite: CE 151.

CE 253. Transportation & Air Quality. 3 Credits.
Air pollution sources, measurement methods, legislation, vehicle emissions formation, control and transport processes. Emphasis on emission factor and dispersion multi-scale modeling using latest modeling tools. Prerequisite: CE 133.

CE 254. Environmental Quantitive Anyl. 0 or 4 Credits.
Course focuses on chemical, biochemical and physical processes; diffusion, equilibria, reaction kinetics, acids/bases, colloids, air/water exchange; laboratories demonstrate standard environmental engineering techniques. Prerequisites: CHEM 032, CE 132, STAT 143.

CE 255. Phys/Chem Proc Water/Wstwater. 0 or 3 Credits.
Theory of physical/chemical processes for treating waters and wastewaters; reactor dynamics, mass transfer, adsorption, ion exchange, precipitation. Prerequisite: CE 151.

CE 256. Biol Proc Water/Wastewater Tr. 0 or 3 Credits.
Theory and application of biological processes for treating industrial and domestic wastewaters and contaminated ground water; microbiological considerations; aerobic and anaerobic processes; reactor design, in-situ bioremediation; bench-scale and pilot-scale experimentation. Prerequisite: CE 151.

CE 259. Msmt of Airborne Contaminants. 3 Credits.
Quantifying airborne contaminants from processes and ambient levels. Laboratories demonstrate calibration and measurement, stack sampling and ambient air monitoring, and specific contaminant generation and measurement. Prerequisite: CE 132.

CE 260. Hydrology. 3 Credits.
Theory of precipitation, run-off, infiltration, and ground water; precipitation and run-off data; and application of data for use in development of water resources. Prerequisite: CE 160.

CE 261. Open Channel Flow. 3 Credits.
Application of the laws of fluid mechanics to flow in open channels; design of channels and transition structures; modeling; uniform and gradually-varied flows. Prerequisite: CE 160.

CE 262. Advanced Hydrology. 3 Credits.
Introduces computer modeling of hydrological systems and involves a semester-long design project. Simple overland flow, flood routing, water quality, and groundwater models are developed using finite difference techniques. Stochastic hydrology and hydrologic time series analysis are also introduced. Prerequisite: CE 260.

CE 265. Ground Water Hydrology. 3 Credits.
Principles of ground water hydraulics, well characteristics, aquifers, and use of numerical methods to solve ground water flow problems. Prerequisite: CE 160.
CE 271. Advanced Structural Analysis. 3 Credits.
Virtual work, energy theorems, analysis of structures by the
displacement method, finite element analysis of structural systems,
non-linear structural analysis, structural optimization, probabilistic
structural analysis. Prerequisite: CE 170.

CE 272. Structural Dynamics. 3 Credits.
Vibrations, matrices, earthquake engineering, stability and wave
propagation. Prerequisites: Senior/Graduate standing in engineering
or physical sciences, or Instructor permission. Cross-listed with: ME
270.

CE 273. Structural Design - Wood. 3 Credits.
Analysis and design of solid and glue laminated timber members
and structural systems including tension members, beams, columns,
beam-columns, diaphragms, shear walls and connections; LRFD and
ASD design methods; application of IBC for timber systems; current
developments in wood design/construction. Prerequisite: CE 170.

CE 281. Geotechnical Design. 3 Credits.
Subsurface explorations; bearing capacity, lateral earth pressures,
slope stability; analysis and design of shallow and deep foundations,
retaining structures, and slopes. Prerequisite: CE 180.

CE 283. Designing with Geosynthetics. 3 Credits.
Geotextiles, geogrids, geonets, geomembranes, geocomposites,
geopipes. Design for separation, reinforcement, filtration, drainage,
erosion, control, liners. Applications in transportation, drainage, solid
waste containment. Material testing, behavior. Prerequisite: CE 180.

CE 284. Site Characterization. 3 Credits.
A comprehensive approach to subsurface site characterization for
geotechnical and environmental designs and a systems approach for
integrating the two. Prerequisites: CE 160, CE 180.

CE 285. Geo-energy Systems. 3 Credits.
An introduction to Geoenergy technologies for subsurface energy
extraction (shallow and deep geothermal systems, enhanced oil
recovery, shale gas extraction) and secure storage of byproducts of
energy production (carbon dioxide and nuclear wastes). Prerequisite:
CE 180.

CE 290. Engineering Investigation. 3 Credits.
Independent investigation of a special topic under the guidance of a
staff member. Preparation of an engineering report is required.

CE 295. Special Topics. 1-18 Credits.
Content is dictated by expanding professional interest in newly
developing, or recently developed, technical areas in which there
is particular need or opportunity. Prerequisite: Senior/Graduate
standing.

CE 304. Adv Engineering Analysis I. 3 Credits.
Analytical methods for the solution of partial differential equations
in engineering mechanics and physics, including: eigenfunction
expansions; Fourier series; Sturm-Liouville theory and special
functions. Prerequisites: Graduate standing in engineering,
mathematics, or physical sciences. Cross-listed with: ME 304.

CE 305. Adv Engineering Analysis II. 3 Credits.
Advanced analytical techniques for problems in engineering
mechanics and physics, including: integral transform methods,
Green’s functions, perturbation methods, and variational calculus.
Prerequisites: ME 304; Graduate standing in engineering,
mathematics, or physical science. Cross-listed with: ME 305.

CE 312. Sustainability & Transportatn. 3 Credits.
Introduction to the complex interconnection of engineering, policy,
science and social science that characterize transportation systems,
mobility problems and solutions. Interdisciplinary teams conduct case
studies. Prerequisite: Instructor permission required. Cross-listed
with: PA 342, TRC 312.

CE 314. Risk/Behavior in Transportatn. 3 Credits.
In-depth examination of human, environmental and vehicle factors
in transportation crashes. Students develop safety research proposals
and statistical measurements of risk and rates. Prerequisite: Instructor
permission.

CE 321. Engr Computations on Adv Arch. 3 Credits.
Engineering computations using multiprocessor computers,
concurrent processing, algorithms for numerical approximation of
differential equations, linear systems. Programming projects required.
Prerequisites: Graduate standing in engineering, mathematics or
physical science.

CE 359. Appld Artificial Neural Ntwrks. 1-3 Credits.
Introduction to artificial neural networks. A broad range of example
algorithms are implemented in MATLAB. Research applications
to real data are emphasized. Prerequisites: CS 020, STAT 223 or
equivalent. Cross-listed with: CSYS 359.

CE 360. Advanced Hydrology. 3 Credits.
Application of statistics to engineering hydrology; concept, use of
instantaneous unit hydrograph; study of runoff models; flow through
porous media; design techniques for water resources projects.
Prerequisites: CE 260, MATH 271. Offered as occasion warrants.

CE 361. Fluvial Forms & Processes. 3 Credits.
Advanced topics in fluvial forms and processes; focus on river and
stream restoration and design; includes journal readings, discussion,
field trips and group design project. Prerequisite: CE 160.

CE 365. Contaminant Hydrogeol&Remediat. 3 Credits.
Practical, theoretical aspects of contaminant hydrogeology, advances
in technologies, mass transport and transformation in saturated
and vadose zones; movement, distribution, and remediation of
nonaqueous-phase liquids. Prerequisite: CE 265.

CE 366. Numerical Method/Surface Water. 3 Credits.
Development of the governing equations for geophysical
hydrodynamics/transport, shallow water equations, analysis and
implementation of finite element/finite difference computational
algorithms. Prerequisite: CE 218 or CE 220.

CE 367. Phys Flow&Trs thru Porous Mdia. 3 Credits.
The fundamental equations describing fluid flow and mass
transport in subsurface systems are developed from first principles.
Prerequisite: CE 265.
CE 368. Groundwater Modeling. 3 Credits.
The fundamental theory of groundwater hydrology is combined with
concepts in numerical methods to provide the technology needed to
study a real-world groundwater problem. Prerequisites: CE 265, and
CE 218 or CE 220.

CE 369. Applied Geostatistics. 3 Credits.
Introduction to the theory of regionalized variables, geostatistics
(kriging techniques): special topics in multivariate analysis;
Applications to real data subject to spatial variation are emphasized.
Prerequisites: CS 020, STAT 223 or equivalent. Cross-listed with:
CSYS 369.

CE 370. Reliability of Eng. Systems. 3 Credits.
Modeling and simulation of functions of random variables and
random processes, propagation of uncertainties in engineering
systems, analytical and computational methods for reliability analysis
of engineering systems and components, Bayesian methods to update
reliability estimates based on operational data. Prerequisite: STAT
151 or equivalent.

CE 380. Advanced Soil Mechanics. 3 Credits.
Stress-strain-strength of soils, introduction to constitutive modeling,
critical state concepts, applications of limit analysis and limit
equilibrium methods in analyzing stability problems in geotechnical
engineering, such as foundations, slopes and embankments and
retaining structures. Prerequisite: CE 180.

CE 390. Adv Topics in Civil & Envr Eng. 1-6 Credits.
Special topics to intensify the programs of graduate students in civil
and environmental engineering. Hours and credits to be arranged.

CE 391. Master Thesis Rsch. 1-12 Credits.

CE 393. CEE Graduate Seminar. 0 Credits.
Presentation and discussion of advanced problems, research, and
current topics in Civil & Environmental Engineering by faculty,
graduate students, and outside guest speakers. Prerequisite: Graduate
student in Civil & Environmental Engineering.

CE 395. Advanced Special Topics. 1-6 Credits.
Advanced topics in recently developed technical areas. Hours and
credits as arranged.

CE 491. Doctoral Dissertation Research. 1-18 Credits.