

499. Senior Thesis Research
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course. R: Approval of department.
 An individual research project supervised by a faculty member that demonstrates the student's ability to do independent research and submit or present a major paper.

CIVIL ENGINEERING CE

**Department of Civil and
Environmental Engineering
College of Engineering**

271. Engineering Surveying
Fall, Spring. 4(3-3) P: (MTH 104 or MTH 116 or MTH 120 or MTH 124 or MTH 132 or LBS 117 or LBS 118)

Application of surveying and error analysis to civil engineering problems. Earth work. Calculations. Layout and management of construction sites.

280. Introduction to Environmental Engineering

Fall, Spring. 3(3-0) P: (CEM 141 or CEM 151) and (MTH 132 or concurrently or LBS 118) and (CSE 101 or concurrently or CSE 131)

Elements of hydrology. Groundwater and surface water supply and contamination. Treatment systems for drinking water, wastewater, air, and solid and hazardous waste. Introduction to noise and radiation pollution.

305. Structural Analysis

Fall, Spring. 3(3-0) P: (MSM 211) R: Open only to juniors or seniors in the Department of Civil and Environmental Engineering.

Determinate and indeterminate plane structures. Linearity, stability, determinacy. Virtual-work calculation of forces and displacements. Flexibility and stiffness methods in plane structures.

312. Soil Mechanics

Fall, Spring. 3(2-3) P: (MSM 211) and completion of Tier I writing requirement. R: Open only to juniors or seniors in the Department of Civil and Environmental Engineering or in the Biosystems Engineering major.

Engineering properties of soil and their measurement. Effective-stress concept. Permeability and seepage. Compaction. Consolidation, shear strength and stress-strain behavior.

321. Introduction to Fluid Mechanics

Fall, Spring. 4(3-2) P: (MTH 235 or concurrently) and completion of Tier I writing requirement. R: Open only to juniors or seniors in the Department of Civil and Environmental Engineering or in the Biosystems Engineering major. Not open to students with credit in ME 332.

Fluid properties, fluid statics, fluids in motion. Conservation of mass, energy and momentum. Dimensional analysis and similitude. Internal and external flows. Applications.

337. Civil Engineering Materials I

Fall, Spring. 4(3-3) P: (MSM 211 or concurrently) R: Open only to juniors or seniors in the Department of Civil and Environmental Engineering.

Common civil engineering construction and paving materials: aggregates, inorganic cements, asphalts, concretes, wood and steel. Composition, structure, physical and mechanical properties, tests, and production mix design.

341. Transportation Engineering

Fall, Spring. 3(3-0) P: (MTH 234 or concurrently) RB: (STT 351) R: Open only to juniors or seniors in the Department of Civil and Environmental Engineering or in the Urban and Regional Planning major.

Overview of transportation system issues and problems. Fundamentals of highway design and operations. Planning and evaluation of transportation system alternatives.
 SA: CE 346

400. Structural Mechanics

Fall. 3(3-0) P: (CE 305) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Matrix methods of structural analysis. Flexibility method. Direct stiffness method for plane structures. Elastic supports, inclined supports, member releases and non-prismatic members. Application software.

405. Design of Steel Structures

Fall, Spring. 3(3-0) P: (CE 305) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Design of steel beams, columns, tension members and connections. Stability and plastic strength.

406. Design of Concrete Structures

Fall, Spring. 3(3-0) P: (CE 305 and CE 337) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Design of reinforced concrete beams, slabs, columns and footings.

418. Geotechnical Engineering

Fall, Spring. 4(4-0) P: (CE 312) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Shallow foundation design including bearing capacity, stress distribution, and settlement analysis. Pile foundations. Design of retaining structures including rigid walls, braced excavations, and sheet-pile walls. Stability of slopes and embankments.

421. Engineering Hydrology

Fall. 3(2-2) P: (CE 321 or concurrently) RB: (STT 351) R: Open only to juniors or seniors or graduate students in the College of Engineering or College of Natural Science or Department of Crop and Soil Sciences.

Hydrologic design of stormwater systems. Equilibrium hydrograph analysis, unit hydrographs, infiltration, hydrograph synthesis, and reservoir routing. Groundwater: Darcy's law, flow nets, well hydraulics, design of capture wells.

422. Applied Hydraulics

Spring. 3(2-2) P: (CE 321 or ME 332) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering or Department of Mechanical Engineering or in the Biosystems Engineering major.

Fundamentals of open-channel flow. Rapidly and gradually varied nonuniform flow analysis. Confined flows past submerged bodies, in pipe networks, and in turbo machinery. Design applications.

431. Pavement Design and Analysis I

Fall. 4(4-0) P: (CE 312 and CE 337) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Highway and airfield pavement structural design. Performance measures. Failure mechanisms, popular thickness design procedures, and design considerations for surface friction, pavement joints, and drainage. Design of rehabilitation alternatives, design of overlays.

442. Airport Planning and Design

Fall. 3(3-0) P: (CE 341) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Components of the airport system including ground access facilities, aircraft characteristics, air traffic control, airport configuration, capacity analysis.

443. Advanced Airport Systems Design

Spring. 3(3-0) P: (CE 442) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Analysis and design of airport systems using computer models. Design parameters, demand analysis. Runway orientation and capacity, air-side delay, vehicle processing. Passenger processing.

448. Transportation Planning

Spring. 3(3-0) P: (CE 341 and STT 351)

Transportation planning process and procedures. Estimation of travel demand using traditional models of trip generation, trip distribution, modal split, and traffic assignment. Use of "quick-response" procedures. Traffic impact of new facilities.

449. Highway Design

Fall, Spring. 4(3-3) P: (CE 271 and CE 341) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Geometric design of highways as related to operation, capacity and safety. Alignment, drainage and pavement design. The use of CAD systems in preparing contract plans.

480. Water and Wastewater Analysis Laboratory

Fall. 1(0-3) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering. C: CE 481 concurrently.

Chemical and microbial analysis of water and wastewater.

481. Environmental Engineering Chemistry

Fall. 3(3-0) P: (CEM 361 and CHE 201 and CE 280)

Chemistry of environmental processes including alkalinity, precipitation-dissolution reactions, chemical complexation and redox reactions. Engineering applications to processing plants for water and wastewater.

483. Water and Wastewater Treatment

Fall. 3(3-0) P: (CE 280 and CE 321 or concurrently) R: Open only to juniors or seniors or graduate students in the Department of Civil and Environmental Engineering.

Distribution of water and collection of sewage. Theory and design of water treatment processes.

Descriptions—Civil Engineering of Courses

485. Solid and Hazardous Waste Management

Spring. 3(3-0) P: (CE 280) R: Open only to juniors or seniors or graduate students in the College of Engineering.

Design of solid waste collection and disposal systems. Definition of hazardous waste problems and selection of treatment alternatives.

487. Microbiology for Environmental Health Engineering

Spring. 3(3-0) P: (CEM 361 and CHE 201) R: Open only to juniors or seniors or graduate students in the College of Engineering.

Use and control of microorganisms for the protection of public health and the environment. Thermodynamics of microbial populations and microbial transformations.

490. Independent Study

Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to juniors or seniors in the Department of Civil and Environmental Engineering. Approval of department.

Civil engineering problem of specific interest to the student and a faculty member. May be analysis or design.

491. Civil Engineering Design Project

Fall, Spring. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to juniors or seniors in the Department of Civil and Environmental Engineering. Approval of department.

Planning, specification, and design of a civil engineering project or facility.

492. Selected Topics in Civil Engineering

Fall, Spring. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of department.

Selected topics related to construction engineering, environmental engineering, fluid mechanics, geotechnical engineering, hydrology, pavements, structural engineering, or transportation engineering.

802. Introduction to Dynamics and Earthquake Engineering

Fall. 2 credits. P: MSM 306. Not open to students with credit in ME 461.

Dynamic response of single degree-of-freedom systems. Damping in structures and soils. Time domain and frequency domain methods. Analytical and numerical solution techniques. Earthquake response spectra.

803. Dynamics of Structures and Soils and Earthquake Engineering (MTC)

Fall. 1 to 3 credits. A student may earn a maximum of 3 credits in all enrollments for this course. Topics vary each semester. Topics such as structural dynamics, soil dynamics, and earthquake engineering.

804. Advanced Structural Mechanics I

Fall. 3(3-0)

Advanced linear structural mechanics. Potential energy principle. Finite element formulations. Applications to space frames, plates, and shell structures.

805. Advanced Design of Steel Structures

Spring. 3(3-0)

Flexural and torsional instability of columns and beams. Slender cross-sectional elements, design of beam-columns. Torsion, plastic design, plate girders, composite steel-concrete construction, connections.

806. Advanced Concrete Materials and Structures

Spring. 3(3-0) P: CE 406

Analysis and design of indeterminate reinforced concrete structural systems. Seismic design of reinforced concrete structures. Modeling of elastic, viscoelastic, fracture properties and concrete materials.

807. Concrete Materials and Technology

Summer. 3(3-0)

Concrete properties and production, structure-property relations. Advances in concrete technology. Special engineering applications.

808. Prestressed and Fibrous Concrete

Fall of even years. 3(3-0) P: CE 406

Analysis and design of prestressed concrete structures. Production and properties of fiber reinforced concrete. Theory, design and testing of fibrous concrete.

809. Finite Element Method

Fall, Spring. 3(3-0) Interdepartmental with Materials Science and Mechanics; Mechanical Engineering; and Biosystems Engineering. Administered by Materials Science and Mechanics.

Theory and application of the finite element method to the solution of continuum type problems in heat transfer, fluid mechanics, and stress analysis.

810. Reliability-Based Design in Civil Engineering

Fall. 3(3-0)

Probabilistic treatment of live and dead loads: earthquakes, floods, material properties, and capacity. Reliability basis of design specifications, reliability index, probability of failure, design for reliability. Reliability of engineering systems.

811. Advanced Hydrogeology

Spring. 3(3-0) Interdepartmental with Geological Sciences. Administered by Geological Sciences. P: CE 821

Processes influencing groundwater flow and solute transport. Mathematical equations and numerical methods to describe these processes.

812. Mechanical Properties of Soils

Fall. 3(2-3)

Permeability, consolidation theory, stress-strain behavior, conditions of failure, shear strength. Laboratory determination of soil properties including interpretation of experimental data.

815. Selected Topics in Geotechnical Engineering

Spring. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course.

Selected topics related to soil stabilization, highway and airport soils, and frozen ground engineering.

818. Advanced Geotechnical Design

Spring. 3(3-0)

Foundations and earth retaining structures. Bearing capacity, settlement, and lateral resistance of deep foundations. Advanced design of retaining structures using in-situ test data. Numerical solution of geotechnical problems.

821. Groundwater Hydraulics

Fall. 3(3-0)

Physical properties of porous media. Equations of flow in saturated media. Flow nets, well flow and parameter measurement. Transport processes and the advective-dispersion equation for conservative contaminants.

831. Pavement Design and Analysis II

Spring. 3(3-0)

Theoretical models for analysis of pavement systems. Evaluation and application of current design practices related to elastic and plastic theory. Formulation of improved design procedures.

835. Engineering Management of Pavement Networks

Spring of even years. 3(3-0)

Theoretical and statistical analysis of pavement networks. Engineering monitoring. Determination of distress mechanisms and engineering solutions. Assignment of priorities to engineering actions.

839. Stabilizing Unbound Granular Materials

Fall of even years. 3(3-0)

Improving performance and engineering properties of various granular materials through the use of mechanical processes, and chemical or mineralogical additives. Characterization of engineering properties of stabilized materials.

841. Traffic Flow Theory

Spring. 3(3-0)

Microscopic and macroscopic traffic flow models, Queueing theory. Gap acceptance. Simulation models for network analysis. Intelligent vehicle highway systems.

843. Simulation and Optimization of Urban Traffic Flow

Fall of even years. 3(3-0) P: CE 841.

Statistical analysis of highway geometric designs and operational-control strategies with respect to the optimal flow of traffic: intersection, arterial, network design and control models. Traffic simulation. System management and optimization.

844. Highway and Traffic Safety

Fall of odd years. 3(3-0)

Analysis of highway geometric design alternatives and operational-control strategies with respect to accident probabilities. Statistical methods of pattern identification. Countermeasure selection and evaluation methodology. Risk management.

845. Public Transportation System Planning

Fall of odd years. 3(3-0)

Planning and operating urban and rural transportation systems. System technology and management. Budgeting and programming of transportation services. Environmental impact statements. Paratransit and demand-responsive systems.

846. Statewide Transportation Network Evaluation
Spring of odd years. 3(3-0)
Transportation system measures, needs studies, sufficiency ratings. Cost allocation models, programming and budget constraints. Corridor analysis, transportation economics, demand elasticity.

847. Simulation Models for Transportation Applications
Fall of even years. 3(3-0)
Simulation models for analysis and optimization of transportation systems. Experimentation with planning and traffic simulation models for signal timing and capacity analysis.

849. Transportation Research Methods
Spring. 3(3-0)
Application and interpretation of quantitative methods and design of experiments for transportation research; ANOVA, non-parametric, discriminant analysis, factor analysis, multivariate regression, SPSS.

850. Intelligent Transportation Systems (ITS)
Fall of odd years. 3(3-0) RB: Traffic and transportation engineering
Technical and policy aspects emerging from the application of advanced technologies to transportation problems. Intelligent Transportation Systems (ITS) user services requirements, available and emerging technologies, case studies of ongoing operational tests, legal institutional and planning issues related to ITS development and deployment.

890. Independent Study in Civil Engineering
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to Civil Engineering master's students. Approval of department.
Research problems of limited scope not pertaining to thesis accomplished under CE 899 or CE 999.

891. Selected Topics in Civil Engineering
Fall, Spring, Summer. 2 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course.
Selected topics in new or developing areas of civil engineering.

892. Master's Research Project
Fall, Spring, Summer. 1 to 3 credits. R: Open only to master's students in the Civil Engineering major. Approval of department.
Master's degree Plan B individual student research project. Original research, research replication, or survey and reporting on a research topic.

893. Master's Design Project
Fall, Spring, Summer. 3 to 5 credits. R: Open only to master's students in the Civil Engineering major. Approval of department.
Master's degree Plan B individual student civil engineering design project.

899. Master's Thesis Research
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 24 credits in all enrollments for this course.

990. Independent Study in Civil Engineering
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to Civil Engineering doctoral students
Research problems of limited scope not pertaining to thesis accomplished under CE 999.

999. Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 72 credits in all enrollments for this course.

CLASSICAL STUDIES CLA

Department of Romance and Classical Languages College of Arts and Letters

120. Latin and Greek Roots of English Words
Spring of even years. 3(3-0)
Prefixes, suffixes, and roots of English vocabulary from Greek and Latin word elements.

140. Greek and Roman Mythology
Fall. 3(3-0)
Introduction to Greek and Roman myths, with emphasis on myth as social discourse and as an influence on ancient poets and thinkers.

210. Greek Civilization
Fall. 3(3-0)
General survey of salient aspects of ancient Greek civilization and modern approaches to its study.

211. Roman Civilization
Spring. 3(3-0)
Ancient Roman civilizations and modern approaches to their study.
SA: CLA 310

292. Introduction to Ancient Studies
Fall. 2(1-2) Interdepartmental with Arts and Letters; History of Art; and History. Administered by Arts and Letters.
Methods and current trends in the study of the Greek and Roman world. Visits to library and museum collections.

350. Greek and Roman Literature in English Translation
Fall of even years. 3(3-0) R: Not open to freshmen.
Representative works of major Greek and Roman authors.

360. Ancient Novel in English Translation
Spring of odd years. 3(3-0) R: Not open to freshmen.
Translation of the ancient Greek and Roman novel. Interpretation of assigned novels. The role of popular literature in Greco-Roman society.

400. Women in Classical Greek Society
Spring of odd years. 3(3-0) Interdepartmental with Women's Studies. R: Not open to freshmen and sophomores.
Image, role, and status of women in Greek society as seen through literary sources.

491. Topics in Classical Studies
Spring of even years. 3(3-0) P: CLA 210. R: Open only to juniors and seniors.
Special topics supplement regular course offerings.

499. Senior Thesis
Fall, Spring. 3(3-0) P: (LTN 402) R: Approval of department.
Scholarly research and writing with a focus on specific problems, under faculty supervision.

COMMUNICATION COM

Department of Communication College of Communication Arts and Sciences

100. Human Communication
Fall, Spring, Summer. 3(3-0)
Process and functions of communication. Principles underlying communication behavior. Practice in analyzing communication situations and in speaking and writing.

200. Methods of Communication Inquiry
Fall, Spring, Summer. 4(3-2) P: Completion of University mathematics requirement.
Nature and conduct of communication inquiry. Significant questions about communication and finding systematic answers.

225. An Introduction to Interpersonal Communication
Fall, Spring, Summer. 3(3-0)
Principles and practices of interpersonal communication. Emphasis on effective and responsible interpersonal communication.

240. Introduction to Organizational Communication
Fall, Spring, Summer. 4(4-0)
Theories, systems, structures and processes of organizational communication. Organizational cultures. Communication in multinational organizations and in individual, leadership, supervisor-subordinate and small group situations.

275. Effects of Mass Communication
Fall, Spring, Summer. 3(3-0) Interdepartmental with Telecommunication. Administered by Telecommunication. R: Not open to freshmen.
Major social effects of mass media on audience behavior. Political communication. Media effects on children. Message strategies producing attitude change. Interrelationships between mass media and interpersonal communication.

315. Information Gathering and Interviewing Theories
Fall of odd years. 3(3-0) R: Open only to juniors or seniors.
Information gathering as a relational process. Interaction through the asking and answering of questions.