837. Transportation Materials Engineering
Fall of even-numbered years. 3(3-0)
Engineering characteristics of soils and materials commonly used in transportation facilities. Relationships of material engineering properties to pavement design and performance. Material behavior under cyclic loading.

838. Selected Topics in Highway and Airfield Engineering
Fall of odd-numbered years. 1 to 4 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
Topics in pavement engineering such as nondestructive deflection testing and back calculation of layer moduli, advanced application of finite element theory in slab design, or fracture mechanics analyses of joint and crack performance.

839. Stabilizing Unbound Granular Materials
Fall of even-numbered 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.

840. Plates and Shells
Fall of even-numbered years. 3(3-0) Interdepartmental with Materials Science and Mechanics. Administered by Materials Science and Mechanics.
P: MSM 815.
Deformation and stress analysis of plates and shells with different types of geometry, thickness, and boundary conditions.

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-numbered 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 optim ization.

844. Highway and Traffic Safety
Fall of odd-numbered 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 manage ment.

845. Public Transportation System Planning
Fall of odd-numbered 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-numbered years. 3(3-0)
Transportation system measures, needs studies, sufficiency ratings. Cost allocation models, programming and budget constraints. Corridor analysis, transportation economics, demand elasticity.

848. Travel Demand Analysis
Fall of even-numbered years. 3(3-0)
Advanced topics in travel demand modeling. Disaggregate and behavioral models, error analysis, and model sensitivity. Economic investment and analysis in demand context. Activity modeling.

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.

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.

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.

902. Random Vibration of Structural and Mechanical Systems
Spring of odd-numbered years. 3(3-0) Interdepartmental with Mechanical Engineering and Materials Science and Mechanics.
P: CE 802 or ME 860; CE 810.
Probabilistic modeling of random excitations (e.g., earthquake, aerodynamic, and ocean wave loadings). Response of single and multiple degree-of-freedom systems to random excitation. Designing against failure. Nonstationary and nonlinea r problems.

904. Advanced Structural Mechanics II
Spring. 3(3-0)
P: CE 804.
Complementary energy, hybrid finite element, applications of plasticity theory. Nonlinear analysis of frames. Nonlinear finite elements. Computer implementation.

915. Earth Structures
Fall of odd-numbered years. 3(3-0)
P: CE 812.
Design of earth dams and embankments. Natural and cut slopes, slope stability analysis. Embankments on soft foundations, seepage analysis, earth reinforcement. Instrumentation.

921. Advanced Topics in Groundwater
Spring of odd-numbered years. 3(3-0)
P: CE 821.
Formulation and use of numerical simulation to model the physics of flow and contaminant transport in complex settings or the mechanics of immiscible fluids in porous media.

929. Selected Topics in Hydraulics
Fall of odd-numbered years. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
P: CE 826 or CE 828 or CE 829.
Advanced fluid mechanics and hydraulics related to civil and environmental engineering.

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-numbered years. 3(3-0)
Prefixes, suffixes, and roots of English vocabulary from Greek and Latin word elements.

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, and History of Art. 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-numbered 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-numbered 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-numbered 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-numbered 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.