

GRADUATE COURSES

Contents

GEOTECHNICAL.....	1
STRUCTURAL.....	1
MATERIALS	3
TRANSPORTATION.....	4
WATER RESOURCES.....	6
ENVIRONMENTAL.....	7
GENERAL.....	10

GEOTECHNICAL

NUMBER	TITLE	HRS	DESCRIPTION
CEG 5115	Foundation Engineering	3	<i>Design of shallow foundations, cantilevered and anchored retaining walls, piling, drilled piers and special foundations. Computer applications to geotechnical engineering are covered.</i>
CEG 6065	Soil Dynamics	3	<i>Fundamentals of vibrations, wave propagation, design of foundations, retaining walls and slopes to resist vibrations, liquefaction of soils.</i>
CEG 6415	Seepage and Subsurface Drainage	3	<i>Design of underdrains, wells, soil filters, fabric filters, and dewatering systems with special emphasis on case studies.</i>

STRUCTURAL

NUMBER	TITLE	HRS	DESCRIPTION
CES 5209	Structural Dynamics	3	<i>Behavior of structural components and systems when subjected to periodic dynamic loads.</i>
CES 5715C	Prestressed Concrete	3	<i>Fundamental principles of prestressing; calculation of losses; stress analysis and design of simple beams for flexure and shear. Examples of pressures applications.</i>
CES 6103	Experimental Stress Analysis	3	<i>This course will provide the tools of research necessary to design experiments and/or instrumentation schemes for directed studies. It is intended for structural and geotechnical engineering graduates conducting master's or doctoral research</i>

NUMBER	TITLE	HRS	DESCRIPTION
CES 6118	Applied Finite Elements	3	<i>The course focuses on applying the finite element method to types of problems encountered in various fields of engineering. In the course, underlying theories are presented, enough hand calculations are done to ensure an understanding of the methods, and then the students solve problems using the ANSYS finite element program. The course is ideally suited for engineers wanting an understanding of the finite element method as applied to their jobs, graduate students wishing to apply the finite element method to their research problems, and the student wanting a preparation for the Department's computational mechanics course sequence.</i>
CES 6144	Advanced Structural Analysis	3	<i>This course provides a firm foundation in matrix structural analysis with emphasis on the direct stiffness method. The theory and development of the matrix equations for truss and frame structures in two- and three-dimensions will be covered.</i>
CES 6230	Advanced Structural Mechanics	3	<i>This course develops linear elasticity from kinematics, equilibrium through linear constitutive theory.</i>
CES 6586	Design of Structures to Resist Natural Hazards	3	<i>Study of natural hazards (wind, earthquakes & ocean waves) and their interaction with structures. Use of exact and approximate methods of analysis, computer modeling, and design provisions for structures to resist the aforementioned loads.</i>
CES 6609	Advanced Steel Design	3	<i>Advanced topics in steel design. Topics covered include connection design, torsion of wide range sections, and optimum structural design.</i>
CES 6706	Advanced Concrete Design	3	<i>Advanced topics in concrete designs. Topics include torsion two way floor systems, composite construction, slabs on grade, and deep beams.</i>
CES 6835	Design of Masonry Structures	3	<i>This course provides an overview of the design of masonry structures using concrete masonry units. It covers both working stress and strength design of typical elements such as walls and lintels and simple structures.</i>
CES 6841	Infrastructure I: Repair/Rehab of Structures	3	<i>This course focuses on the repair of structures using fiber reinforced polymers.</i>
CGN 6933	Advanced Computational Solid Mechanics	3	<i>Fundamental principles underlying the Finite Element Method and other advanced techniques used in solid mechanics. Topics include direct stiffness method, boundary value problems, Galerkin method, finite deformation, meshfree methods and fracture mechanics.</i>

NUMBER	TITLE	HRS	DESCRIPTION
CGN 6933	Graduate Structures/Materials Seminar	1	
EGN 6333	Continuum Mechanics	3	<i>This course covers the fundamental mathematical and physical principles of Newtonian Mechanics as applied to continuous media, including solids & fluids, and complete linear & non-linear description of kinematics and equilibrium in the Lagrangian frame.</i>

MATERIALS

NUMBER	TITLE	HRS	DESCRIPTION
CGN 6720	Electrochemical Diagnostic Techniques	3	<i>Fundamentals and applications of electrochemical diagnostic techniques. Focus on electrochemical impedance spectroscopy to evaluate reaction rates in corrosion and interfacial phenomena of materials. Includes research project.</i>
CES 6010	Structural Life Prediction	3	<i>Prediction of durability of structures, detection and evaluation of structural corrosion damage in steel/cementitious system, structure corrosion damage prevention, control and rehabilitation techniques.</i>
CGN 6933	Material Infrastructure Durability	3	
EMA 5326	Corrosion Control	3	<i>Provide understanding of corrosion fundamentals. Introduce design for corrosion detection, protection, and control. Acquire research project experience.</i>

TRANSPORTATION

NUMBER	TITLE	HRS	DESCRIPTION
CGN 6933	Traffic Flow Theory/ ITS	3	<i>This course provides a systematic overview of the definition, taxonomy and models of highway traffic flow and intelligent transportation systems. Topics include theories on vehicles, human drivers and traffic streams; autonomous vehicles; and future of transportation.</i>
CGN 6933	Statistical and Econometric Methods	3	<i>This course provides students with a general background in the application of various statistical and econometric analysis techniques. The course will present a number of model-estimation methods that are used in the analysis of engineering and scientific data. The course will emphasize model estimation and application, but underlying theory and limitations will be discussed to ensure that the methods are properly applied and understood.</i>
CGN 6933	Statistical and Econometric Methods II	3	<i>This course solidifies students' understanding of the material taught in Statistical and Econometric Methods and extends students' knowledge with the presentation of new model estimation techniques. Topic covered include detailed assessment of simultaneous equations models, generalized extreme value models, mixed logit models, latent-class models, models with fixed and random effects, zero-inflated count data models, and multivariate models.</i>
TTE 5205	Traffic Systems Engineering	3	<i>Traffics models, intersection analysis, capacity analysis, data methods collection, parking studies, volume and speed studies, freeway management, and advanced technologies.</i>
TTE 5305	Infrastructure Systems Management	3	<i>This course introduces analytical methods for the management of infrastructure systems over their life, focusing on pavement. Topics covered include data measurement and sampling, performance modeling, and maintenance strategies.</i>
TTE 5501	Transportation Planning and Economics	3	<i>Fundamentals of urban transportation planning: trip generation, trip distribution, modal split, traffic assignment. Introduction to environmental impact analysis, evaluation an choice of transportation alternatives.</i>
TTE 5620	Air Transportation	3	<i>This course is for graduate students in the College of Engineering who are interested in air transportation. It covers topics such as, airport management, air traffic flow management, air transport economics, etc.</i>

NUMBER	TITLE	HRS	DESCRIPTION
TTE 6315	Transportation Safety	3	<i>Transportation safety studies, accident data analysis, traffic safety control devices, special population regiment safety, highway conflict studies, accident reconstruction, and tort and liability issues.</i>
TTE 6505	Discrete Choice Models of Travel Behavior	3	<i>Theories of travel behavior; multinomial logit and nested logit models of mode choices, destination choice, and car ownership. Theory and application to travel forecasting.</i>
TTE 6507	Travel Demand Modeling	3	<i>Statistical modeling of travel demand forecasting; emphasis on trip generation and trip chaining.</i>
TTE 6651	Public Transportation	3	<i>Planning, design and operation of public transportation systems; costs and productivity of transit; impacts of transit on travel behavior and urban form; ridership forecasting; public transportation policy analysis.</i>
TTE 6655	Transportation and Land Use	3	<i>Relationships between transportation and land use, coordinated transportation and land use planning, theory of urban development, urban sprawl, integrated transportation and land use models, transportation friendly urban design, and accessibility.</i>
TTE 6833	Asphalt and Asphalt Mixes	3	<i>This course introduces asphalt binder and asphalt mix types and their use in Civil Engineering structures, focusing on asphalt pavements.</i>
TTE 6835	Pavement Design	3	<i>Analysis of flexible and rigid pavements, equivalent single wheel loads, pavement material and their properties, pavement evaluation, reliability, flexible and rigid pavement design, overlay design, pavement lifecycle cost analysis.</i>
TTE 6837	Pavement Management Systems	3	<i>Review of flexible and rigid pavement design, overlay design; pavement evaluation, pavement network delineation, condition prediction models, pavement maintenance and rehabilitation, pavement management techniques, life-cycle analysis.</i>
TTE 6930	Graduate Transportation Seminar	1	<i>Seminars, presentations, and discussions of contemporary transportation issues.</i>
CGN 6933	Airport and Port Operations Management	3	
CGN 6933	Advanced Geometric Design of Highways	3	
CGN 6933	Access Management	3	<i>This course will address a wide range of planning, engineering, legal and policy issues.</i>

NUMBER	TITLE	HRS	DESCRIPTION
CGN 6933	GIS in Transportation	3	<i>This course provides an introduction to the basic concepts, features, and capabilities of GIS; focusing on the usefulness of GIS in solving problems in transportation engineering and planning to develop basic skills of applying GIS software.</i>
CGN 6933	Computer Applications in Traffic Engineering	3	<i>This course will introduce students to apply computer simulation models to the field of Traffic Engineering.</i>
CGN 6933	Logistic System Analysis	3	
CGN 6933	Transportation and Infrastructure Network	3	

WATER RESOURCES

NUMBER	TITLE	HRS	DESCRIPTION
CWR 6235	Free Surface Flow	3	<i>Fundamental and applied aspects of free surface flow, including river hydraulics, canal flow, and open channel design.</i>
CWR 6239	Waves and Beach Protection	3	<i>A study of the fundamentals of shoreline dynamics including distribution of wave energy, motion of beach sand, stable configurations and protective measures.</i>
CWR 6305	Urban Hydrology	3	<i>A study of the quantity and quality problems and solution techniques associated with urban runoff.</i>
CWR 6534	Coast and Estuary Modeling	3	<i>Digital modeling of coastal and estuary systems, currents, tide heights, sediment transport, erosion, data collection, temperature distribution, sources and sinks. Special emphasis on Florida regions.</i>
CWR 6535	Hydrologic Models	3	<i>A study of the theoretical principles of hydrologic modeling and an examination of various numerical hydrologic models available. Students will be required to develop and apply computer models.</i>
CWR 6538	Advanced Hydrologic Models	3	<i>Present the theoretical and applied concepts of advanced hydrologic modeling and especially integrated surface water/ground water modeling and to examine various numerical hydrologic models used in engineering practice.</i>
CWR 6820	Coastal Waves And Structures	3	<i>Fundamentals of wave motion and the mutual interaction of waves and structures. A design project is included.</i>

NUMBER	TITLE	HRS	DESCRIPTION
CGN 6933	Advanced Computational Fluid Mechanics	3	<i>Temporal and spatial discretization techniques for computational fluid mechanics; mass, momentum and energy considerations, introduction to turbulence and computational methodologies for turbulent flows.</i>
CGN 6933	Vadose Zone Hydrology	3	<i>The course provides fundamental understanding of flow and transport processes occurring in porous media and soil environments, with emphasis on water and energy exchanges at the land surface. We study the physics of variable saturated flow and the role of land and vegetative covers in root zone water budget, water and energy relations in soils, and aquifer recharge. Public domain models (e.g. HYDRUS 1D) will be introduced for numerical simulations of soil hydrologic processes.</i>
CGN 6933	Groundwater Hydraulics	3	<i>The course provides an understanding of the significance of groundwater occurrence and flow in the hydrologic cycle. We cover principles of groundwater hydraulics with emphasis on engineering applications in groundwater source development, subsurface drainage, and aquifer characterization.</i>

ENVIRONMENTAL

NUMBER	TITLE	HRS	DESCRIPTION
EES 6107	Biological Principles of Environmental Engineering	3	<i>This course improves the student's knowledge and problem solving skills with respect to the Biological Principles used by Environmental Engineers to design biological processes. Students will learn about microbial physiology and metabolism, and current methods used to understand bioprocesses.</i>
ENV 6002	Physical Chemical Principles	3	<i>Investigates how chemical properties, physical processes, and environmental characteristics all influence the fate and transport of chemicals in natural and engineered systems. Includes theory, practical examples, and laboratory experiments.</i>
ENV 6105	Air Pollution	3	<i>A graduate level survey of air pollution fundamentals, including physics/chemistry of air pollution, sources and emissions estimation, Gaussian dispersion models, exposures and effects, measurement/monitoring, and management/control.</i>

NUMBER	TITLE	HRS	DESCRIPTION
ENV 6337	Environmental Site Assessment	3	<i>All of the fundamental elements of Environmental Site Assessments, including a review of pertinent laws and regulations, the process of interviews, file reviews, and the site reconnaissance, through the use of procedures based on the Scientific Method.</i>
ENV 6438	Physical & Chemical Processes for Treatment of Drinking Water	3	<i>Theory, analysis, and design of physical and chemical processes typically used for treatment of U.S. public water supply.</i>
ENV 6510	Sustainable Development Engineering	3	<i>Study of applying appropriate and sustainable engineering solutions and technology to control environmental pollutants found in a developing world setting and smaller communities in North America. Concepts of sustainable development are covered. Topics are drawn from several areas of engineering, including water supply, water treatment, water storage, wastewater treatment, materials, solid waste management, construction, and watersheds.</i>
ENV 6518	Environmental Field Sampling	3	<i>This course is designed to provide students with an interest in the field of environmental science/engineering, with the highest level of practical, hands-on environmental field training to help them advance their careers.</i>
ENV 6519	Physical and Chemical Processes in Groundwater Remediation	3	<i>Theory and design of processes used in advanced water and wastewater treatment, including membrane processes, absorption, electro dialysis, ozonation, irradiation.</i>
ENV 6564	Environmental Engineering Design	3	<i>An engineering design experience for Environmental Engineering graduate students. Students will work in teams on real world design projects in water or wastewater treatment. Prereq: Physical/Chemical Principles and Biological Principles of Environmental. Eng.</i>
ENV 6617	Green Engineering for Sustainability	3	<i>Offers an overview of principles of green engineering including innovation, inherency, interdisciplinary, integration, and international, with an emphasis on applications of green engineering principles.</i>
ENV 6667	Environmental Biotechnology	3	<i>Study of biochemical relations and processes in treatment of pollutants with emphasis on control of effluents for the protection of water quality.</i>
ENV 6935	Environmental & Water Resources Engineering Seminar	1	<i>This course consists of oral presentations made by EWRE students, faculty members, and outside speakers on their current topics of environmental and water resource engineering.</i>

NUMBER	TITLE	HRS	DESCRIPTION
EVS 6920	Environmental Research Interdisciplinary Colloquium	1	<i>Interdisciplinary seminar series that exposes students to a variety of environmental topics through presentations and interactive discussions with scholars and practitioners.</i>
CGN 6933	Resilient Infrastructure for Sustainable Communities	3	<i>Develops core understanding of green design, sustainability principles and infrastructure management. Using the US Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system as a framework, students will learn integrated approaches for smart management of resources and components (e.g., water, energy, sites, transportation, habitat, materials and indoor quality) in the built environment.</i>
CGN 6933	ENVISION Sustainable Communities	3	<i>The goal of this course is to correctly apply the ENVISION rating system to local infrastructure projects in partnership with community partners.</i>
CGN 6933	Environmental Modeling	3	<i>This course will provide a graduate-level introduction to environmental fate and transport modeling with applications primarily to air pollution modeling.</i>
CGN 6933	Global Water Sustainability	3	<i>This course teaches principles of sustainability science applied to water management issues related to flooding, scarcity, pollution, and distribution inequality. Concepts that facilitate tradeoff analysis and conflict resolution at the watershed scale are reviewed, including: integrated water resources management, the food-energy-water nexus, water diplomacy, and water allocation strategies. These principles will be taught using watershed cases from around the world, and through the course students will analyze their own case study and propose solutions to a particular water management issue.</i>
CGN 6933	Ecological Engineering	3	<i>This course explores ecological principles and engineering design techniques to enable the use and restoration of ecosystems for the benefit of nature and society. Particular applications to be covered include treatment wetlands (wastewater and stormwater), and restoration (freshwater/coastal wetlands, and rivers).</i>

GENERAL

NUMBER		TITLE	HRS	DESCRIPTION
CGN	6906	Independent Study	1-9	<i>Independent study in which students must have a contract with an instructor.</i>
CGN	6915	Directed Research	1-9	<i>Course consists of directed research on topics selected by student and professor. The topics vary. The course allows students to develop research skills and independent work disciplines.</i>
CGN	6933	Special Topics in Civil and Environmental Engineering	1-4	<i>Topics to be chosen by students and instructor permitting newly developing interdisciplinary special interests to be explored.</i>
CGN	6933	Advance Numerical Methods	3	<i>Numerical methods are discussed for solving ordinary and partial differential equations (ODEs and PDEs) important in many practical engineering problems. Solution techniques for spatial and time integration of these equations are discussed such as single and multistep methods for initial value problems and finite differencing for boundary value problems. Convergence, stability and consistency analysis of these methods is stressed. The goal of the course is to teach a number of commonly-used numerical methods for ODEs and PDEs and in the process develop the mathematical skills necessary to apply these methods outside of the course for graduate research or other interests. This is accomplished via lectures, exams, and assignments implementing numerical methods for selected DEs. The programming language for the implementation of the methods is left to the choice of the student.</i>
CGN	6950	Mentoring Novice Researchers	3	<i>This course is designed for graduate students who are mentoring undergraduate researchers through the NSF Research Experience for Undergraduates (REU), Research Experience for Teachers (RET) and similar programs.</i>
CGN	6945	Graduate Research Methods in Civil & Environmental Engineering	1	<i>Course covers proposal writing including review of successful proposals and scientific literature, developing research hypotheses and objectives, presenting preliminary results and developing a research program. Required core course for doctoral students.</i>
CGN	6971	Thesis: Master's	1-9	<i>Thesis/Specialist project hours.</i>
CGN	7915	Directed Research	1-9	<i>Course consists of directed research on topics selected by student and professor. The topics vary. The course allows students to develop research skills and independent work disciplines.</i>
CGN	7980	Dissertation Doctoral	1-9	<i>Research and writing of a dissertation.</i>