

**REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN
CIVIL ENGINEERING 2005
COLLEGE OF ENGINEERING
UNIVERSITY OF TEXAS AT ARLINGTON
General Requirements
Total Credit Hours = 130**

FRESHMAN							
FIRST SEMESTER			Hours	SECOND SEMESTER			Hours
ENGL	1301	Critical Thinking, Reading and Writing I	3	CE	1350	Computer Aided Drafting	3
MATH	1426	Calculus I	4	ENGL	1302	Critical Thinking, Reading and Writing II	3
CHEM	1441	Chemistry I (w/ Lab)	4	MATH	2425	Calculus II	4
CE	1104	Introduction to Engineering	1	PHYS	1443	Tech Physics I (w/ Lab)	4
CE	1105	Introduction to Civil Engineering	1	CHEM	1442	Gen Chemistry II (w/ Lab)	4
HIST	1311	US History to 1865	3				
TOTAL CREDIT HOURS			16	TOTAL CREDIT HOURS			18
SOPHOMORE							
FIRST SEMESTER			Hours	SECOND SEMESTER			Hours
MATH	2326	Calculus III	3	MATH	3319	Diff Equations & Linear Algebra	3
PHYS	1444	Technical Physics II (w/Lab)	4	CE	2313	Mechanics of Materials I	3
CE	2312	Statistics & Dynamics	3	EE	2320	Circuit Analysis	3
CE	2331	Surveying	3	MAE	3309	Thermal Engineering	3
HIST	1312	U.S. History since 1865	3	SPCH	3302	Prof & Tech Communication	3
				POLS	2311	Government of U.S	3
TOTAL CREDIT HOURS			16	TOTAL CREDIT HOURS			18
JUNIOR							
FIRST SEMESTER			Hours	SECOND SEMESTER			Hours
CE	3261	Properties & Behavior of Engr Materials	2	IE	3312	Economics for Engineers	3
CE	3305	Basic Fluid Mechanics	3	CE*	3301	Stochastic Models for Civil Engineering	3
CE	3341	Structural Analysis	3	CE	3302	Transportation Engineering	3
CE	3343	Soil Mechanics	3	CE	3334	Principles of Environmental Engineering	3
§ CE Lab Elective			1	§ CE Lab Elective			1
§ CE Lab Elective			1	■ Literature Elective			3
■ Social/Cultural Elective			3				
TOTAL CREDIT HOURS			16	TOTAL CREDIT HOURS			16
SENIOR							
FIRST SEMESTER			Hours	SECOND SEMESTER			Hours
CE	4331	Water Resources & Conveyance Systems	3	CE	4383	Senior Project	3
CE	4347	Reinforced Concrete Design	3	POLS	2312	State & Local Government	3
CE	4352	Professional Practice	3				
§ CE Technical Elective			3	§ CE Technical Elective			3
§ CE Technical Elective			3	§ CE Technical Elective			3
				■ Fine Arts Elective			3
TOTAL CREDIT HOURS			15	TOTAL CREDIT HOURS			15

Students who do not have two units of a single foreign language in high school will be required to take two courses of a single foreign language in addition to the previously listed curriculum requirements.

(*) Can substitute CE 3301 with IE 3301.

§ To be chosen from the approved list of CE technical electives available in the CE office, 417 NH.

■ To be chosen from the approved list of Fine Arts and Social/Cultural electives available in the CE office, 417 NH.

Literature electives can be any 2000 level American, British, or World literature course.

COURSES IN CIVIL ENGINEERING (CE)

CE 1104. INTRODUCTION TO ENGINEERING (1-0) 1 hours credit. Introduction to basic engineering concepts. Students will become familiar with engineering and its many sub-fields, ethical responsibilities, creativity and design. **Prerequisite:** N/A

CE 1105. INTRODUCTION TO CIVIL ENGINEERING (0-3) 1 hours credit. Introduction to basic civil engineering practice. Teams visit a civil engineering practitioner and report on a civil engineering project. A literature search on an engineering or applied science topic is required. Oral and written presentations are required for both the project and research topic. **Prerequisite:** CE 1104 or concurrent registration therein.

CE 1350. COMPUTER AIDED DRAFTING (2-3) 3 hours credit. Coverage of CAD programs commonly used in Civil and Architectural drafting, including perspective views, structural drawing, topographic drawings, and site development plans. Typical computer-aided-drafting tasks such as creating entities and creating and modifying objects and drawings will be covered. **Prerequisite:** MATH 1323 or concurrent registration therein.

CE 2312. STATICS AND DYNAMICS (2-2) 3 hours credit. The lecture covers principles of forces and force systems, resultants and components of force systems, forces due to friction, condition of equilibrium, forces acting on members of trusses and frame structures, centroids and moments of inertia, review of kinematics and kinetics of particle motion, and two-dimensional motion of rigid bodies. The lab period is used for reinforcement of the course principles through problem solving as well as computer simulation demonstrations. **Prerequisite:** PHYS 1443; and MATH 2425 or concurrent registration therein.

CE 2331. SURVEYING (2-3) 3 hours credit. Principles and theories of physical measurements of spatial quantities; theory of errors and error adjustment techniques; the use of surveying instruments; introduction to engineering design and completion of a small design project. **Prerequisite:** CE 1104 and 1105 or concurrent registration therein; CE 1350 or concurrent registration therein.

CE 3131. WATER QUALITY ANALYSES (0-3) 1 hours credit. Laboratory examinations of water and wastewater. Water quality parameters and their significance. Sources and types of pollutants and their effects, and water quality standards. **Prerequisite:** CHEM 1442; CE 3334 or concurrent registration therein (recommended).

CE 3142. APPLIED FLUID MECHANICS LAB (0-3) 1 hours credit. Fluid flow measurements studied by means of performed laboratory experiments and/or digital computer programming of relevant equations. **Prerequisite:** CE 3305

CE 3143. PROPERTIES AND BEHAVIOR OF SOILS (0-3) 1 hours credit. An introduction to determination of civil engineering properties of soil and their behavior, identification, grain size analysis, Atterberg limits, compaction, permeability, consolidation, and shear strength. Also an introduction to sampling of soil materials. **Prerequisite:** CE 3343 or concurrent registration therein (recommended).

CE 3161. ENGINEERING MATERIALS LABORATORY (0-3) 1 hours credit. Various properties and behavior of engineering materials are investigated by laboratory experimentation. **Prerequisite:** CHEM 1442; CE 3311; and CE 3261 or concurrent registration therein (recommended).

CE 3261. PROPERTIES AND BEHAVIOR OF ENGINEERING MATERIALS (2-0) 2 hours credit. The nature and properties of materials used in civil engineering such as structural metals, concrete, timber, and bituminous materials. The engineering application and performance of materials are emphasized. **Prerequisite:** CHEM 1442; CE 3311 or concurrent registration therein.

CE 3301. STOCHASTIC MODELS FOR CIVIL ENGINEERING (3-0) 3 hours credit. Basic theory of probability and statistics with practical applications to civil and environmental engineering problems. Emphasis on sampling, distribution functions, tests of significance, and regression modeling. **Prerequisite:** MATH 2326 or concurrent registration therein.

CE 3302. TRANSPORTATION ENGINEERING (3-0) 3 hours credit. Planning, design, and operation of transportation facilities. Characteristics of vehicle movement; basic geometric design of highways; traffic flow relations in traffic streams and on transit lines; highway capacity; transit operation; traffic engineering; and legal requirements and procedures for transportation planning. **Prerequisite:** CE 2331; 3311 or concurrent registration therein; and CE 3301 or IE 3301 or concurrent registration therein.

CE 3305. BASIC FLUID MECHANICS (3-0) 3 hours credit. Fundamentals of fluid statics, kinematics of fluid flow, fluid energy, fluid forces, similitude, and dimensional analysis. Related to steady flow of incompressible fluids in confined and free surface systems. **Prerequisite:** CE 2312 (or MAE 1312 or MAE 2322 for non-CE majors).

CE 3311. MECHANICS OF MATERIALS I (3-0) 3 hours credit. Relationship between stresses and strains in elastic bodies and tension, compression, shear, bending, torsion, and combined loadings which produce them. Deflections and elastic curves, shear and bending moment diagrams for beams, and column theory. **Prerequisite:** CE 2312 (or MAE 1312 or MAE 2322 for non-CE majors).

CE 3334. PRINCIPLES OF ENVIRONMENTAL ENGINEERING (3-0) 3 hours credit. Physical, chemical, and biological unit operations and processes in an air, water, and land environment. **Prerequisite:** CHEM 1442; CE 3305 or consent of instructor.

CE 3341. STRUCTURAL ANALYSIS (3-0) 3 hours credit. Analysis of statically determinate structures including beams, trusses, frames, and three-hinged arches. Influence lines, moving loads and Maxwell's law of reciprocal displacement. Methods to compute deflections including double integration, moment area, virtual work, and conjugate beam. Methods of analysis for statically indeterminate structures including consistent deformation, slope deflection and moment distribution. **Prerequisite:** CE 3311

CE 3343. SOIL MECHANICS (3-0) 3 hours credit. An introduction to the significant geophysical and soil science properties and behavior of materials making up the earth's crust as they apply to civil engineering, sources of materials, classification, plasticity, permeability, stress distribution, consolidation, shear strength, and settlement. Also an introduction to basic foundation engineering concepts. **Prerequisite:** CE 3311

CE 4300. ADVANCED TOPICS IN CIVIL ENGINEERING (3-0) 3 hours credit. Advanced topics of current interest in any one of the various fields of civil engineering. The subject title to be listed in the class schedule. May be repeated for credit when topic changes. **Prerequisite:** changes with topic; consent of instructor required.

CE 4311. URBAN TRANSPORTATION INFRASTRUCTURE PLANNING (3-0) 3 hours credit. Urban transportation system design, planning, transportation modeling, economic theory, travel demand and travel estimation techniques. **Prerequisite:** CE 3302.

CE 4312. STREET AND HIGHWAY DESIGN (3-0) 3 hours credit. The planning and geometric design concepts necessary for city streets and highways. The customary surveys and plan preparations along with a review of drainage practices, right-of-way considerations, and road construction materials. Design and construction methods for both flexible and rigid pavements. **Prerequisite:** CE 3302 or concurrent registration therein.

CE 4313. TRAFFIC ENGINEERING (3-0) 3 hours credit. Design and control of fixed-time, actuated, and computer-controlled traffic signals; optimization of traffic flow at intersections; capacity analysis of intersections, legal requirements and traffic studies for installation of traffic control devices; characteristics of signs, signals, and markings; traffic laws. **Prerequisite:** CE 3302 or concurrent registration therein.

CE 4321. FOUNDATION ENGINEERING (3-0) 3 hours credit. Aspects of design and construction considerations for all types of foundation systems in most soil/rock support conditions, interactions between soils and structures, bearing capacity theories, consolidation, shrink-swell, and settlement. Numerical analyses of design are applied to most of the situations. **Prerequisite:** CE 3343 and 3341.

CE 4322. APPLICATIONS WITH GEOSYNTHETICS (3-0) 3 hours credit. Definitions and properties of geotextiles, geogrids, geonets, geocomposites and geomembranes; reinforcement design applications in rigid and flexible pavements, foundations, embankments, slopes and retaining walls; drainage and filtration application designs, AASHTO design criteria; construction methods. **Prerequisite:** CE 3343 or consent of instructor.

CE 4324. MECHANICS OF MATERIALS II (3-0) 3 hours credit. A continuation of CE 3311. Analysis of stresses due to various loading conditions, stresses, and strains at a point, stress-strain relationships, theories of failure, energy methods, shear center, unsymmetrical bending, curved beams, torsion, and buckling problems. **Prerequisite:** CE 3311

CE 4325. INTRODUCTION TO FINITE ELEMENT METHOD (3-0) 3 hours credit. Concepts of indeterminate structural analysis using stiffness method. Derivation of element stiffness matrices will be

presented for spring, axial, Euler-Bernoulli beam, triangular, rectangular, and solid elements. System stiffness equations will be obtained from element equations for variety of structural/mechanical engineering systems, which will be solved with different time efficient numerical techniques. **Prerequisite:** CE 3341

CE 4331. WATER RESOURCES AND CONVEYANCE SYSTEMS (3-0) 3 hours credit. Elements of meteorology, stream flow, unit hydrograph, ground water resources, frequency and duration studies, analysis and design of water conveyance systems, sanitary and storm sewers, and water distribution. **Prerequisite:** CE 3305; and CE 3301 or IE 3301 or concurrent registration therein.

CE 4332. CONSTRUCTION METHODS AND MANAGEMENT (3-0) 3 hours credit. Methods, equipment, and management techniques used by the construction industry. Building and highway heavy construction methods, equipment operating characteristics, safety, and the management of construction operations. **Prerequisite:** senior classification.

CE 4333. INFRASTRUCTURE ENVIRONMENTAL PERMITTING (3-0) 3 hours credit. Overview of law and environmental regulations and permit development critical to design and construction issues; includes Categorical Exclusions, Environmental Assessment, Nationwide Permits, COE Permits, Stormwater Pollution Prevention and planning for Construction and Screening Models. **Prerequisite:** CE 3334 and CE 4331, or consent of instructor.

CE 4347. REINFORCED CONCRETE DESIGN (3-0) 3 hours credit. An analysis, design-synthesis course for concrete structures, emphasizing elastic analysis and ultimate strength design. Topics include strength and serviceability requirements, design of slabs, beams, columns, and foundations for strength for flexure, shear, and bearing. **Prerequisite:** CE 3341

CE 4348. STRUCTURAL DESIGN IN METALS (3-0) 3 hours credit. A design synthesis course for metal structures emphasizing elastic methods. Topics include tension members, compression members, flexural members and connections. The concept of plastic behavior is introduced. Building codes and related documents. **Prerequisite:** CE 3341

CE 4350. AIR POLLUTION CONTROL ENGINEERING (3-0) 3 hours credit. Fundamentals of air pollution control technology; impact of federal and state legislation on the construction, modification, and control of industrial plants is reviewed. Air pollutants, their sources and health effects, and air quality standards. Hazardous air pollutants, modifications to ambient air quality due to meteorological conditions, and basic air pollution dispersion modeling. **Prerequisite:** CE 2312 and senior standing in engineering.

CE 4352. PROFESSIONAL PRACTICE (2-3) 3 hours credit. Professional practice issues in the private and public sector are addressed by visiting practitioners. Topics include project management, teamwork, obtaining work, regulatory requirements, specifications, issues in design/build, design alternatives, cost estimation, design and construction drawings, contract and construction law, legal issues, ethics and professionalism, design reports, licensure, lifelong learning, ethical and engineering practice organizations. Learning principles of engineering practice by working as a team is emphasized. Oral and written presentations are required. **Prerequisite:** IE 3312; SPCH 3302; and admission to the Professional Program.

CE 4356. DESIGN OF MUNICIPAL WATER SUPPLY SYSTEMS (3-0) 3 hours credit. Sources of water supply, water demand, treatment processes, and combinations. Design of intake, raw water pumps, design of treatment facilities, and distribution system. **Prerequisite:** CE 3334

CE 4357. DESIGN OF MUNICIPAL WASTEWATER TREATMENT SYSTEMS (3-0) 3 hours credit. Characteristics of municipal wastewater, design of sanitary and storm sewers, pumping stations, and wastewater treatment processes. Process train and treatment plant layout, hydraulic profile, instrumentation and controls, and upgrading of secondary treatment plants. **Prerequisite:** CE 3334

CE 4358. OPEN CONDUIT SYSTEM (3-0) 3 hours credit. Non-pressure conduit and channel flow, surface profiles, steady and gradually varied flow, hydraulic jumps, and specific energy. **Prerequisite:** CE 3305

CE 4359. WATER RESOURCES DESIGN (3-0) 3 hours credit. Infrastructure water distribution and drainage design including urban, roadway, airport, and agriculture systems. Topics include but not limited to detention and retention storage, soil loss, inlet outlet structures, culverts, measurement systems, pump stations and related profiles. **Prerequisite:** CE 4331 or consent of instructor.

CE 4383. SENIOR PROJECT (2-3) 3 hours credit. Planning, analysis of alternatives and designs of selected projects that cross various civil engineering disciplines. Application of computer-aided engineering in analysis and design. Final oral and written reports that present the pros and cons of alternative solution are required. A team approach is emphasized. **Prerequisite:** Completion of all required CE courses and a minimum of one CE technical elective, one required CE course may be taken concurrently.

COURSES IN ELECTRICAL ENGINEERING (EE)

EE 2320. CIRCUIT ANALYSIS (3-0) 3 hours credit. For non-electrical engineering majors. Basic principles of R, L, and C components. Kirchhoff's laws, network analysis, loop and node equations, basic network theorems. Steady-state AC phasor analysis, operational amplifiers, filtering, and digital circuits. **Prerequisite:** Math 2425, PHYS 1444.

COURSES IN INDUSTRIAL ENGINEERING (IE)

IE 3301. ENGINEERING PROBABILITY (3-0) 3 hours credit. Topics in industrial engineering that involve random processes. Applications and backgrounds for topics in reliability, inventory systems, and queuing problems, including absolute and conditional probabilities, discrete and continuous random variables, parameter estimation and hypothesis testing. **Prerequisite:** MATH 2326 or concurrent enrollment.

IE 3312. ECONOMICS FOR ENGINEERS (3-0) 3 hours credit. Tools and methods used for determining the comparative financial desirability of engineering alternatives. **Prerequisite:** MATH 1426 or concurrent enrollment.

COURSES IN MATHEMATICS (MATH)

MATH 1426. CALCULUS I (3-2) 4 hours credit. (MATH 2413). Concepts of limit, continuity, differentiation and integration; applications of these concepts. **Prerequisite:** MATH 1323 or MATH 1325.

MATH 2326. CALCULUS III (3-0) 3 hours credit. (MATH 2315). Partial differentiation, multiple integrals (with applications), line integrals, Green's Theorem, surface integrals, Stokes' Theorem, divergence theorem. **Prerequisite:** MATH 2425.

MATH 2425. CALCULUS II (3-2) 4 hours credit. (MATH 2314). Applications of integration, techniques of integration, parametric equations, polar coordinates, sequences and series. **Prerequisite:** MATH 1426.

MATH 3319. DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA (3-0) 3 hours credit. Introductory course with emphasis on solution techniques. Ordinary differential equations, vector spaces, linear transformations, matrix/vector algebra, eigenvectors, Laplace Transform, and systems of equations. **Prerequisite:** MATH 2326 or concurrent registration.

COURSES IN MECHANICAL ENGINEERING (MAE)

MAE 3309. THERMAL ENGINEERING (3-0) 3 hours credit. Basic concepts and definitions, properties of pure substance, work and heat, first law of thermodynamics, second law of thermodynamics, entropy, and introduction to conductive, convective, and radiative transfer. Semesters offered: Fa **Prerequisite:** MATH 2425, PHYS 1444.

COURSES IN PHYSICS (PHYS)

PHYS 1443. GENERAL TECHNICAL PHYSICS I (3-3) 4 hours credit. (PHYS 2425). The first half of a one-year technical course. Required for many science and engineering majors, exceeds premedical requirement. The study of physical phenomena in the fields of mechanics, heat, and waves. **Prerequisite:** MATH 1426 or concurrent enrollment.

PHYS 1444. GENERAL TECHNICAL PHYSICS II (3-3) 4 hours credit. (PHYS 2426). The second half of a one-year technical course. The study of physical phenomena including electricity, magnetism, circuit theory, light, and optics. **Prerequisite:** PHYS 1443 and MATH 2325 or concurrent enrollment.