

**REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN  
ELECTRICAL ENGINEERING  
2005  
COLLEGE OF ENGINEERING  
UNIVERSITY OF TEXAS AT ARLINGTON**

**General Requirements  
Total Credit Hours = 129**

<b>FRESHMAN</b>							
<b>FIRST SEMESTER</b>			<b>Hours</b>	<b>SECOND SEMESTER</b>			<b>Hours</b>
ENGL	1301	Critical Thinking, Reading and Writing I	3	ENGL	1302	Critical Thinking, Reading and Writing II	3
CHEM	1441	General Chemistry I (w/ Lab)	4	MATH	2425	Calculus II	4
MATH	1426	Calculus I	4	PHYS	1444	Technical Physics II (w/ Lab)	4
PHYS	1443	Technical Physics I (w/ Lab)	4	EE	1347	Comp Soln of EE Problems	3
EE	1104	Intro to Engineering	1	EE	1347	Comp Soln of EE Problems	3
EE	1105	Intro to EE	1	HIST	1311	U.S. History to 1865	3
<b>TOTAL CREDIT HOURS</b>			<b>17</b>	<b>TOTAL CREDIT HOURS</b>			<b>17</b>
<b>SOPHOMORE</b>							
<b>FIRST SEMESTER</b>			<b>Hours</b>	<b>SECOND SEMESTER</b>			<b>Hours</b>
MATH	2326	Calculus III	3	MATH	3319	Diff Equations & Linear Algebra	3
EE	2315	Circuits Analysis	3	EE	2446	Circuits Analysis II (w/ Lab)	4
CE	2312	Statics & Dynamics	3	EE	2303	Electronics I	3
CSE	1320	Intermediate Programming (w/ Lab)	3	SPCH	3302	Professional & Technical Communication	3
HIST	1312	U.S. History since 1865	3	EE	2307	Electromagnetics I	3
<b>TOTAL CREDIT HOURS</b>			<b>15</b>	<b>TOTAL CREDIT HOURS</b>			<b>16</b>
<b>JUNIOR</b>							
<b>FIRST SEMESTER</b>			<b>Hours</b>	<b>SECOND SEMESTER</b>			<b>Hours</b>
EE	3302	Power Systems Fundamentals	3	ECON	2305	Macroeconomics	3
EE	3308	Electromagnetics II	3	EE	3310	Microprocessors	3
EE	3317	Linear Systems	3	EE	3318	Discrete Signals & Systems	3
EE	3341	Digital Circuits Design (w/ Lab)	3	EE	3330	Probability & Random Systems	3
EE	3444	Electronics II (w/ Lab)	4	EE	3340	Engr Project Management	3
				▪	Fine Arts Elective		3
<b>TOTAL CREDIT HOURS</b>			<b>16</b>	<b>TOTAL CREDIT HOURS</b>			<b>18</b>
<b>SENIOR</b>							
<b>FIRST SEMESTER</b>			<b>Hours</b>	<b>SECOND SEMESTER</b>			<b>Hours</b>
EE	4314	Control Systems	3	EE	434X	Capstone Design (w/ Lab)	3
EE	4330	Fundamentals of Telecommunication Systems	3	MAE	3309	Thermal Engineering	3
EE	434X	Capstone Design (w/ Lab)	3	ENGL	X3XX	Literature	3
POLS	2311	US Government	3	POLS	2312	State & Local Government	3
§	Math/Science Elective		3	§	Engineering Elective		3
<b>TOTAL CREDIT HOURS</b>			<b>15</b>	<b>TOTAL CREDIT HOURS</b>			<b>15</b>

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.

§ To be chosen from the approved list of technical electives available in the EE office, 520 NH.

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## COURSES IN CHEMISTRY & BIOCHEMISTRY (CHEM)

**CHEM 1441. GENERAL CHEMISTRY (3-4) 4 hours credit. (CHEM 1412).** The lecture covers the fundamentals of atomic structure, chemical bonding, the periodic table, nomenclature, kinetic theory, gas laws, chemical equations, and solutions. The laboratory introduces the scientific method, experiment design, data collection and analysis, as well as illustrates fundamental principles presented in the lecture. Students who have not had high school chemistry are advised to take CHEM 1300 first. Semesters offered: Fa Prerequisite: MATH 1302 or equivalent

## COURSES IN CIVIL ENGINEERING (CE)

**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.

## COURSES IN COMPUTER SCIENCE ENGINEERING (CSE)

**CSE 1320. INTERMEDIATE PROGRAMMING (3-2) 3 hours credit.** Programming concepts beyond standard control structures in C/C++. Emphasis is given to data structures and modular design consistent with software engineering principles. Windows and UNIX operating systems are used. Prerequisite: CSE 1105 (or concurrently) and CSE 1310, or EE 1347; and MATH 1323

## COURSES IN ELECTRICAL ENGINEERING (EE)

**EE 1104. INTRODUCTION TO ENGINEERING (1-0) 1 hours credit.** Introduction to basic engineering concepts. Students become familiar with engineering and its many sub-fields, ethical responsibilities, creativity and design. Prerequisite: Co-requisite: EE 1105.

**EE 1105. INTRODUCTION TO ELECTRICAL ENGINEERING (0-3) 1 hours credit.** A project based course in which basic concepts in electrical engineering, such as electrical power and energy, Ohm's law, measurements, and data analysis will be introduced. Student teams will engage in laboratory experiments, application hands-on projects, which cover areas of study in electrical engineering including electronics, electromechanics, semiconductors, electromagnetics, signal processing, optical systems, power system, and telecommunication system. Prerequisite: Co-requisite: EE 1104.

**EE 1347. COMPUTER SOLUTION OF ELECTRICAL ENGINEERING PROBLEMS (2-3) 3 hours credit.** An introduction to the computer, to the algorithmic process, and to programming in C. Use of high-level computer software packages, including MATLAB and PSPICE to solve linear and nonlinear design problems in Electrical Engineering. Prerequisite: EE 1104, EE 1105, MATH 1426, MATH 2425, or concurrently.

**EE 2303. ELECTRONICS I (3-0) 3 hours credit.** Characteristics and circuit models for semiconductor diodes, bipolar junction transistors (BJTs), and field-effect transistors (FETs). Circuit applications of diodes. DC biasing and stability of circuits containing diodes, BJTs, and FETs. Introduction to mid-band single stage small signal analysis of BJT and FET circuits. Prerequisite: EE 2315, EE 2446, or concurrently, MATH 2326

**EE 2315. CIRCUIT ANALYSIS I (3-0) 3 hours credit.** Basic circuit concepts of R, L, and C elements. Kirchhoff's laws, resistive network analysis, power calculations, loop and node equations, topology, basic network theorems. Dependent sources and operational amplifiers. Computer-assisted solution of circuit problems. Elementary transient analysis. Steady state A-C phasor analysis, including element laws and phasor diagrams. Prerequisite: EE 1347, MATH 2425, MATH 2326, or concurrently, PHYS 1444

**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.

**EE 2440. CIRCUIT ANALYSIS WITH LAB (3-3) 4 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. Concurrent laboratory experiments complement lecture topics. Prerequisite: Math 2425, PHYS 1444.

**EE 2446. CIRCUIT ANALYSIS II WITH LAB (3-3) 4 hours credit.** Network theorems. Power, reactive power, resonance, circular loci, mutual inductance and transformers. Dependent sources, linear variational models, and introduction to two-port networks. Solution of differential equations using Laplace transform techniques. Introduction to transmission lines. Concurrent laboratory experiments complement EE 2315 and EE 2446 lecture topics. Prerequisite: EE 2315, EE 1347, MATH 2326

**EE 3302. FUNDAMENTALS OF POWER SYSTEMS (3-0) 3 hours credit.** Introduction to power systems, three-phase circuit analysis, symmetrical components, transformer, polyphase induction motors, synchronous generators, synchronous motors, diode and diode circuits, thyristor and thyristor circuits, DC-DC switching converters, and DC-AC switching converters. Prerequisite: EE 2446.

**EE 3308. ELECTROMAGNETICS I (3-0) 3 hours credit.** Electric charge, Coulomb's law, static electric field, electric potential, electric flux, Gauss's law, divergence theorem, electric conductor, dielectric media, permittivity, electric field boundary conditions, capacitance, electrostatic energy and forces, steady electric current, electromotive force, Kirchhoff's voltage law and Kirchhoff's current law; Static magnetic field, Ampere's law of force, Biot-Savart law, Ampere's circuital law, curl of the magnetic field, Stokes' theorem, vector magnetic potential, magnetic flux, magnetic fields in media, permeability, magnetic field boundary conditions, magnetic forces and the Hall effect. Prerequisite: EE 2446; co-requisite: MATH 3319.

**EE 3308. ELECTROMAGNETICS II (3-0) 3 hours credit.** Time varying electric and magnetic fields, Faraday's law, energy in a magnetic field, displacement current, Maxwell's equations and transverse electromagnetic waves; plane waves in an unbounded medium, waves in media with planar interfaces, boundary conditions, reflection and transmission, plane waves in lossless and lossy media; electromagnetic waves in a bounded medium, guided waves, wave guides, propagation modes; transmission lines, circuit models of transmission lines, transmission line equations, reflection at discontinuities, terminations, transient response, steady state waves on transmission lines, open and short circuited lines, power flow, impedance matching and the Smith chart. Prerequisite: EE 3307

**EE 3310. MICROPROCESSORS (3-0) 3 hours credit.** Principles of operation for 80x86 family of microprocessors, including assembly language programming, internal architecture of 80x86 processors, timing analysis, and interfacing techniques. Special emphasis will be placed on hardware-software interactions, design of memory systems for microprocessors and utilization of programmable peripheral devices. Prerequisite: EE 3341, CSE 1320

**EE 3317. LINEAR SYSTEMS (3-0) 3 hours credit.** Time-domain transient analysis, convolution, Fourier Series and Transforms, Laplace Transforms and applications, transfer functions, signal flow diagrams, Bode plots, stability criteria, and sampling. Prerequisite: EE 2446 and MATH 3319

**EE 3318. DISCRETE SIGNALS AND SYSTEMS (3-0) 3 hours credit.** Discrete-time convolution. Time and frequency domain analyses of linear time invariant systems. Stability analyses of causal and non-causal systems using the Z-transform. FIR digital filter design. Convolution via the discrete Fourier transform. Design of frequency selective IIR digital filters using frequency transformations and the bilinear transform. Prerequisite: EE 3317.

**EE 3330. PROBABILITY AND RANDOM SIGNALS (3-0) 3 hours credit.** Probability, random variables, functions of random variables, random signals, noise, response of linear systems to random inputs. Prerequisite: EE 3317

**EE 3340. ENGINEERING PROJECT MANAGEMENT (2-3) 3 hours credit.** Resource management and scheduling for engineering projects. GANTT charts and PERT charts will be introduced as project management tools. Students will create plans and proposals for capstone design projects. Oral and written

presentations of project proposals will be made. Emphasis will be placed on teamwork, communication and organization. The "Fundamentals of Engineering" Exam will be reviewed for students seeking certification as an "Engineer-in-Training" (EIT) and subsequently as a "Professional Engineer" (PE). Prerequisite: SPCH 3302 and ECON 2305.

**EE 3341. DIGITAL CIRCUITS DESIGN (2-3) 3 hours credit.** Theory and design of digital logic circuits. Review of number systems and binary arithmetic. Boolean function theorems and minimization by algebraic and mapping methods, logic gates, arithmetic logic units, multiplexers/demultiplexers, analysis and synthesis of combinatorial logic circuits, ROM memories, synchronous and asynchronous state machines, hazards and races in pulse mode and fundamental mode state machines. Design and fabrication project utilizing digital integrated circuits. Laboratory consists of: Prerequisite: EE 2303

**EE 3444. ELECTRONICS II WITH LAB (3-3) 4 hours credit.** Low and high frequency characteristics and circuit models for diodes, bipolar junction transistors (BJTs), and field effect transistors (FETs). Analysis and design of full spectrum small signal BJT and FET circuits. Analysis and design of active filters, oscillators, feedback configurations, and multistage differential and operational amplifiers. Concurrent laboratory exercises in support of the topics covered in Electronics I and II. Prerequisite: EE 2303, EE 2446, EE 3317, or concurrently.

**EE 4314. CONTROL SYSTEMS (3-0) 3 hours credit.** Analyses of closed loop systems using frequency response, root locus and state variable techniques. System design based on analytic and computer methods. Prerequisite: EE 3318

**EE 4330. FUNDAMENTALS OF TELECOMMUNICATIONS SYSTEMS (3-0) 3 hours credit.** Examines analog and digital communication techniques including amplitude modulation, frequency modulation, and pulse code modulation. Time-domain and frequency domain multiplexing. Analog and digital noise analysis, information theory. Design of communications systems. Prerequisite: EE 3330.

**EE 4341. POWER SYSTEMS DESIGN PROJECT (2-3) 3 hours credit.** This course includes open ended design studies of power systems using modern computer solution methods and/or hardware projects. Relevant design projects in the areas of generation, transmission, distribution, and industrial/commercial systems will be covered. The student must submit a proposal in response to the instructor's Request For Proposal (RFP), followed by project design, development, and presentation/demonstration. Prerequisite: EE 3302, EE 3340, and senior standing.

**EE 4342. MICROPROCESSOR SYSTEM DESIGN PROJECT (2-3) 3 hours credit.** Design principles for digital and analog instrumentation utilizing open computer architectures (ISA, EISA, MicroChannel). The course is intended to provide a comprehensive design experience in microprocessor-based and microcomputer-oriented functional subsystems. Will include bus protocol analysis, timing design, simulation, prototype development, physical debugging of digital circuits, and printed circuit board design using advanced CAD/CAE tools. Special attention will be given to data acquisition techniques and to the design of computer graphics systems. Prerequisite: EE 3310, EE 3317, EE 3340 and senior standing.

**EE 4343. CONTROL SYSTEM DESIGN PROJECT (2-3) 3 hours credit.** Design of continuous and digital control systems using modern analytic and computer design tools. Student teams will design specific control systems. Prerequisite: EE 3340, EE 4314 and senior standing.

**EE 4344. OPTICAL SYSTEM DESIGN PROJECT (2-3) 3 hours credit.** Design projects based on the principles and techniques of optical engineering, including optical modulation, optical fibers and systems, sources and detectors, measurements, imaging, lenses, wave optics, polarization, interference, diffraction, optical Fourier transforms, holography, frequency conversion, interaction of light and matter. Prerequisite: EE 3308, EE 3340, and senior standing. PHYS 3445 or by permission of the instructor.

**EE 4345. SEMICONDUCTOR ELECTRONICS DESIGN PROJECT (2-3) 3 hours credit.** Design principles for electronic circuits and systems based on semiconductor integrated circuits. Will include cell and circuit development using CAD/CAE design tools. Both physical and behavioral model design will be utilized. Integration of semiconductor electronics principles, process principles and design and simulation in the open-ended design of microelectronic circuits and systems. Prerequisite: EE 3340, EE 3444, and senior standing.

**EE 4346. ELECTRONIC SYSTEM DESIGN PROJECT (2-3) 3 hours credit.** System design based on quantitative performance concepts. Design of electronic systems using discrete devices, integrated circuits (analog, digital, and hybrid), sensors, and actuators. Incorporates manufacturing, production, and cost issues. Prerequisite: EE 3340, EE 3444 and senior standing.

**EE 4347. COMMUNICATION SYSTEMS DESIGN PROJECT (2-3) 3 hours credit.** Design of radio-frequency (1 MHz to 2 GHz) circuits for telecommunications applications. Design simulation and fabrication of RF amplifiers, oscillators, and heterodyne mixers. Advanced concepts involving phase-locked loops, surface-acoustic wave devices, spread-spectrum techniques, and modulation/coding techniques may be included. Prerequisite: EE 3340, EE 3444, EE 4330, and senior standing.

**EE 4348. ELECTRICAL ENGINEERING SYSTEM DESIGN PROJECT (2-3) 3 hours credit.** A general design project that will integrate concepts from several areas of electrical engineering in a team approach. To be included are proposal preparation, feasibility studies, project planning and management, and design reviews. Progress and final reports and presentations will be emphasized. Topics will vary from semester to semester. May be repeated for credit as the topics change. Prerequisite: EE 3340, senior standing and consent of the department.

## 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 convective, 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.