ELECTRICAL ENGINEERING

Academic Year

2014-2015

School

School of Science, Engineering and Technology School Web site

School Dean

Winston F. Erevelles, Ph.D. werevelles@stmarytx.edu

Department

Engineering

Department Chair

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Description of Program/Major

The electrical engineering program at St. Mary's University is best known for its high academic standards and innovative student projects. Every engineering senior completes a year-long design project, some of which have even been patented. The curriculum emphasizes new research findings and industry advances, including computer-aided design tools.

Students become well-versed in science and mathematics; current and relevant technical knowledge; extensive, practical hands-on experience in laboratories; and the opportunity to participate in faculty research projects.

Unique facilities available to electrical engineering students include an electrical engineering laboratory accessible 24-hours a day; an energy conversion laboratory for motors, generators and transformers; a manufacturing and robotics laboratory; and a research laboratory equipped with both UNIX and Windows workstations.

The B.S. in Electrical Engineering is accredited by the Engineering Accreditation Commission of ABET.

Degree Requirements

Core Curriculum (SMC)

St. Mary's University Core (30 Hours)
All St. Mary's Core SMC13## "Reflection" courses must be completed before registering for SMC23## "Practice" courses. "Reflection" courses can be taken in any order followed by "Practice" courses in any order.

SMC 1301	Foundations of Civilization	3
SMC 1311	Foundations of Reflection: Self	3
SMC 1312	Foundations of Reflection: Nature	3
SMC 1313	Foundations of Reflection: Others	3
SMC 1314	Foundations of Reflection: God	3
SMC 2301	Foundations of Practice: Ethics	3
SMC 2302	Foundations of Practice: Civic Engagement and Social Action	3
SMC 2303	Foundations of Practice: Fine Arts and Creative Process	3

SMC 2304	Foundations of Practice: Literature	3
SMC 4301	Capstone Seminar: Prospects for Community and Civilization	3

School Specific Core (SSC)

School of Science, Engineering, and Technology Specific Core (21 Hours)

Speech	SE 1321 (for international students), SE 1341, SE 2333, SE 3391	3
Composition and Rhetoric (grade of "C" or better)	EN 1311, EN 1313 (for international students)	3
Foreign Languages	Six hours at the sophomore level (2311, 2312) in a Foreign Language previously studied for a minimum of one year; Or, 6 hours of introductory level (1311, 1312) in a Foreign Language not previously studied; Or, 12 hours of CLEP credit for a language previously studied.	6
Social Science	BA 1310, BA 3325, CJ 2300, CJ 3300, EC 2301, EC 2303, PO 1311, PO 1312, PO 1314, PS 1301, PS 3386, SC/CR 1311, SC 3321, HU 3300, HU 3303	3
Theology	Advanced Theology 33XX	3
Fine Arts	AR, DM, MU or Literature: EN 2321, 2322, 2353, 2354, 2355, 2356	3

Four Year Degree Plan

Sample Degree Plan

Department Courses and Descriptions

EG 1101
Intro to Electrical Engineering I (1)
Introduction to electrical/computer engineering consist of two 1-hour course sequence directed at incoming freshmen. The two courses focus on MATLAB and its application to engineering problems. In the first course, EG1101, the basic MATLAB features are covered. This includes MATLAB help utility, MATLAB environment and desktop, all MATLAB windows and their functionalities, solving simple problems using MATLAB, preliminary graphing capabilities of MATLAB, m-file development, debugging m-files with MATLAB, solving more sophisticated engineering problems with MATLAB. Prerequisite: none.

EG 1102
Intro to Electrical Engineering II (1)
Introduction to electrical/computer engineering consist of two 1-hour course sequence directed at incoming freshmen. The two courses focus on MATLAB and its application to engineering problems. In the second course, EG1102, the more advanced MATLAB features are covered. This includes m-file and its debugging features, flow control in MATLAB, more advanced usage of MATLAB help utilities, more advanced MATLAB commands, MATLAB toolboxes, solving advanced engineering and scientific problems using MATLAB, more advanced graphing capabilities of MATLAB. Prerequisite: EG 1101.

EG 1180
Intro to Mechanical Engineering (3)
Introduction to mechanical engineering consist of a one-hour course directed at incoming freshmen. The course focuses on educating the students on mechanical engineering ethics and careers as well as on the background skills/tools needed for success in the mechanical engineering sequence. Skills/tools include critical thinking processes, writing of short papers, introduction to programming and data analysis, presentation preparation and delivery, introduction of the design/build/test concept. This course will also include a study on several specific cases of mechanical engineering careers as examples of what

the students might expect after graduating with their bachelor's degree in the mechanical engineering field. Prerequisite: none

EG 1301

Engineering Graphics and Design (3)

Introduction to drawing instruments, lettering, and sketching. Work drawings: pictorials, orthographic projection, dimensioning, sections, and auxiliary views. Descriptive geometry: points, lines, planes, revolutions, intersections, etc. Use of Computer Aided Design (CAD) software. Introduction to engineering design. Several design projects are developed. Prerequisite: none.

EG 1302

Programming for Engineers (3)

The goal of this course is to provide students with a working knowledge of C programming language as defined by the ANSI standard. This class does not just focus on the C language syntax and program constructs. It will also empha ize good programming habits in developing a well-structured code. The concepts that will be presented in this course include: programming environment; basic C program structure; variables, constants and operators; looping with for, while, and do while statements; decision-making constructs (if, if/else, switch, and conditional expression statements); using and writing functions; using arrays, pointers and combination thereof; string operations/functions; performing file I/O; using the preprocessor directives; and using modular development methodology. Prerequisite: none.

EG 1305

Object-Oriented Programming and Design (3)

Introduction to object-oriented programming and design using the Java language. Classes, objects, data members (class attributes), methods (member functions or class behavior), data abstraction, and encapsulation. Arrays and array lists. Software reuse. Java compilers,IDEs, and APis. Basic file input and output. Object-oriented analysis and design methodologies and their role in the software development process. The Unified Modeling Language (UML) as a design and development tool. Hands-on programming is emphasized with weekly programming assignments using the Eclipse IDE. Prerequisite: EG 1302 or CS 1310

EG 2141

Logic Design Laboratory (1)

This lab introduces the basic principles of digital electronic design using standard TTL devices. Experiments illustrate the principles learned in the Fundamentals of Logic Design (EG 2341) class. The first part of this laboratory focuses on the design of combinational networks. This includes the basic operation of various logic gates; verification of truth tables; minimization of logic functions; realization of digital functions using multiple stage networks, decoders, multiplexer, and read-only memory. The second part of this lab emphasizes the design of sequential network. Here, students are introduced to various types of flip-flops, counters; design of digital circuits using Finite State Machines. This is a writing intensive course. Corequisite: EG 2341.

EG 2152

Circuit Analysis Laboratory (1)

This lab is geared towards students who are taking electrical engineering laboratory for the first time. The lab is divided into two parts: First part covers introductory concepts and basic measurements in electrical circuits. Second part is dedicated to circuit theorems; transient response of circuits composed of resistors, capacitors, and inductors; AC steady state; frequency response (PHASORS); and the characteristics of operational amplifiers in electrical circuits. This is a writing intensive course. Prerequisite: EG 2352 Co-requisite: EG 2353.

EG 2181

Digital Systems Laboratory (1)

Lab experiments illustrate the principles learned the Digital Systems Design (EG 2382) class. The first part of this laboratory

focuses on the design of combinational and sequential network s using ITL and CMOS devices. This includes comparing the electric characteristics, drive capability, and tri-state and open-collector/open-drain outputs. The second part of this laboratory emphasizes digital systems design techniques that use modern CAD tool that support hardware design languages such VHDL. Laboratory experiments introduce students to various VHDL sequential and concurrent constructs. Students learn how to simulate, verify, and synthesize their designs using state-of-the-art CAD tools. Writing intensive course. Prerequisite: EG 2141, EG 2341; Co-requisite: EG 2382

EG 2306

Principles of Materials Science (3)

A study of the atomic and crystalline structure of solids including the theory of solid solutions, diffusion, and phase transformations. The behavior of matters based on their mechanical, electrical, thermal, magnetic, and optical properties. Point defects, dislocation theory, forensics. Discussions of societal issues in materials science and engineering. Prerequisites: CH 1401, PY 2404, MT 2412.

EG 2307

Engineering Mechanics (3)

Fundamentals of statics, vector methods, concentrated and distributed force systems, methods of moments for extended rigid structures, static equilibrium of structures. Topics also include Moments oflnertia, Friction, and Centroids/Center of Gravity. Prerequisite s: PY 1404, MT 2412, EG130l

EG 2308

Strength of Materials (3)

Mechanical properties of materials: normal and shear stress, normal and shear strain. Separate treatments of axial load, torsion, and bending. Bending and shearing stresses in beams. Deflection in homogeneous beams. Design of members by strength criteria. Prerequisite: EG 2307, MT2413.

EG 2309

Fluid Mechanics (3)

Forces and energy generated by liquids and gasses at rest and in motion. Fundamental laws of fluid behavior: conservation of mass, energy, and momentum. Differential and finite control volume approaches for flow analysis. Steady, incompressible flow. Real world applications. Prerequisites: MT 3311, PY 2404, EG 2307.

EG 2310

Human Computer Interaction (3)

The goal of this course is to teach the fundamentals of human-computer interface in software design and development. Students learn to design, implement and evaluate effective and usable graphical computer interfaces. The course emphasizes the importance of usability and iterative design. Design of windows, menus, and commands. Voice and natural language I/O. Response time and feedback. Color, icons, and sound. Students work on individual and team projects to design, implement and evaluate computer interfaces. Prerequisite: EG 3392

EG 2311

Software Requirement Engineering (3)

This course provides an introduction to the fundamentals of software requirements management. Topics covered include requirements gathering, system modeling and software specifications. The major emphasis is on using a variety of modeling tools and techniques to define a system specification. Languages and models for representing requirements. Analysis and validation techniques, including need, goal, and use case analysis. Students participate in a group project on software requirements.

EG 2322

Work Design & Product Measure (3)

Industrial engineering tools and concepts for engineering problem solving. Work design and methods engineering. Work measurement and work sampling, productivity measurement, incentives, standard time techniques. In-class labs and design projects are required. Prerequisites: none.

EG 2325

Industrial Automation and Control (3)

Logic-structured and icon-driven programming. Introduction to industrial field devices for control and automation. Number systems and codes. Digital and analogue signals. Interposing relay control. Timers, counters, and data compare instructions. In-class labs and design projects are required. Prerequisite: EG1302, CS1310, or CS 1311.

EG 2341

Fundamentals of Logic Design (3)

The first half of this course focuses on combinational network design. This includes the number systems and conversion; Boolean algebra; minimization of switching functions using Karnaugh maps; multilevel gate networks; multi-output networks; realizing Boolean functions using multiplexers, decoders, read-only memories, and programmable logic devices. The second half of this course focuses on the analysis and the design of sequential network. Topics covered in this part of the course include flip-flops; designing counters using different type of flip-flops; analysis of sequential networks; derivation of state graphs and tables; introduction to Finite State Machines; minimization of state tables; guidelines for state assignment; derivation of flip-flop input equations, and realization of sequential networks. Co-requisite: EG 2141.

EG 2342

Data Structures & Algorithms (3)

This course provides an introduction to the design and analysis of computer data structures and algorithms, focusing in particular on techniques for achieving high performance software in computer systems. Students will learn the necessary mathematical background to carry out algorithm analysis, such as time and space complexity, worst-case and average-case analysis, tractability & intractability, and design techniques. It discusses recursion and recurrence relations, asymptotic notations, basic data structures, dynamic dictionaries, balanced trees, priority queues, and graphs. The specific data structures which will be discussed in class include linked lists, stack, heaps, self-organizing lists, binary search trees, hash tables, AVL trees, red-black trees, balanced trees, leftist trees, minimum spanning trees, and others. Prerequisite: MT3323

EG 2352

Circuit Analysis I (3)

This course deals with basic circuit elements and models; circuits with resistors: R; circuit theorems; loop and nodal analysis of resistive networks; analysis of operational amplifiers; analysis of circuit its with energy storage elements (capacitors: C and inductors: L); natural and step response of RL; RC; and RLC circuits. Prerequisite: PY2404. Co-requisite: MT3311.

EG 2353

Circuit Analysis II (3)

The goal of this course is to provide students with a working knowledge of phasor diagrams; sinusoidal steady-state power analysis and complex load matching; series and parallel resonance; Laplace transform and its applications in circuit analysis: the step function, the impulse function, inverse transforms, initial and final value theorems, and circuit analysis in the s-domain. Transfer functions and Bode diagrams are also included. Prerequisites: EG 2352, MT 3311.

EG 2382

Digital Systems Design (3)

The first part of this course presents a quick review of sequential network design concepts as presented in the pre-requite course on Fundamentals of Logic Design (EG 2341); iterative networks; integrated circuit logic families and their electric

characteristics; drive capability and fan-out of TTL and CMOS devices; Tri-state buffers, and Open-collector outputs. Mixing logic families; Hazard detection and prevention; designing digital systems using Programmable Logic Devices (PLD); digital systems design using Algorithmic State Machine (ASM) charts. The second part of this course focuses on the design of combinational and sequential networks using VHDL. Students will learn how to use the top-down design techniques to analyze, design, simulate, verify, and synthesize complex digital circuits using modern CAD tools. Prerequisites: EG 2341 and EG 2141; Co-requisite: EG 2181.

EG 2385

Dynamics (3)

Linear and angular kinematics and kinetics of particle s and systems of particles. Work-energy and impulse momentum principle s. Planar and three-dimensional kinetics and kinematic s of rigid bodies. Dynamic friction. Introduction to vibrations. Prerequisite: EG2307, MT2413

EG 3145

Circuits and Systems Laboratory (1)

Basis of electrical measurement s and technical report writing. Experimental verification and applications of circuit theorems; investigation of the current divider, the voltage divider, and Thevenin's theorem ; application of the oscilloscope; the analysis of the transient response of RC and RL circuits; applications of operational amplifiers in the design of summing, amplification, and comparator circuits; analysis of the frequency response of filter circuits; the design and construction of a Karaoke machine.. This is a writing-intensive course. This course cannot be taken for credit by electrical engineering or computer engineering majors. This is a writing intensive course. Prerequisite: EG 3345

EG 3156

Electronics I Laboratory (1)

DC circuits; the diode as a nonlinear device; the oscilloscope; RC circuits; RC filters; LC resonant circuit; rectifier; signal diodes; diode clamp; emitter follower; current source; common emitter amplifier; transistor as a switch; op-amp open-loop gain; inverting and non-inverting op-amps; op-amp follower and current source; summing amplifier; op-amp as an integrator, a differentiator, an active rectifier, and an active clamp; FET transistor; FET current source and source follower; FET as a voltage-controlled resistance; amplitude modulation and AM radio; input and output characteristics of integrated gates: TTL and CMOS. Prerequisite: EG 2152; corequisite: EG 3356.

EG 3157

Electronics II Laboratory (1)

Flip-flops; counters; shift registers; the cascading 16-bit counter with added display and keypad; programmable divide-by-n counters; period meters; capacitance meters; memory; RAM; divide-by-3; memory-based state machines; the dynamic diode curve tracer; the grounded emitter amplifier; current sources; the Ebers-Moll model; push-pull amplifiers; differential amplifiers; the bootstrap circuit; the Miller effect; the Darlingtonpair; the super beta; the analog switch and its applications: chopper circuits; sample-and-hold circuits; switched capacitor filters; voltage inverter circuits; A/D and D/A converters; the phase-locked loop circuit; the frequency multiplier. Prerequisite: EG 3156; Co-requisite: EG 3357.

EG 3316

Human Factors (3)

Integration of the human component into the design, development, and evaluation of human-machine systems. Ergonomic and human factors research methodology. A term project featuring the design of a human-machine system from an ergonomic/human factors perspective is required.

EG 3322

Industrial Statistics (3)

Introduction to probability and statistics; descriptive statistics; random variables; sampling; distributions; hypothesis testing;

linear regression and correlation; goodness-of-fit tests; design of experiments and analysis of variance. Prerequisite: MT2412

EG 3333

Lean Production Systems (3)

Principles and models for analysis and design of production facilities. Material handling. Forecasting. Capacity Planning. Deterministic and stochastic inventory planning models. Aggregate planning. Materials requirement planning. Master production scheduling. Job shop scheduling. Assembly line balancing. Push and pull frameworks. Lean and just-in-time principles. Prerequisite: MT 4332

EG 3334

Engineering Economy (3)

Overview of finance/accounting concepts. Fundamental principles and methods for economic analysis of technical alternatives leading to decision making under deterministic and uncertain conditions. The effects of interest, taxation, depreciation, and inflation. Prerequisite: MT 2413 Calculus II.

EG 3335

Optimization (3)

Mathematical optimization model formulation. Classical optimization. Numerical search methods. Linear optimization via the graphical and simplex methods. Introduction to duality and sensitivity analysis. Network flow optimization . Prerequisite: MT 2413.

EG 3336

Applied Optimization & Analysis (3)

Project management using CPM/PERT. Introduction to dynamic programming. Heuristics and meta-heuristics. Markov chains: Chapman-Kolmogorov equations and classifications of states. Markov decision models. Queuing theory. Prerequisite: MT 4331.

EG 3337

Supply Chain Management (3)

Fundamental concepts and theory for supply chain management planning, analysis, and design. Supply chain business processes, process metrics, and best practices in supply chain management. Multi-echelon inventory models, channel coordination, supply contracts and negotiations, supply chain disruptions/risk management, pricing. Decision making under uncertainty for optimal profitability in the context of global outsourcing and international trade treaties. Prerequisite: EG3333

EG 3345

Circuits and Systems (3)

An introduction to the theory and applications of electrical circuits, devices and systems; review of basic physics involving resistors, inductors, and capacitors; electrical units and measurements; analysis of dc circuits; analysis of the transient response to RL and RC switching circuits; introduction to ac circuit analysis; the frequency response; diodes, rectifiers and wave-shaping circuits; applications of operational amplifiers. This course may not be taken for credit by electrical engineering or computer engineering majors. Prerequisite: PY 2404; Co-requisite: MT 3311

EG 3350

Software Design and Architecture (3)

This course introduces basic concepts and principles about software design and software architecture. Study of design concepts and notations. Architecture, middleware architectures, design patterns, frameworks and components. Designing for qualities such as performance, security, reu sability, reliability. Techniques for designing, building, and evaluating software architectures. Prerequisite: EG 2311

EG 3351

Software Project Management (3)

This course introduces concepts deemed central to effective management of software projects. Software systems engineering, process management and control, and project planning and management. Using specifications and descriptions, making use of structured and object-oriented techniques, completing reviews and audits, confirming product development with planned verifications, and validations and testing. Management of expectations. Release and configuration management. Software process standards and process implementation. Software contracts and intellectual property. Prerequisite: EG2311

EG 3352

Software Quality Assurance and Testing (3)

This course provides an introduction to software quality assurance and testing. Quality assurance process and its role in software development. Measuring software quality and software quality standards. Inspections and formal technical reviews. Testing, verification, and validation techniques. Black-box and white-box testing. The automation of software testing. A team-based software development project is required in which students apply learned techniques. Prerequisite: EG3350.

EG 3356

Electronics I (3)

Physical properties of diodes and p-n junctions; Diode circuits; physical properties of Metal-Oxide Field Effect Transistors (MOSFET); amplification circuits using MOSFET; NMOS; PMOS and CMOS devices; physical properties of Junction Field Effect Transistors (JFET); electronic circuits using JFET; physical properties of Bipolar Junction Transistors (BJT); amplification circuits using BJT; switching circuits using cut off and saturation modes of BJT. Prerequisite: EG2352.

EG 3357

Electronics II (3)

The second part of a two-semester course sequence, which focuses on analog electronic circuits. Differential and multi-stage amplifiers; feed back in amplifier circuits; frequency response of different amplifiers; the four basic feedback topologies in amplifiers; various output stages; power amplifiers; and the complete analysis of the 741 operational amplifier circuit. The MultiSIM circuit analyzer software package is heavily utilized. Prerequisite: EG 3356; co-requisite: EG 3157.

EG 3363

Microprocessors I (3)

This is the first part of a two-semester course sequence that is intended to familiarize students with the development of microcontroller-based products. The first goal of the course is to teach students the skills of assembly language programming in general and the HCS12 Motorola microcontroller in particular. The second goal of the course is to introduce and familiarize students with different architecture and hardware design in microcontrollers using HCS12 as a model. The course is accompanied by laboratory assignments throughout the semester. Prerequisites: EG 1302/04, EG 2341.

EG 3364

Microprocessors II (3)

The second part of a two-semester course sequence is intended to familiarize students with the development of microcontroller-based products. Concepts covered in this course include interfacing; timing diagrams and synchronization for handshake purposes. The course utilizes all the onboard functionalities of the Mc9S12DP256 microcontroller such as the A/D converter; synchronous and asynchronous serial interfaces; a timer module with input capture, output compare, and pulse accumulator capabilities; PWM; controller area network (CAN); and a variety of input and output ports. The course includes six or seven practical data acquisition and control projects based on the HCS12 microcontroller. Prerequisites: EG 3363.

EG 3366

Electromagnetic Theory (3)
Review of vector analysis, complex vectors, application s of Stokes' theorem and the divergence theorem. Maxwell's equations; elements of electrostatics; the Lorentz force law; introduction to magnetostatics; Faraday's law ; time-varying electromagnetic fields; propagation of timeÂ harmonic plane waves; Poynting 's theorem; wave attenuation in conductive and dissipative media; polarization; and dispersion. Introduction to transmission lines. Prerequisites: PY2404, MT3311, MT3315, EG2352. Co-requisite: EG2353

EG 3368
Semiconductor Devices (3)
Review of quantum mechanics; introduction to crystallography; energy band and charge carriers; physical properties of the p-n junction; physical properties of diodes; physical behavior of Bipolar Junction Transistors (BJT) in active, saturation and cut-off modes. Prerequisites: EG3356 and senior standing.

EG 3372
Signals and Systems (3)
Continuous signal and system modeling, properties of linear, time-independent systems, BIBO stability, response of continuous systems to periodic and non-periodic signals, the convolution integral, theory and applications of Fourier series and Fourier transforms, power spectrum of periodic signals, energy spectrum of non-periodic signals, modulation. Prerequisite: MT3311, EG2353.

EG 3374
Computer Organization & Architecture (3)
Instruction set architecture: instruction types, data types, addressing modes, instruction formats, and RISC versus CISC architectures. Basic computer organization: Central processing unit, system buses, memory subsystems, and computer peripherals. Processor design: hardwired versus micro-programmed control unit, arithmetic logic unit, pipeline design, pipeline hazards, branch prediction, register windowing, register renaming, and instruction level parallelism. Memory hierarchy: cache organizations, cache placement and replacement policies, main memory, virtual memory, and memory protection. Performance measurements. Prerequisites: EG2341, EG2382.

EG 3380
Mechanical Design I (3)
Failure theories, fatigue, and thermal/environmental considerations in the design process. Design of machine elements, fasteners and weldments, pressure vessels, and robotic elements. Methods for the calculation of deflection of machine components. Prerequisites: EG2308, EG2385. Prerequisite or Co-requisite: EG2306 and EG3381.

EG 3381
Numerical Methods (3)
Introduction to numerical methods with emphasis on algorithm construction, analysis and implementation to provide solutions to common problem s formulated in science and engineering. Programming, round -off error, root finding for nonlinear equations, solutions of equations in one variable, interpolation and polynomial approximation, approximation theory , direct solvers for linear systems, numerical differentiation and integration, initial-value problems for ordinary differential equations and boundary value problem s. Observe firsthand the issues of accuracy, computational work effort, and stability. Students will also be introduced to Finite Element Analysis and Computational Fluid Dynamic principals. Prerequisites: EG1302, EG2308, MT33 l l , MT3312

EG 3382
Heat Transfer (3)
Fundamental laws of heat transfer by conduction, convection, and radiation; boundary-layer concepts; simultaneous heat, mass and momentum transfer, heat transfer in engineering apparatus. Heat exchangers and heat transfer from extended surfaces.

Prerequisites: EG2309 and EG2386.

EG 3383

Experimental Methods (3)

The general behavior of different measurement techniques, such as force, deflection, pressure, flow, and temperature. Emphasis will be placed on the use of uncertainty analysis and statistical data analysis in estimating the accuracy of measurements. Laboratory experience. Prerequisites: EG2308, EG2309, MT4332

EG 3384

Aerospace and Wind Power Structures (3)

Design and analysis of flight structures and wind power structures. Topics from two and three dimensional elasticity . Behavior of composite materials. Stress and deflection analysis of thin-skinned stiffened structures . Introduction to the finite element method and its applicability in the design process. Manufacturing considerations. Course will include a design/build/test element. Prerequisites: EG2306, EG3380

EG 3387

Power Systems (3)

This course covers the use of renewable and non-renewable energy sources in power production. Energy conversion processes are analyzed, and performance characteristics of components and systems are modeled using modern computational methods. Engine component match ing for design using analysis routines, including centrifugal and axial flow turbines and compressors, inlets, diffusers, nozzles, fans and propellers. Applications may also include design of nuclear, solar, wind, wave, thermoelectric, and geothermal energy system s. Prerequisites: EG2309, EG2386.

EG 3388

Intro to Biomedical Engineering (3)

The course serves as an introduction to the fundamental science and engineering on which biomedical engineering is based. It covers applications of mechanical engineering principles to problems in the life sciences; transport phenomena of physiological solids and fluids; bio-signal analysis and instrumentation; bio-materials design and compatibility; principles of bio-mechanics and human locomotion; physiological systems modeling and control; case studies of drugs and medical products; illustrations of the product development-product testing cycle, patent protection, and FDA approval. In-class student presentations. Prerequisites: MT3312, EG2308, EG2309.

EG 3392

Java and Applications (3)

Introduction to developing Java Applications. Fundamentals of object-oriented programming: Encapsulation, inheritance, polymorphism, and abstraction Exception handling. Event-driven programming. Binary input and output. Applets and multimedia. Accessing databases with JDBC. UML will be extensively used in the design activities. Hands-on programming is emphasized with weekly programming assignments using the Eclipse IDE. Prerequisites: EG 1305

EG 4132

Computer Aided Manufacturing & Robotics Lab (1)

Operations and programming of stepper motors and servomotors; integration of discrete-event sensors with microcomputer interfaces. Programming, simulation, implementation, and applications of industrial robots and microcontrollers. Experiments on an autonomous robotics design system and other input and output field devices. Weekly written reports on experiments are required. This is a writing intensive course. Co-requisite: EG4332.

EG 4160

Energy Conversion Laboratory (1)

Laboratory examination of the design, construction and operating characteristics of transformers and various types of motors and generators. Measurement of transformer parameters. The experimental investigation of the ac generator (alternator); the series, shunt, and compound dc motors; the synchronous motor; the induction motor; and the universal motor. This is a writing-intensive course. Co-requisite: EG4360

EG 4166

Advanced Electronics Design Laboratory (1)

This course includes individual design, construction and testing of analog, digital, and mixed electronics subsystems. Typical exercises include power control, oscillators, instrumentation amplifiers and applications, digital and mixed systems, communications circuits and electromechanical control systems. This is a writing intensive course. Prerequisite: EG 4366.

EG 4330

Six Sigma Quality (3)

Statistical process control: data collection and analysis, control charts, process control, capability analysis. Introduction to total quality management (TQM). The DMAIC process. Introduction to Six-Sigma Certification. Failure mode effect analysis. Benchmarki ng. Kaizen. Pok a-yoke. Value stream mapping. Quality function deployment. Integration of Lean. Prerequisite: MT 4332.

EG 4331

Manufacturing Processes (3)

Geometric dimensioning and tolerancing standards. Economical and environmental considerations in manufacturing. Selection of materials. Processing methods: casting, injection molding, assembling, machining, etc. Measuring and inspection equipment and techniques. Product data management. Product design and redesign. Rapid prototyping. In-class labs and design projects are required. Prerequisite: EG1301.

EG 4332

Computer Aided Manufacturing (3)

Modern manufacturing systems including automation, computer integrated manufacturing, robotics, and programmable logic controllers. Use of CAD/CAM/CAE software in analyzing industrial robots and manipulators. Design projects are required. Prerequisite: EG2325

EG 4337

Computer Simulation (3)

Discrete event Monte Carlo simulation. Statistical data collection. Simulation modeling: model building, verification and validation. Output analysis. Prerequisite: MT 4332

EG 4338

Special Topics I (3)

EG 4339

Special Topics II (3)

EG 4350

Digital Signal Processing (3)

Discrete time signals & systems, z-transform, discrete Fourier transform, flow graph and matrix representation of digital filters,

digital filter design techniques and computation of the fast Fourier transform (FFT). MATLAB software package is heavily utilized in this course. Prerequisite: EG 3372

EG 4352

Software Maintenance and Evolution (3)
This course introduces maintenance methodologies and the evolution of software systems. Concepts and techniques for modifying software in evolving environment s. Designing and implementing software to increase maintainability and reuse; evaluating software for change; and validating software changes. Evolution of legacy software systems. Software re-engineering, data reverse engineering. Prerequisite: EG3350

EG 4356

Computer Networking (3)
Introduction to the fundamentals of computer networking and data communication in the context of the OSI and TCP/IP reference models. The focus is on the concept of layered protocols and the role of each layer of the combined OSI-TCP/IP reference models; namely the Application layer, the transport layer, network layer, the link layer, and the physical layer. Local area networks and Current trend in computer networking. Quantitative measures to gage the performance of computer networks. Error detection, error correction, and security in computer networks. Prerequisite: MT 4331

EG 4360

Energy Conversion (3)
Three-phase circuits, magnetic circuits, transformers, electrical-mechanical transducers, dc motors, synchronous motors, induction motors, ac generators.Theoretical principles, matematical models, operating characteristics, and practical applications of transformers, motors, and generators are emphasized. Prerequisites: PY2404, MT3311, EG2352, EG3366.

EG 4362

Senior Design Project I (3)
This is the first course in the six-hour senior design sequence. Requires a thorough understanding of the iterative engineering design and analysis process: need recognition, literature review, assessment of societal impact, project management, definition of design objectives, design, model building, analysis, implementation, validation and testing. The course requires industry-university cooperation and status briefings. The senior design sequence consciously integrates and reflects upon the goals and objectives from the four core areas (self, others, nature, God) and their relationship with engineering. A common reflection theme in the course is the impact of the students' engineering projects on the local, national, or global communities as they enter the next stage of their lives. Prerequisites: senior standing in the major and consent of the academic adviser.
Specific prerequisites by major:
CE: EG2382, EG3357, EG3364, and EG3374.
EE: EG3357, EG3364.
EM: FN3310, EG3333, EG4330, and EG4337.
ES: EG2306, EG3145, and MT4331.
IE: EG3333, EG4330, EG4332, and EG4337.
ME: EG2306, EG2309, EG3345, EG3380, EG3381 & EG3384 or EG3387.
SE: EG2310, CS3340, EG3350, EG3351, and CS4320.

EG 4363

Senior Design Project II (3)
This is the second course in the six-hour senior design sequence. In addition to the requirements in EG 4362, this course requires a formal final presentation and comprehensive final report submission. This is a writing intensive course. Prerequisite: enrollment in EG 4362 and completion of the first nine SMC Core courses.

EG 4366

Advanced Electronics Design (3)
This is a practical design course at the integrated circuit level. The topics include operational amplifier applications, feedback, active filters, oscillators, voltage regulators, linear and switching power supplies, precision and low noise techniques, and digital circuits. Prerequisite: EG 3357.

EG 4369
Control Systems (3)
This course deals with the fundamentals of automatic control systems including the analysis and design of control systems for various engineering applications. Topics include modeling of physical systems using both transfer function and state space models. System responses; performance and design criteria; control system characteristics; stability; sensitivity; steady state errors and transient response; stability analyses using Routh-Hurwitz, Root-locus, Nyquist, and Bode methods; lead and lag compensators and PID controllers design using root-locus method; frequency-response analysis; MATLAB and SIMULINK are used to aid in the analysis and design of control systems; Prerequisite: EG3372

EG 4370
Communication Theory (3)
Introductory information theory; frequency response of linear systems; analog-to-digital conversion; time multiplexing of signals; Pulse Amplitude Modulation (PAM); Pulse Code Modulation (PCM); quantization noise; Amplitude Modulation (AM) and Frequency Modulation (FM) techniques: Prerequisite: EG3372 and MT4331

EG 4386
Engineering Thermodynamics II (3)
Moist air properties, psychometric systems and analysis, vapor and gas power cycles, refrigeration and heat-pump cycles and thermodynamic relations. Mixtures of fluids, chemical reactions, chemical and phase equilibrium, thermodynamic aspects of fluid flow; introduction to compressible flow, isentropic and normal shock wave relations. Design aspects of engineering thermodynamic are introduced through the assignments of open-ended problems and design projects. State-of-the art software programs are introduced to solve the design problems and projects. Prerequisites: EG2309, EG2386. Co- or Prerequisite: CH1402

EG 4387
Parallel Programming (3)
Overview of the shared and distributed memory systems; Taxonomy of parallel computers; Quick review of Instruction Level Parallelism (ILP), pipe lining, memory hierarchy (caching), and interconnection networks. Performance measurement of parallel program s. Distribute-memory programming with Message Passing Interface(MPI) . Shared-memory programming with Pthreads . Shared-memory programming with OpenMP. Process and thread synchronization; Mutual exclusion and semaphores; Barriers and condition variables; Read-Write locks. Cache coherence and false sharing. Prerequisite : EG3374 and EG2342

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