Engineering

School

School of Science, Engineering and Technology (http://www.stmarytx.edu/set)

School Dean

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Department

Engineering (https://www.stmarytx.edu/academics/department/engineering)

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Engineering

The Engineering programs at St. Mary's University are known for high academic standards and innovative Senior Design Projects.

The curriculum emphasizes important areas in the respective engineering fields and exposes students to state-of-the-art engineering tools including hardware and software.

Students get a special blend of classroom learning and hands-on engineering practice, creating technical leaders who are able to "engineer the greater good" for the society.

St. Mary's focuses on educating the whole individual by integrating liberal arts and professional education. Our institution promotes student development in the context of the larger community, preparing students for success not only in their engineering careers, but also in all aspects of their lives. Education of the whole person is an important trait of the Marianist education philosophy that we follow in our engineering programs.

Annual Enrollment and Graduation of Accredited Programs

Computer Engineering (B.S.): Accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org

Electrical Engineering (B.S.): Accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org

Industrial Engineering (B.S.): Accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org

Mechanical Engineering (B.S.): Accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org

Academic Year: 2013-2014

Program	Enrollment	Graduates
Computer Engineering	36	1
Electrical Engineering	57	2
Industrial Engineering	57	8

Educational Objectives

To educate and train Engineering graduates who successfully:

- contribute to the missions of their organizations.
- practice engineering and compete in the professional arena.
- work independently, as a member of a group, or in a managerial position.
- complete graduate education if they so desire.
- become life-long scholars, pursue advanced training, and remain abreast of and contribute to technical developments in their professions.
- communicate and collaborate with professionals of varied backgrounds.
- apply their professional knowledge responsible and ethically.
- contribute to their community.

Student Learning Outcomes

Students should:

- be able to apply their knowledge of mathematics to real world problems.
- be able to apply their knowledge of science to real world problems.
- be able to apply their knowledge of engineering to real world problems.
- be able to design and conduct experiments.
- be able to analyze and interpret data.
- be able to design a system, component, or process to meet desired needs.
- be able to function on multi-disciplinary teams.
- be able to identify, formulate, and solve engineering problems.
- have an understanding of professional and ethical responsibility.
- be able to communicate effectively.
- have a broad education necessary to understand the impact of engineering solutions in a global and societal context.
- recognize the need for, and have the ability to engage in life-long learning.
- have the knowledge of contemporary issues.
- should have the ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- improve their critical thinking skills and apply them to solve real world problems.

Majors in Engineering

- B.S. in Computer Engineering (catalog.stmarytx.edu/undergraduate/majors-programs/science-engineering-technology/engineering/computer-engineering)
- B.S. in Electrical Engineering (catalog.stmarytx.edu/undergraduate/majors-programs/science-engineering-technology/engineering/electrical-engineering)
- B.S. in Engineering Management (catalog.stmarytx.edu/undergraduate/majors-programs/science-engineering-technology/engineering/engineering-management)
- B.S. in Engineering Science (catalog.stmarytx.edu/undergraduate/majors-programs/science-engineering-technology/engineering/engineering-science)
- B.S. in Industrial Engineering (catalog.stmarytx.edu/undergraduate/majors-programs/science-engineering-technology/engineering/industrial-engineering)
- B.S. in Mechanical Engineering (catalog.stmarytx.edu/undergraduate/majors-programs/science-engineering-technology/engineering/mechanical-engineering)
- B.S. in Software Engineering (catalog.stmarytx.edu/undergraduate/majors-programs/science-engineering-technology/engineering/software-engineering)

All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.

EG 1101. Introduction to Engineering. 1 Semester Hour.
Introduction to Engineering course consists of six critical areas that each incoming engineering student ought to be exposed to and eventually master them. These areas are (i) Critical Thinking; (ii) Formal Report Writing; (iii) Basic Math Concepts used in Engineering; (iv) Contemporary Issues of our Time; (v) Familiarity with the Basic Tools of Machine Shop; and (vi) Career Preparation and Development. The course is designed to expose the students to these areas and guide them through available tools and methods in order to progress towards mastering these concepts. Course restricted to first time freshmen and transfer students. (Fall; Spring) Prerequisite MT1303.

EG 1102. Intro to Electrical Engineering. 1 Semester Hour.
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. (Spring only) Pre-requisite: EG 1101.

EG 1301. Engineering Graphics and Design. 3 Semester Hours.
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. CAD software "SolidWorks" is used. Introduction to engineering design and simple design projects are conducted. (Fall; Spring) Pre-requisite: none.

EG 1302. Programming for Engineers. 3 Semester Hours.
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 emphasize 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. (Fall; Spring) Pre-requisite: none.

EG 1305. Object-Oriented Programming and Design. 3 Semester Hours.
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. (Spring only) Pre-requisite: EG 1302 or CS 1310. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2141. Logic Design Laboratory. 1 Semester Hour.
This lab introduces the basic principles of digital electronics 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. Writing intensive course. (Fall only) Co-requisite: EG 2341. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2152. Circuit Analysis Laboratory. 1 Semester Hour.
Experimental verification of various circuit theorems and laws, understanding of the cathode ray oscilloscope functions; implementation and analysis of the transient response of first-order and second order circuits; implementation and analysis of frequency response; resonant networks, series and parallel RLC circuits. Writing intensive course. (Fall only) Pre- or Co-requisite: EG2353. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2181. Digital Systems Design Laboratory. 1 Semester Hour.
Experiments illustrate the principles learned in the Digital Systems Design (EG 2382) class. The first part of this laboratory focuses on the design of sequential networks using 7400 series TTL and CMOS devices. This includes comparing the electric characteristics; drive capability, fan-in, and fan-out of TTL and CMOS devices; Tristate buffers, and Open-collector outputs. The second part of this laboratory emphasizes the more recent digital systems design techniques that use modern CAD tools that support Hardware Design Languages such as VHDL. Many 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. (Spring only) Pre-requisite: EG2141, Pre- or Co-requisite: EG2382. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2306. Materials Science. 3 Semester Hours.
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. (Fall only). Pre-requisite: CH 1401, PY 2404, MT 2412. All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.

EG 2307. Engineering Mechanics. 3 Semester Hours.
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 of inertia, Friction, and Centroids/Center of Gravity. (Fall; Spring) Pre-requisites: MT2412, PY1404, and EG1301.

EG 2308. Strength of Materials. 3 Semester Hours.
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. (Spring only) Pre-requisites: MT 2413 and EG 2307. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2309. Fluid Mechanics. 3 Semester Hours.
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. (Fall only) Pre-requisites: PY 2404, MT 3311, and EG 2307. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2310. Human Computer Interaction. 3 Semester Hours.
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. (Spring only) Pre-requisite: EG 3392. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2311. Software Requirement Engineering. 3 Semester Hours.
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. (Spring only) Pre-requisite: none.

EG 2322. Work Design & Product Measure. 3 Semester Hours.
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. (Spring only) Pre-requisites: none.

EG 2325. Industrial Automation and Control. 3 Semester Hours.
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. (Fall only) Pre-requisite: EG1302, or CS1310. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2341. Fundamentals of Logic Design. 3 Semester Hours.
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; multi-level 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. (Fall only) Pre-requisite: Sophomore standing; Co-requisite: EG 2141. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2342. Data Structures & Algorithms. 3 Semester Hours.
To build on knowledge students have gained from previous programming and mathematics courses so that they may learn how to apply more sophisticated techniques to the design and analysis of data structures and algorithms. This will allow students to understand and/or conduct assessments of the data structures and algorithms used in modern computer operating systems, application programs, etc. Students will gain experience implementing data structures and algorithms, and using these to solve practical engineering problems. (Spring only) Pre-requisites: EG1305 and MT3323. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2352. Circuit Analysis I. 3 Semester Hours.
This course familiarizes students with basic circuit elements and models; resistive circuits; circuit theorems; loop and nodal analysis of resistive networks; techniques of analysis of operational amplifiers; analysis of circuits with energy storage elements (capacitors and inductors); natural and step response of RL; RC; and RLC circuits. (Fall only) Prerequisite: PY2404; Pre- or Co-requisite: MT3311. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2353. Circuit Analysis II. 3 Semester Hours.
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. (Spring only) Pre-requisite: EG 2352. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2382. Digital Systems Design. 3 Semester Hours.
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; 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. (Spring only) Pre-requisites: EG 2341and EG 2141; Co-requisite: EG 2181. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2385. Dynamics. 3 Semester Hours.
Linear and angular kinematics and kinetics of particles and systems of particles. Work-energy and impulse momentum principles. Planar and three-dimensional kinetics and kinematics of rigid bodies. Dynamic friction. Introduction to vibrations. (Spring only) Pre-requisites: EG 2307 and MT 2413. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 2386. Engineering Thermodynamics I. 3 Semester Hours.
Introduction, definitions of different properties of thermodynamics, first law, physical properties, ideal and real gases, second law, reversibility, irreversibility and consequences, thermodynamic cycles. (Spring only) Pre-requisites: MT 2413, PY 2404, and CH 1401. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3145. Circuits and Systems Lab. 1 Semester Hour.
Basis of electrical measurements 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 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 course cannot be taken for credit by electrical engineering or computer engineering majors. Writing intensive course. (Fall; Spring) Pre-requisite or Co-requisite: EG 3345. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3156. Electronics I Lab. 1 Semester Hour.
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. (Spring only) Pre-requisite: EG 2152; co-requisite: EG 3356. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3157. Electronics II Lab. 1 Semester Hour.
Biasing Transistor good and bad; Input/output impedance of a device; Current source and current mirror; Push-pull; Op-amp limitations; Switching at higher frequencies; Analog switches; Chopper circuit, sample-and-hold, and negative supply from positive; Switched capacitor filters; Differential amplifiers, Miller Effect, Darlington pair, and bootstrap; Comparators and Schmitt triggers; RC Oscillators and Wein bridge; A/D and D/A conversions; Voltage regulators; Phase-locked loop circuit; the frequency multiplier. (Fall only) Pre-requisite: EG 3156; Co-requisite: EG 3357. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3316. Human Factors. 3 Semester Hours.
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. (Spring only) Pre-requisite: none.

EG 3331. Design & Analysis of Experiments. 3 Semester Hours.
Fundamentals of industrial experimental design, statistical data analysis, and model building, with emphasis on engineering formulations and applications. Two-level multi-variable experiments, multilevel multi-variable experiments (ANOVA), validation testing methods, and estimation of variance. Introduction to Taguchi methods. (Spring only - Elective- may not be offered every Spring) Prerequisite: MT 4331, MT 4332.

EG 3333. Lean Production Systems. 3 Semester Hours.
Principles, models and techniques for production planning and analysis of production systems. Demand forecasting. Capacity planning. Aggregate planning. Master production scheduling. Demand management. Deterministic and stochastic inventory lot-sizing. Material requirements planning. Scheduling. Assembly line balancing. Lean and just-in-time principles. Material handling. Analytical principles of production systems design, analysis and control with emphasis on stochastic analysis. Role of variability and impact on cycle time. Push versus pull production strategies including Kanban and constant WIP control. Little’s Law. (Fall only) Pre-requisites: MT 2413 and MT 4331. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3334. Engineering Economy. 3 Semester Hours.
Overview of business operations, valuation and 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. Analysis of loans, securities and derivatives. Economy of selection and operation and replacement analysis in reference to manufacturing/service enterprise. (Fall;Spring) Pre-requisites: MT 2413. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3335. Optimization. 3 Semester Hours.
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. (Fall only) Pre-requisite: MT 2413. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3336. Applied Optimization & Stochastic Analysis. 3 Semester Hours.
Introduction to stochastic modeling. Conditional probabilities. Conditional expectations. Markov chains, Chapman-Kolmogorov equations and classification of states. Markovian decision process. Poisson process. Introduction to queuing systems. Birth-death processes. Queuing networks. Queuing decision models. Introduction to stochastic programming. Project planning CPM and PERT. Deterministic and stochastic dynamic programming. (Spring only) Pre-requisites: MT 4331. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3337. Supply Chain Management. 3 Semester Hours.
Fundamental principles, models, and techniques 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 and risk management. Revenue management and pricing. Facility location. Layout planning. Decision making under uncertainty for optimal profitability in the context of global outsourcing, international logistics, and international trade treaties. (Fall only)Pre-requisite: EG 3333. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3338. Logistics Management. 3 Semester Hours.
Measures of logistical systems performance, facilities location allocation, production/distribution system design, transportation network design – air, sea, road and rail networks, vehicle routing, hub-and-spoke network design, inventory-routing, location-routing, reverse logistics, international logistics and infrastructure, Incoterms, security issues, risk management, multi-modal transportation, 3PLs, 4PLs, sustainable logistics with an emphasis on mathematical modeling based on large-scale optimization models and solution approaches for the logistics network design and planning problems. (Spring only - Elective - may not be offered every Spring) Prerequisite: EG 3333.

EG 3339. Facility Layout and Material Handling. 3 Semester Hours.
Types of layout pertaining to production and distribution systems, distance metrics, layout planning and evaluation. Group technology, part families, cellular layout. Analysis and design of integrated material handling systems. Automatic storage and retrieval of unit loads. Material handling capacity analysis. (Spring only - Elective - may not be offered every Spring) Prerequisite: EG 1301, EG 2325, EG 3333.

EG 3345. Circuits and Systems. 3 Semester Hours.
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. (Fall; Spring) Pre-requisite: PY 2404; Pre- or Co-requisite: MT 3311. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3350. Software Design and Architecture. 3 Semester Hours.
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, reusability, reliability. Techniques for designing, building, and evaluating software architectures. (Spring only) Pre-requisite: EG 2311. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3351. Software Project Management. 3 Semester Hours.
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. (Fall only) Prerequisite: EG2311 (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3352. Software Quality Assurance and Testing. 3 Semester Hours.
Testing and quality control of software projects. Testing methodologies: Unit testing, integration testing, test driven development, compatibility testing, web site testing, alpha, beta, and acceptance testing. Testing tools. Developing test plans. Managing the test process. Problem reporting, tracking, and analysis. Defects vs. failures. Quality: how to assure it and verify it, and the need for a culture of quality. Avoidance of errors and other quality problems. Inspections and reviews. Testing, verification and validation techniques. Process assurance vs. Product assurance. Quality process standards. Product and process assurance. (Fall only) Prerequisite: EG 3350. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3356. Electronics I. 3 Semester Hours.
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. (Spring only) Prerequisite: EG 2352. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3357. Electronics II. 3 Semester Hours.
The second part of a two-semester course sequence, which focuses on analog electronic circuits. Differential and multi-stage amplifiers; feedback 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. (Fall only) Prerequisites: EG 2353 and EG 3356; Co-requisite: EG 3157. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3363. Microprocessors I. 3 Semester Hours.
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. (Fall only) Prerequisites: EG 1302 and EG 2341. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3364. Microprocessors II. 3 Semester Hours.
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. (Spring only) Prerequisite: EG 3363. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3366. Electromagnetic Theory. 3 Semester Hours.
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 electromagneticc fields; propagation of time¬ harmonic plane waves; Poynting 's theorem; wave attenuation in conductive and dissipative media; polarization; and dispersion. Introduction to transmission lines. (Spring only) Prerequisites: MT 3315, and EG 2353. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3368. Semiconductor Devices. 3 Semester Hours.
Review of quantum mechanics ;introduction to crystallography; energy band and charge carriers; physical properties of p-n junction; physical properties of diodes; physical behavior of Bipolar Junction Transistors (BJT) in active, saturation and cut off modes; physical behavior of Field Effect Transistors (FET) in pinch off, triode and off modes. (Fall only) Prerequisites: CH 1401, and EG 3356. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3372. Signals and Systems. 3 Semester Hours.
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, sampling. (Fall only) Prerequisites: EG 1102, EG 2353, and MT 3315. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3374. Computer Organization & Architecture. 3 Semester Hours.
Instruction set architecture; addressing modes and instruction formats. Arithmetic Logic Unit (ALU), datapaths, and control. Microprogrammed and hardwired control. CPU performance measures. Pipelining; pipelined datapath and control, pipeline hazards. memory hierarchy; basics of caches, cache performance, and principles of virtual memory. (Fall only) Prerequisite: EG 2341. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3380. Mechanical Design I. 3 Semester Hours.
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. (Fall only) Prerequisites: EG 2308, EG 2385; Pre- or Co-requisites: EG 2306 and EG 3381. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3381. Numerical Methods. 3 Semester Hours.
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. (Fall only) Prerequisites: EG 1302, EG 2308, MT 3311 and MT 3312 (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 3382. Heat Transfer. 3 Semester Hours.
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. (Spring only) Prerequisites: EG 2309 and EG 2386.

EG 3383. Experimental Methods. 3 Semester Hours.
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. (Fall only) Prerequisites: EG 2308, EG 2309, and MT 4332. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.).

EG 3384. Aerospace and Wind Power Structures. 3 Semester Hours.
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. (Spring only)Prerequisites: EG 2306, and EG 3380. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.).

EG 3387. Power Systems. 3 Semester Hours.
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 matching 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 systems. (Spring only) Prerequisites: EG 2309, and EG 2386. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.).

EG 3388. Intro to Biomechanical Engineering. 3 Semester Hours.
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. (Spring only) Prerequisites: MT3312, EG2308, EG2309.

EG 3392. Java and Applications. 3 Semester Hours.
Introduction to Java applications. Control structures and arrays in Java. Object-oriented programming principles: Encapsulation, abstraction, inheritance, and polymorphism. Objects and classes. Unified Modeling Language (UML). Strings and text manipulation. Exception handling. Graphics and Java 2D. Graphical User Interface (GUI) components. Layout managers. Event-driven programming. Abstract methods and interfaces. Java applets. Java libraries. Java database connection (JDBC). Extensive use of Java programming. (Fall only) Prerequisites: EG 1302 or CS 1310, and EG 1305. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.).

EG 4132. Computer Aided Manufacturing & Robotics Lab. 1 Semester Hour.
Operations and programming of stepper and servomotors; integration of discrete-event sensors with microcomputer interfaces. Programming, simulation, implementation, and applications of industrial robots and microcontrollers. Experiments on computer numerical control (CNC) programming and coordinate measuring machines (CMM). Solid modeling on CAD. Weekly written reports on experiments are required. (Fall; Spring) Co-requisite: EG 4332. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.).

EG 4138. Special Topics. 1 Semester Hour.

EG 4160. Energy Conversion Lab. 1 Semester Hour.
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. (Spring only) Prerequisite: EG 4360. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.).

EG 4166. Adv Electronics Design Lab. 1 Semester Hour.
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. (Spring only) Prerequisite: EG 3357; Pre- or Co-requisite: EG 4366. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.).

EG 4330. Quality Control & Reliability. 3 Semester Hours.
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. Benchmarking. Kaizen. Poka-yoke. Value stream mapping. Quality function deployment. Integration of Lean. (Fall only) Prerequisite: MT 4332. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a "C" or better in order to advance to the next sequenced course.).

EG 4331. Manufacturing Processes. 3 Semester Hours.
An overview of modern manufacturing process driven activities. Processing methods: casting, injection molding, assembling, machining, and etc. Concepts related to synergize manufacturability, assemblability, reproducibility, and repeatability, interdependently, to achieve goals of value-added manufacturing processes. Experiments on computer integrated design, manufacturing related to specific manufacturing processes are conducted. A design project is required. (Fall only) Prerequisite: EG 1301 and EG 2306 (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 4332. Computer Aided Manufacturing. 3 Semester Hours.
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. (Spring only) Prerequisite: EG 2325 and EG 4331. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 4337. Computer Simulation. 3 Semester Hours.
Discrete-event Monte Carlo simulation. Statistical data collection. Simulation modeling: model building, verification and validation. Output analysis. (Spring only) Prerequisite: MT 4332. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 4338. Special Topics I. 3 Semester Hours.

EG 4339. Special Topics II. 3 Semester Hours.

EG 4350. Digital Signal Processing. 3 Semester Hours.
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. (Spring only) Prerequisites: EG 3372. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 4352. Software Maintenance and Evolution. 3 Semester Hours.
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. (Spring only) Prerequisite: EG 3350. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 4356. Computer Networks. 3 Semester Hours.
Fundamentals of computer networking and data communication in the context of the OSI and TCP/IP reference models. 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 local area networks. Current trend in computer networking, design principles behind computer networks, the quantitative measures to gage the performance of computer networks, and major issues involved in designing high speed computer networks. (Spring only) Prerequisite: MT 4331. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 4360. Energy Conversion. 3 Semester Hours.
Three-phase circuits, magnetic circuits, transformers, electrical-mechanical transducers, dc motors, synchronous motors, induction motors, ac generators. Theoretical principles, mathematical models, operating characteristics, and practical applications of transformers, motors, and generators are emphasized. (Fall only) Prerequisites: MT 3311, EG 2353, and EG 3366 (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 4362. Senior Design Project I. 3 Semester Hours.
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, and 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. (Fall only) Prerequisites: senior standing in the major and consent of the academic adviser. Specific prerequisites by major: CE: EG 2382, EG 3357, EG 3364, and EG 3374 EE: EG 3357, EG 3364, and EG 4350 EM: FN 3310, EG 3333, EG 4330, and EG 4337 ES: Adviser consent IE: EG 3333, EG 4330, EG 4331, and EG 4337 ME: EG 2306, EG 2309, EG 3345, EG 3380, EG 3381, and EG 3384 or EG 3387 SE: EG 2310, CS 3340, EG 3350, EG 3351, and CS 4320 (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 4363. Senior Design Project II. 3 Semester Hours.
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. (Spring only) Prerequisite: enrollment in EG 4362 and completion of the first nine SMC Core courses. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 4366. Advanced Elec Design. 3 Semester Hours.
Advanced Electronic Design is a practical design course at the integrated circuit level. The topics include operational amplifier circuitry and feedback, active filters, oscillators, voltage regulators, linear and switching power supplies, precision and low noise techniques, and digital circuitry. (Spring only) Prerequisite: EG 3357. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 4369. Control Systems. 3 Semester Hours.
This course familiarizes students 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 model, 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, PID controllers, design using root-locus method, and frequency-response analysis. MATLAB and SIMULINK are used to aid in the analysis and design of control systems. The laboratory work is designed to introduce the student to modern techniques needed for the design and implementation of automatic control systems. (Fall only) Prerequisite: EG 3372. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 4370. Communication Theory. 3 Semester Hours.
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. (Spring only) Prerequisites: EG 3372 and MT 4331.

EG 4386. Engineering Thermodynamics II. 3 Semester Hours.
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. (Spring only - Elective - may not be offered every Spring) Prerequisites: EG 2309, EG 2386; Pre- or Co-requisite: CH 1402. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).

EG 4387. Parallel Programming. 3 Semester Hours.
Brief review of uniprocessor organization and architecture. Flynn taxonomy of parallel computers. Fundamental design issues in parallel processing. Interconnection networks, Parallelization process. Partitioning for performance. Data access and communication in a multi-memory system. Analysis of parallel algorithms. Performance issues from the processor perspective. Shared memory multiprocessors. Single level and multilevel cache hierarchies. Cache coherence issues, memory consistency, and synchronization. Snooping bus protocols. Distributed memory systems. Directory-based cache coherence. Parallel programming of distributed-memory systems using MPI. Parallel programming of shared-memory multi-core processors using Posix Threads (Pthreads) and OpenMP. (Spring only) Prerequisites: EG 2342 and EG 3374. (All courses serving as prerequisites in the School of Science, Engineering and Technology must be completed with a “C” or better in order to advance to the next sequenced course.).