

ENGINEERING (ENGR)

ENGR 1031 Fundamentals of Engineering 3 Credits

Attributes: MWID Magis Core: Writing in the Discipline

This course provides core engineering knowledge and competencies in a highly interactive class format. Topics include professional skills such as technical writing and presentation, guidelines for professional engineering practice, and career preparation. Introduction to the fields, roles, and industries of engineering also serves as a basis for selection of engineering major field. Hands-on team projects are core learning experiences. They form a structured introduction to the implementation of principles of design and engineering methodologies, system engineering management, and presentation skills. Guest presenters and field trips augment this course, which is taught by interdisciplinary faculty teams. Previously EG 0031.

ENGR 1060 Science, Technology, Engineering, and Mathematics of the Guitar 3 Credits

Fee: \$250 Engineering Lab Fee

This course looks at the design elements, manufacturing and assembly of solid-body electric guitars. Science, technology, engineering, and mathematics (STEM) concepts that relate directly to guitars are used to help students make an applied learning connection. Each student will construct their own electric guitar. Course will cover wood species and the environment, guitar headstock design features, chemistry of finishes, math applications in a guitar, physical science aspects of the guitar such as mechanical systems, concepts of sound waves, string tension, fretboard layout, intonation, and electronics. Studio-style class, lecture, and lab time combined throughout course. A lab fee applies to cover materials. Previously EG 0060.

ENGR 2130 Engineering Graphics I 3 Credits

This is a basic course in engineering graphics principles and is taught simultaneously with SolidWorks, a 3-D modeling design application. Using computer design, the course stresses orthographic projection, dimensioning, sectional views, 3-D part modeling, assembly modeling, drafting and engineering drawings, and geometric tolerance representation. Students will gain a working knowledge of SolidWorks in engineering design. Course requires a personal laptop running a 64-bit Windows 10 operating system. Previously EG 0130.

ENGR 2145 Mathematical Analysis 3 Credits

Attributes: EVAP Environmental Studies: Applied Professional Skills, EVPE Environmental Studies Elective

Corequisite: ENGR 2145P.

Prerequisite: MATH 1142.

In this course students will learn mathematical and numerical methods such as differentiation, integration, and Fourier analysis and how to apply these methods to solve scientific problems. Additionally, the course will cover statistics including data analysis, trend fitting, data correlation, and interpolation. Students will learn to use MATLAB as a tool but also become proficient in programming. Previously EG 0145.

ENGR 2145P Mathematical Analysis PLG 0 Credits

Peer learning group for ENGR 2145. Previously EG 0145P.

ENGR 3260 Robots 3 Credits

Prerequisite: PHYS 1171.

Introductory course in robotics develops understanding of how robotic systems integrate sensors, actuators, and control systems to achieve specific goals. Principles of autonomy, programming, wireless communications, sensor applications, mechatronics, electrical power, electric motors, pneumatics, structure, and locomotion will be understood and applied. Design of robotic subsystems will utilize multiple areas of knowledge. The course will involve application of statistical analysis to quantify robot performance. Service learning is an integral part of the course. All participants will participate in weekly mentoring of a youth robotics competition team to put into practice the principles learned in class, and to learn through community interaction from other students using robots to accomplish different feats. Previously EG 0260.

ENGR 4301 Feedback Control Systems 3 Credits

Prerequisites: ELEG 3301, MATH 2251.

This course emphasizes analysis and synthesis of closed loop control systems using both classical and state-space approaches with an emphasis on electro-mechanical systems. The mathematical requirements include the Laplace transform methods of solving differential equations, matrix algebra, and basic complex variables. The discussion of classical control system design includes the modeling of dynamic systems, block diagram representation, time and frequency domain methods, transient and steady state response, stability criteria, controller action [Proportional (P); proportional and integral (PI); Proportional, integral, and derivative (PID); and pseudo-derivatives feedback], root locus methods, the methods of Nyquist and Bode, and dynamics compensation techniques. The discussion of state-space methods includes formulation and solution (analytical and computer-based) of the state equations and pole-placement design. The course integrates the use of computer-aided analysis and design tools (MATLAB) so as to ensure relevance to the design of real world controlled electro-mechanical systems using case studies and applications to electrical and mechanical systems. Includes lab (hardware-based) exercises. Graduate equivalent: MEEG 5301. Previously EG 0300.

ENGR 4303 Industrial Automation 3 Credits

Prerequisite: ELEG 2213.

This course will give students an understanding of industrial automation concepts in the areas of process control, manufacturing, material handling, and others. Topics covered include sequential control, ladder logic, PLC systems and programming; industrial sensors; feedback control systems, PID and advanced control algorithms; distributed control systems, industrial networking, including network types and standards. Practical implementation of typical systems is discussed. The course will consist of lectures, case studies, and lab exercises. Graduate equivalents: ECEG 5303, MEEG 5303. Previously EG 0303.

ENGR 4305 Design of Mechatronics Systems 3 Credits

Prerequisite: Senior standing.

This course covers development of mechatronics theory and applications to systems dependent upon the integration of mechanical, electrical and computer engineering. Students assemble hardware components to create a product design that fulfills a specified task in a mechatronics system. Students develop design skills in mechanisms, electrical devices, and software to create, test, and verify system function. Graduate equivalent: MEEG 5305. Previously EG 0305.

ENGR 4330 Engineering Graphics II**3 Credits**

This course introduces CATIA Version 5, the leading CAD/CAM/CAE application used by automotive, aerospace, shipbuilding, and consumer goods industries. It provides mechanical, electrical, automotive, aerospace, and marine engineers and architects with the design tools to take products from concept to completion in one seamless application. This course covers basic solid modeling concepts of individual sheet metal and machined parts from detailed drawings. Complex Shape Modeling using wireframe concepts and surface-based modeling is covered. Building of assemblies of components and control of their positioning and orientation, as well as motion simulation is covered. Fully detailed production drawings of components and assemblies are also covered. Previously EG 0330.

ENGR 4360 Engineering Project Management**3 Credits**

Attributes: HASM Humanitarian Action Minor Skills/Method Course

This course concentrates on the general methodology of managing an engineering project from concept to operational use with emphasis on the functions, roles, and responsibilities of the project manager. Study of the basic principles and techniques related to controlling resources (i.e. people, materials, equipment, contractors, and cash flow) to complete a project on time and within budget while meeting the stated technical requirements. Through group and individual activities, including case study review and field work, students will learn to apply project management tools and techniques. The course will be taught by teaching each phase of project management as we complete the relevant aspects of the project in the field. There will be some classroom time for introducing concepts, and planning. However, the majority of time each day will be spent in the field executing the project, putting into practice the phases of project management. The course will prepare students with the ability to learn the necessary background information and hands-on technical skills, to be flexible and adaptable in difficult environments. These skills will be valuable in many areas, particularly in the planning and execution of humanitarian action and engineering in developing countries. Enrollment by permission only. Students must be able to study abroad. Previously EG 0360.

ENGR 4415 Engineering Applications of Numerical Methods**3 Credits**

Prerequisite: CPSC 1131.

Topics include root-finding, interpolation, linear algebraic systems, numerical integration, numerical solution of ordinary and partial differential equations, modeling, simulation, initial boundary value problems, and two point boundary value problems. Graduate equivalents: ECEG 5415, MEEG 5415. Previously EG 0315.

ENGR 4961 Senior Design Project I**3 Credits**

Prerequisite: Completion of all non-elective program courses; completion of other program requirements to enable graduation within the year of completion of ENGR 4962.

In this capstone course, students work in teams on advanced projects that emphasize engineering design with due attention to design constraints and engineering standards. The overarching scope of this course is to transform engineering students to practicing engineers. Under the guidance of a faculty instructor and a mentor, each team conducts literature searches, write a technical proposal and its members develop skills in information analysis and synthesis; they model and test prototypes of their devices, and make frequent oral and poster presentations of their work to faculty and peers, and submit timely progress reports. In the process, they receive instruction in effective communication and presentation practices, and develop an appreciation of teamwork and collective success. This two-semester sequence of courses begins in the fall of the academic year and concludes at the end of the spring term with a final team oral presentation and a final written report, and a working prototype of the team's project. It also includes sample hardware fabrication in the machine laboratory. Previously EG 0390.

ENGR 4962 Senior Design Project II**3 Credits**

Prerequisite: ENGR 4961.

In this capstone course, students work in teams on advanced projects that emphasize engineering design with due attention to design constraints and engineering standards. The overarching scope of this course is to transform engineering students to practicing engineers. Under the guidance of a faculty instructor and a mentor, each team conducts literature searches, write a technical proposal and its members develop skills in information analysis and synthesis; they model and test prototypes of their devices, and make frequent oral and poster presentations of their work to faculty and peers, and submit timely progress reports. In the process, they receive instruction in effective communication and presentation practices, and develop an appreciation of teamwork and collective success. This two-semester sequence of courses begins in the fall of the academic year and concludes at the end of the spring term with a final team oral presentation and a final written report, and a working prototype of the team's project. It also includes sample hardware fabrication in the machine laboratory. Previously EG 0391.

ENGR 4980 Internship**0-3 Credits**

Internships are off-campus experiential learning activities designed to provide students with opportunities to make connections between the theory and practice of academic study and the practical application of that study in a professional work environment. Internships offer the opportunity to "try out" a career while gaining relevant experience and professional connections. Internships are completed under the guidance of an on-site supervisor and a faculty member, who in combination with the student will create a framework for learning and reflection. Previously EG 0398.

ENGR 4990 Independent Study**1-4 Credits**

Previously EG 0399.

ENGR 5980 Internship**0-3 Credits**

Internships are off-campus experiential learning activities designed to provide students with opportunities to make connections between the theory and practice of academic study and the practical application of that study in a professional work environment. Internships offer the opportunity to "try out" a career while gaining relevant experience and professional connections. Internships are completed under the guidance of an on-site supervisor and a faculty member, who in combination with the student will create a framework for learning and reflection. Previously EG 0400.

ENGR 5990 Independent Study**1-4 Credits**