HOWARD PAYNE UNIVERSITY

THE SCHOOL OF SCIENCE & MATHEMATICS

ENGINEERING

OVERVIEW

The purpose of the School of Science and Mathematics is to provide programs and coursework to students in the fields of science, engineering, technology, and mathematics. The school also contributes course offerings for HPU's liberal arts and sciences general education curriculum. Undergraduate degrees are offered in the areas of biology, biomedical engineering, biomedical science, chemistry (with concentrations in biochemistry and forensic science), computer information systems, engineering science, information systems management, mathematics and software engineering.

COURSES DESCRIPTIONS

ENS 1101: Introduction To Engineering I

An introduction to the engineering profession, including ethics, design and teamwork, communication, estimation, and problem solving. One hour lecture per week. Fall.

ENS 1305: Engineering Computer-Aided Design Systems

Application of contemporary engineering computer-aided design (CAD) systems for measurements and control by means of interfacing sensors and DAQ devices. Students will develop skills to analyze, design, and build both real and virtual instruments for scientific data acquisition, real-time signal processing and engineering design control in a team environment. Two hours lecture and 2 hours lab per week. Fall.

ENS 1379: Engineering Principles And Practices

A course designed to begin development of engineering problem-solving skills in complement with computer tools. Three hours lecture per week. Spring.

ENS 2104, 2204, 2304: STEM Internship

A student undertakes an internship program in a company in which the operation is STEM (Science, Technology, Engineering and Mathematics) related. A site supervisor representing the company and academic advisor are appointed. The student is required to submit an abstract of proposed work/project for approval prior to beginning the internship. The student will orally present a report of the internship to a committee of at least three faculty and one student, including the academic advisor. The site supervisor is to provide a written evaluation of work

performance of the intern. Forty-five clock hours of serve per credit hour are required. No more than four hours may apply toward an Engineering Science degree. (Courses may be repeated for credit, but only four hours of STEM internship will apply to the Engineering science degree.) Fall, Spring, May, Summer.

ENS 2301: Statics
Force and moment vectors; equivalent force-couple systems; force equilibrium and free body diagrams; trusses; beams; cables; dry frictional forces; centroids and moments of inertia; distributed loads; hydrostatics. Spring.

ENS 2302: Dynamics
Position, velocity, and acceleration vectors; Newton's laws of motion; linear and curvilinear motion; particle and rigid body kinematics and kinetics; rotating reference frames; linear and angular momentum; work-energy; impulse-momentum; elastic and inelastic impact; vibrations and periods of oscillation. Fall.

ENS 2334: Engineering Economic Analysis
The course focuses on economic cost analysis and feasibility studies of engineering design projects and their implementation. Concepts and principles of engineering economics decision making including consideration of potential problems and issues with the design and implementation will be studied and possible solutions considered. Time value of money and other cash-flow concepts are also covered. Three hours lecture per week. Spring, even years.

ENS 3104: Special Topics In Engineering Applications
This course provides an in-depth understanding of specific topics or current issues within the engineering discipline. Through independent study, students will gather information about a current engineering topic or issue and analyze potential engineering applications relevant to the topic or issue. Hardware and/or computer-based design of a prototype is strongly encouraged. The selected choice requires instructor approval. Both written and oral reports are required. The course can be repeated for credit up to five times. Spring.

ENS 3306: Technical Writing For Engineering
This course is designed to give students an understanding of the basic concepts in the field of technical writing. It is especially designed to interest majors in Engineering. Spring, even years.

ENS 3331: Thermodynamics
Introduction to the fundamental principles of classical engineering thermodynamics. Application of mass and energy balances to closed and open systems including systems undergoing transient processes. Entropy generation and the second law of thermodynamics for closed and open systems. Introduction to phase equilibrium and chemical reaction equilibria. Ideal solution behavior. Three hours lecture per week. Fall.

ENS 3339: Mechanics Of Materials
Stress and strain in materials; axial deformation and Hooke's law; normal and shear stress/strain and the linear constitutive law; multi-axial loading; transformation of stress/strain and Mohr's circle; torsion of circular shafts; shear- and moment-diagrams for beams; beam stresses and deflections; statically indeterminate and composite beams; pressure vessels; columns; combined loading; and Castigliano's theorem. Two hours lecture and 2 hours lab per week. Fall

ENS 3351: Engineering Ethics
This course will examine ethical issues in engineering relating to professional and societal issues. Topics such as professional ethics codes, moral aspects of problem solving, responsibilities to employers, co-workers, clients, and the public will be discussed. Students will consider ethical solutions to scenarios drawn from various case studies as well as possible future ethical challenges in the engineering profession. Three hours lecture per week. Spring, odd years.

ENS 4109: Design Project Lab Proposal
Students, provided with a framework for an engineering design specification, will propose a solution to a specific design problem. Students will be required to hypothesize and search scientific and engineering literature for supporting materials, attend weekly design progress meetings, consider financial and ethical constraints and document findings in an engineering notebook. Using engineering standards, students will be required to provide a formal written design proposal and present this proposal orally. Students may work individually or in teams and the outcome used as a basis for implementation of the design in ENS 4369. 3 hours lab per week. Spring.

ENS 4309. Electrical Circuit Theory
This course presents the fundamental concepts and principles of electrical circuit theory. Students will study Ohm's law, Kirchhoff's laws, techniques of circuit analysis, Op-Amps, RC and RLC circuits and apply these concepts in practical

situations. Students will use Laplace and Fourier transforms to analyze circuits. Using PSpice, students are required to solve challenging circuit design problems. (SPICE: simulation program with integrated circuit emphasis). 2 hours lecture + 2 hours lab per week. Fall.

ENS 4344. Advanced Engineering Research and Development
The course offers a continuation of engineering project work in the direction of advanced research and development resulting in patent applications, conference participation, journal paper writing and other dissemination activities. Fall, Spring.

ENS 4369 and 4379: Engineering Design Project Lab I And II
A two-semester senior design project lab that emphasizes student integration of concepts learned throughout the curriculum. The goal is to familiarize students with the rigors of the engineering design process from initial conceptualizations to final implementation. Students work individually or in teams as they design, construct, and test their projects. Documentation in an engineering notebook is required as is a written and oral report showing the design details including market feasibility and ethical protocols for their product, prototype and/or simulation. 2 hours lecture and 3 hours lab per week. ENS 4369, Fall; ENS 4379, as needed. Prerequisites: ENS 4369: ENS 4109 and credit or concurrent in ENS 4309; ENS 2334, and ENS 3351. ENS 4379: ENS 4369, MAT 4441.