Engineering Science

ES 103 Introduction to Engineering

History of engineering. Overview of engineering specialties. Canon of Ethics. Economic analysis. Engineering design process and documentation. Graphing data, curve fitting, CAD. Written report formats. Oral presentation skills. May Term odd years. Prerequisite: MA 90.

ES 195 Special Topics (variable credit)

Topics and credits vary. See course schedule.

ES 204 Electrical Circuits

Introduction to electrical circuit analysis. AC/DC currents, Kirchoff's Laws, Ohm's Law. Resistive networks. Linear circuits. Power transfer. Filters and resonant circuits. Measurement techniques. Winter Term even years. Prerequisite: MA 250 or concurrent enrollment.

ES 205 Structural Statics

Structural elements. Truss-structures. Statically determinate beam structures. Area, centroids, moments of area. Stress/strain relationships. Measurement techniques. Fall Term odd years. Prerequisite: MA 250 or concurrent enrollment.

ES 206 Thermal Science

Introduction to engineering thermodynamics. Thermodynamic properties and states. 0th, 1st, 2nd Laws. Vapor and gas cycles. Psychrometrics. Winter Term odd years. Prerequisite: MA 250 or concurrent enrollment.

ES 230 Engineering Economic Analysis

Engineering cost-benefit estimation. Interest and equivalence. Present worth, annual cost, rate of return analysis. Depreciation and taxes. Replacement costs. Fall Term odd years. Prerequisite: ES 103.

ES 295 Special Topics (variable credit)

Topics and credits vary. See course schedule.

ES 303 Structural Analysis

Statically indeterminate structures. Beam bending, columns and buckling, shear stress/strain. Combined stresses. Introduction to finite element methods. Design component. Fall Term even years. Prerequisite: ES 205.

ES 304 Fluid Mechanics

Fluid properties and states. Continuity, Bernoulli equations, hydrostatics. Steady internal flow. Frictional losses. Similitude and dimensional analysis. External flows. Design component. Winter Term even years. Prerequisite: ES 206.

ES 305 Electronics and Digital Systems

Identical with PHY 305. Logic circuits, microprocessors, computer-based instrumentation. Diodes, amplifiers, FETs, BJTs, op-amps. Lab. Winter Term odd years. Prerequisite: ES 204.

ES 310 Dynamics

Kinematics and kinetics of particles, rigid bodies. Newtonian, work-energy, impulse-momentum methods. Fall Term odd years. Prerequisite: ES 205.

ES 320 Engineering Materials

Chemical, electrical, mechanical, physical properties of materials. Metals, ceramics, polymers, composites. Failure and degradation. Winter Term odd years. Prerequisites: CH 113; ES 205.

ES 350 Engineering Design Methods

Introduction to the engineering design process. Problem formulation. Preliminary, concept, configuration, parametric, detail design processes. Manufacturing processes, material selection, prototyping. Safety, failure, environmental impact, human factors. May Term. Prerequisites: ES 103 and three ES courses numbered 200 and above.

ES 360 Preliminary Design Project (½ course credit)

Student design project. Problem selection and formulation. Research of existing products/designs. Initial generation of alternatives, analysis, selection. Oral and written presentation of design reports. May repeat for a maximum of 1.5 course credits. Writing Intensive. Prerequisites: ES 350, third-year standing.

ES 371 Internship

Integration of classroom theory with planned and supervised periods of progressively challenging employment related to students' career objectives. Only one course credit applies toward an engineering science major. P/D/F only. Prerequisites: Third- or fourth-year standing, 2.0 cumulative GPA, 2.75 major GPA, department approval.

ES 372 Internship

Integration of classroom theory with planned and supervised periods of progressively challenging employment related to students' career objectives. Only one course credit applies toward an engineering science major. P/D/F only. Prerequisites: Third- or fourth-year standing, 2.0 cumulative GPA, 2.75 major GPA, department approval.

ES 395 Special Topics (variable credit)

Topics and credits vary. See course schedule.

ES 399 Supplemental Instruction: Engineering Science (½ course credit)

Teaching practicum in a specific area of study. Student SI leaders participate in leader training, attend classes for which they serve as leaders, prepare and lead study sessions that reinforce course content, model, teach effective study strategies. P/D/F only.

ES 402 Engineering Seminar (½ course credit)

Quantitative and qualitative cost-benefit analysis. Detailed examination of the Canon of Engineering Ethics. The Engineers' Creed. Application via case studies and current events. Capstone. Winter Term even years. Prerequisite: Third- or fourth-year standing.

ES 450 Independent Study (variable credit)

Instructor-approved independent study or research.

ES 460 Senior Design Project (½ course credit)

Detail design and realization of prototype or system. Oral, written, poster presentation. Writing Intensive. Winter Term. Prerequisite: ES 360 with a B or higher.

ES 495 Special Topics (variable credit)

Topics and credits vary. See course schedule.