

# GENERAL ENGINEERING (ENGR)

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**ENGR-COMP Senior Comprehensive Exam**  
(NULL credits) (Both Fall & Spring Semesters)  
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**ENGR-1001 STEM Fund of Robotcs & Makerlabs**  
(3 credits) (Fall Semester)

STEM Fundamentals of Robotics & Makerlabs (3) (F) This is an introductory "hands-on" lecture course that introduces basic STEM (Science, Technology, Engineering, and Math) concepts for non-STEM majors. The course will initially focus on basic electrical concepts including: electric charge, voltage, current and power. These concepts will be further developed and applied to the study of the basic components and how they are arranged in the electric circuits and systems that permeate our daily life. Hands-on activities will be used throughout the course to complement and reinforce the concepts taught during lectures. As the course progresses, students will be taught how to survive and even thrive in a "makerspace" by utilizing 3-D printing and building simple robots capable of performing various tasks. (NW)  
**Prerequisite(s):** MATH-1020 or equivalent.

**General Education Categories:** Understanding the Natural World

**ENGR-1200 Introduction to Engineering**  
(2 credits) (Fall Semester)

Introduction to Engineering (2) (F) This course reviews the origins and current state of the engineering profession and its four main disciplines. Students learn an engineering analysis process and a design process, review the use of units, develop problem-solving skills, practice technical communication skills, and apply professional skills, including teamwork, project management, and engineering ethics. An introduction to the laws of dynamics, kinematics, and thermodynamics provides students the background necessary to solve simple engineering problems.  
**Prerequisites or Co-requisites:** MATH-1250 or MATH-1300.

**ENGR-1500 Technical Drawing**  
(2 credits) (Spring Semester)

Technical Drawing (2) (S) This is a course in graphical communication, expression and interpretation applicable to engineering, sciences, and other technical fields of study. Computer Aided Design (CAD) is the primary computer drafting tool used in conjunction with manual instruments of drawing. The ability to visualize in three dimensions is developed through shape description, sketching and multi-view projection exercises. The course includes the engineering and architectural scales, engineering lettering, geometric constructions, and pictorial projections. Descriptive geometry, using geometric dimensioning and tolerancing standards, is an essential aspect of this course. CAD instruction covers making parts of varying complexity, functioning assemblies, and technical drawings. (VC)

**General Education Categories:** Visual Communication

**ENGR-1520 Intro to Engineering Design Laboratory**  
(1 credit) (Spring Semester)

Introduction to Engineering Design Laboratory (1) (S) This class is designed to facilitate student discovery of selected engineering aspects through hands-on projects. The goal of the class is to introduce the student to the following: design process, problem solving, electronics, programming, controls, and working in a team. Students will complete projects in which they will build and program robots and other devices, troubleshoot them, and demonstrate they have achieved the design objectives. **Prerequisite or Co-requisite:** ENGR-1500.

**ENGR-2000 Computer Applications in Engineering**  
(2 credits) (Fall Semester)

Computer Applications in Engineering (2) (F) This course introduces students to the fundamentals of computer programming to solve engineering problems. Students will learn to perform calculations using selection statements and loops, design structured programs using I/O, existing codes, and subroutines, and perform post processing.  
**Corequisite(s):** ENGR-1200.

**ENGR-2300 Statics**  
(3 credits) (Fall Semester)

Statics (3) (F) This course is an introductory course in mechanics that directs the student toward the use of Newtonian physics in the solution of statically determinate particles and rigid bodies when acted upon by outside forces. These solutions will result in the quantification of external forces, resultant forces, reactions and moments (or coupled forces) as well as associated positions for equivalent force systems. Must be one of the declared engineering majors or an Architecture major.  
**Prerequisite(s):** PHYS-2100 or PHYS-2000.

**ENGR-2310 Dynamics**  
(3 credits) (Spring Semester)

Dynamics (3) (S) Applies Newtonian Physics to study kinematics and kinetics of both particles and rigid bodies in plane motion. This includes: integral forms of Newton's 2nd Law (work/energy and impulse/momentum); solutions using both analytical and numerical techniques; use of Cartesian, path, and polar coordinate systems; non-constant mass systems. Must be a declared Mechanical, Civil, or Electrical Engineering major.  
**Prerequisite(s):** ENGR-2300 and ENGR-2000 or CIVL-2000.

**ENGR-2320 Mechanics of Materials**  
(3 credits) (Spring Semester)

Mechanics of Materials (3) (S) This course directs the student in the basic concepts of stress and strain that result from axial, transverse, torsional, and bending loads on bodies loaded within the elastic range. The student will be directed to the application and use of shear and moment equations and diagrams, combined stresses, Mohr's circle, and beam deflections. Must be declared Mechanical, Civil, or Architecture major.  
**Prerequisite(s):** ENGR-2300.

**ENGR-3150 Statistical Analysis of Data**  
(3 credits) (Both Fall & Spring Semesters)

Statistical Analysis of Data (3) (B) This course provides students with the basic statistical skills needed to draw legitimate conclusions from experimental data. It covers the fundamentals of probability theory and emphasizes several probability distributions: binomial, Poisson, exponential, normal, and lognormal. Students learn how to calculate confidence intervals, perform hypothesis tests, fit empirical models with linear regression, and perform analysis of variance. **Prerequisite or Co-requisite:** MATH-2300.

**ENGR-3170 Engineering Economy & Society  
(3 credits) (Both Fall & Spring Semesters)**

Engineering Economy & Society (3) (B) This course provides students with an understanding of the principles and methodology of engineering economics. It helps students develop proficiency with these methods in making practical design decisions. In particular, the course covers cost estimation techniques, the time value of money, depreciation and income taxes, evaluating projects with the benefit-cost ratio method, break even and sensitivity analysis, probabilistic risk analysis, capital budgeting process, and decision making formalities. Students engage in a regular and serious study of the influence of technological and innovative design decisions on persons, business endeavors, the environment, economies, and communities. (PC)

**General Education Categories:** Person & Community

**ENGR-3250 Thermodynamics  
(3 credits) (Spring Semester)**

Thermodynamics (3) (S) This course explores fundamental matter and energy relationships applied to both closed and open systems. Course topics include determination of thermodynamic properties, the laws of thermodynamics (zeroth, first, second), and basic cycles (power, refrigeration).

**Prerequisite(s):** PHYS-2100 and MATH-1350.

**ENGR-3300 Fluid Mechanics  
(3 credits) (Fall Semester)**

Fluid Mechanics (3) (F) This course provides the student an introduction to the static and dynamic properties of ideal and real fluids. Course topics include the application and use of continuity, energy, and momentum principles in the engineering and study of laminar, turbulent, compressible, and incompressible fluid flow. The study of laminar and turbulent flow of fluids in closed conduits and open channels; flow through orifices, weirs, and venturi meters; and flow in pipe networks and pumping systems are emphasized.

**Prerequisite(s):** MATH-2300, PHYS-2100, and either ENGR-2300 or CENG-2010.

**ENGR-3400 Materials Laboratory  
(2 credits) (Fall Semester)**

Materials Laboratory (2) (F) This course provides the student with the laboratory procedures common to the mechanical design area. Students will explore the methods and applications of mechanical property measurements, including torsion, tension, and bending tests. The course covers quantitative metallography, corrosion, heat treatment, strain gages, and mechanical property measurements. (WC)

**Prerequisite(s):** ENGR-2320 or ENGR-3500.

**General Education Categories:** Written Communication

**ENGR-3410 Thermofluids Laboratory  
(2 credits) (Spring Semester)**

Thermofluids Laboratory (2) (S) In this laboratory course, students apply fluid mechanics, thermodynamics, heat transfer, and statistics knowledge to develop and execute experimental designs. Preparation of experimental proposal memorandum and technical reports develops technical writing skills. (WC)

**Prerequisite(s):** ENGR-3150.

**Pre or Corequisite(s):** ENGR-3600.

**General Education Categories:** Written Communication

**ENGR-3500 Materials Science  
(3 credits) (Fall Semester)**

Materials Science (3) (F) This is a course in engineering materials and their applications. The technological uses of metals, ceramics, plastics, and composite materials are discussed and explained in terms of their basic atomic structure, and mechanical, thermal, electrical, and degradation properties. Material selection in engineering design is emphasized.

**Prerequisite(s):** CHEM-1200.

**ENGR-3600 Heat & Mass Transfer  
(3 credits) (Spring Semester)**

Heat and Mass Transfer (3) (S) This course provides an analytical study of the transport of energy via convection, conduction, and radiation, as well as mass; derivation and utilization of the differential equations of change; dimensional analysis; applications of heat and mass transfer principles to the design of heat and mass transfer equipment.

**Prerequisite(s):** ENGR-3300 or CENG-3300 and either ENGR-3250 or CENG-3250.

**ENGR-3901 Engineering for Human Development I  
(2 credits) (Discretion of Department)**

Engineering for Human Development I (2), II (1) (D) Design and build of an engineering project in a developing country. Community appraisal, initial project design, implementation, assessment and exit strategy will be developed during the fall semester. Final design and implementation will take place in the spring semester with delivery as part of the spring break mission trip. Includes readings on Catholic social teaching and human development and engineering technical content as pertains to the particular project. Open to engineering majors of all disciplines. Must have junior standing. Travel for installation of the project as part of the mission trip is encouraged, but not required. Students must complete both courses in the sequence to receive credit for an engineering elective.

**ENGR-3902 Engineering for Human Development II  
(1 credit) (Discretion of Department)**

Engineering for Human Development I (2), II (1) (D) Design and build of an engineering project in a developing country. Community appraisal, initial project design, implementation, assessment and exit strategy will be developed during the fall semester. Final design and implementation will take place in the spring semester with delivery as part of the spring break mission trip. Includes readings on Catholic social teaching and human development and engineering technical content as pertains to the particular project. Open to engineering majors of all disciplines. Must have junior standing. Travel for installation of the project as part of the mission trip is encouraged, but not required. Students must complete both courses in the sequence to receive credit for an engineering elective.

**ENGR-4150 Design Engineering Experiments  
(3 credits) (Discretion of Department)**

Design of Engineering Experiments (3) (D) This course builds on the statistical foundation of ENGR-3150. It focuses on the design and analysis of experiments including screening designs, full factorials, designs with blocking, response surface methods, linear regression, path of steepest ascent, mathematical modeling, and analysis of variance.

**Prerequisite(s):** ENGR-3150.

**ENGR-4799 Cooperative Education  
(1 credit) (Both Fall & Spring Semesters)**

Cooperative Education (0-6) (B)

**ENGR-4830 Project Engineering****(3 credits) (Discretion of Department)**

Project Engineering (3) (D) This course provides students with the skills and knowledge necessary to manage effectively an engineering project from initiation to completion. Students will learn the methodology and techniques of defining, planning, executing, controlling, and closing a project. Techniques for time estimating, scheduling, monitoring, and managing resources, risk, and contingencies will be emphasized.

**ENGR-4840 Quality Engineerg****(3 credits) (Discretion of Department)**

Quality Engineering (3) (D) This course utilizes the DMAIC methodology (Define, Measure, Analyze, Improve, and Control) as a framework to teach students to manage, control, and improve quality. The course provides a solid foundation in statistical process control (SPC) concepts such as process capability, control charts, etc. Students will apply statistical tools from previous courses (linear regression, design of experiments) and learn new techniques (components of variance and robust parameter designs) to reduce process variability and improve product quality.

**Prerequisite(s):** ENGR-3150.