

# ENGINEERING (ENGR)

## ENGR 3X1: Mat. Sci/Op. Research 1

**Credits:** 3

**College:** School of Design & Engineering

**Schedule Type:** Lecture

## ENGR 3XX: Engr Designated Elective

**Credits:** 3

**College:** School of Design & Engineering

**Schedule Type:** Lecture

## ENGR 101: Introduction to Engineering

This course is an introduction to engineering through hands on use of design, build and test modules in mechanical, industrial and architectural fields. The course helps the students to relate basic sciences to engineering applications. The course makes an introduction to programming logic, engineering design, materials, workshop skills, engineering ethics and technical presentation. Visits to engineering industries and professional society meetings will be arranged.

**Credits:** 3

**College:** School of Design & Engineering

**Schedule Type:** Lab, Lecture, Lecture/Lab

## ENGR 102: Engineering Drawing

This course introduces students to engineering drawing, descriptive geometry, design and problem solving. Engineering drawing is a graphic language that can convey, with exactness and detail, ideas from the design engineer to the fabricator. Thus, the emphasis of the course is on communicating design ideas through engineering drawings.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** MATH 102 or MATH 110 or MATH 111 [Min Grade: D]

**Schedule Type:** Lab, Lecture

## ENGR 104: Introduction to Computing

An introductory course which provides a coherent and comprehensive treatment of fundamental concepts of computer science. It describes how computing systems work and how they are applied to solve real-world problems. The main emphasis is on the design of algorithms and procedural abstraction. High-level, language-programming projects.

**Credits:** 3

**College:** School of Design & Engineering

**Schedule Type:** Lecture

## ENGR 210: Intro to Materials Science

A study of the relationship between structures and properties for common engineering materials, including metals, polymers, ceramics, and composites. Mechanical behavior temperature effects, heat treatment, corrosion, electrical, and other properties are covered.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** (MATH 110 or MATH 111) and (CHEM 103 and CHEM 103L) [Min Grade: D]

**Schedule Type:** Lecture

## ENGR 215: Engineering Statics

Engineering statics describes the mechanical behavior of materials and systems in equilibrium using Newton's laws of motion. In this course, students will learn the principles of force equilibrium, how to construct free-body diagrams, understanding distributed forces, friction and introductory structural response.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** PHYC 201 and PHYC 201L [Min Grade: D]

**Schedule Type:** By Appointment, Lecture, Lecture/On-Line, On-Line

## ENGR 217: Human Factors Engineering

**Credits:** 3

**College:** School of Design & Engineering

**Schedule Type:** Lecture

## ENGR 218: Engineering Dynamics

Engineering dynamics describes the motions of particles and rigid bodies and the forces that accompany or cause those motions. Basic methods include Newton's laws, the work and energy principle, and the impulse and momentum principle.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** ENGR 215 and MATH 112 and PHYC 201 and PHYC 201L [Min Grade: D]

**Schedule Type:** Lecture

## ENGR 301: Mechanics of Materials

Internal forces; stress, strain and their relations; stresses and deformations in axially loaded members; stresses and deformations in torsionally loaded members; stresses and deformations in flexural members; combined stresses; column analysis; statically indeterminate members; introduction to member design.

**Credits:** 3

**College:** School of Design & Engineering

**Schedule Type:** By Appointment, Lecture

## ENGR 302: Design for Manufacturability

This course focuses on the design process; interaction of materials, processes and design; economic considerations; design considerations for machining, casting, forging, extrusion, forming, powder metallurgy; designing with plastics; design for assembly; projects and case studies.

**Credits:** 3

**College:** School of Design & Engineering

**Schedule Type:** Lecture

## ENGR 303: Engineering Economics

This course is designed to provide the engineering student with the decision-making skills necessary to evaluate the monetary consequences of the products, processes and projects that engineers design. Decisions must balance economics, performance, aesthetics and resources. As the capital outlays may be significant and affect the productive potential of a firm over the long term, it is important to understand the time value of money. The course emphasizes calculations of present values, future worth, internal rates of return and replacement analysis. In addition to the specific financial concepts covered, the student will construct computer spreadsheets to do sensitivity analysis and generate graphs to enhance presentation skills.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** ENGR 305 [Min Grade: D]

**Schedule Type:** By Appointment - 1 student, Lecture, On-Line

**ENGR 304: Operations Research I**

This course addresses the philosophy and techniques of operations research. Emphasis is placed on elementary model building and concepts of optimization; structure of problem solving; linear programming, transportation and assignment algorithms; game theory; network analysis, branch and bound theory.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** ENGR 305 and MATH 112 [Min Grade: D]

**Schedule Type:** Lecture

**ENGR 305: Engineering Statistics**

This course addresses the fundamentals of probability and distribution theory with application to various branches of engineering; basic probability theory, discrete random variables, continuous random variables, independent random variables, covariance and correlation and linear combinations of random variables. Statistical decision theory including significance testing and estimation, confidence intervals, design and perform tests of hypotheses on population means, standard deviations and proportions.

**Credits:** 3

**College:** School of Design & Engineering

**Schedule Type:** Lecture

**ENGR 307: Engineering Statistics II**

This course is a continuation of EN505 Engineering Statistics, and it is required for the BSISE and the BSE with minor in ISE. Application of statistical techniques to industrial problems; relationships between experimental measurements using regression and correlation theory and analysis of variance models; design of experiments with one and more than one levels; emphasis on inherent variability of production processes; control chart techniques and the use of exponential and Weibull models in reliability analysis; statistical process control.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** ENGR 305 [Min Grade: D]

**Schedule Type:** Lecture

**ENGR 308: Integrated Engr Product Dev. I**

ENGR 308 Integrated Engineering Product Development I The IEPD two-course sequence combines the perspectives of design, engineering and marketing in the product development process in a hands-on, collaborative environment. Throughout the course students will be working in groups to design, develop, prototype and analyze economic and marketing aspects of engineered products. Students will be prepared to use modern engineering tools including rapid prototyping, CNC machine tools, CAD based product lifecycle analysis and management, costing and market data analysis.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** MATH 112 and ENGR 104 and ENGR 102 [Min Grade: D]

**Schedule Type:** Lab, Lecture

**ENGR 309: Integrated Engr Prod Dev. II**

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** ENGR 308 [Min Grade: D]

**Schedule Type:** Lab, Lecture

**ENGR 311: Fluid Mechanics**

The fundamentals of fluid mechanics. Topics include fluid statics, control-volume analysis, the Navier-Stokes equations, similitude, viscous, inviscid and turbulent flows and boundary layers.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** ENGR 218 [Min Grade: D]

**Schedule Type:** Lecture

**ENGR 314: Numerical Meths for Engineers**

Numerical methods are used to solve mathematical problems that are often impossible to solve analytically. Numerical methods enable formulating engineering problems so that they can be solved by arithmetic operations. Problems with large systems of equations, nonlinearities and complicated geometries that are encountered in engineering can be solved by the use of numerical methods and programming using computers. The emphasis of this course is the use of personal computers to solve mathematical problems.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** MATH 225 and ENGR 104 [Min Grade: D]

**Schedule Type:** By Appointment - 1 student, By Appointment - 2 students, Lecture

**ENGR 316: Intr & Materials for Composi**

An overall introduction to composites will be presented including their mechanical properties and advantages. Fiber reinforcements will include pre-pregs and textile composites. Composites design and various molding techniques will be covered. The laboratory will have various manufacturing and experimental exercises.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** ENGR 215 [Min Grade: D]

**Schedule Type:** Lab, Lecture, Lecture/Lab

**ENGR 317: Composites Manufacturing**

This course will be a laboratory intensive course that will include material selection and tooling types. Materials will include pre-pregs and woven and braided performs. Key issues in tool design, bond assembly jigs and secondary tooling, hand layup, tape layup and fiber placement, bag molding and autoclaving, compression molding, pultrusion, RTM, VaRTM, mechanical property tests, manufacturing defects and quality control will be covered.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** ENGR 316 [Min Grade: D]

**Schedule Type:** Lab, Lecture

**ENGR 322: Fund. of Elect. Engineering I**

This course explores the analysis of circuits; transient and steady state phenomena; and general analysis techniques; and the fundamentals of direct and alternating circuits, transformers rotating machinery, electrical and electronic control, and electrical energy.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** PHYC 203 and PHYC 203L and MATH 111 and MATH 112 [Min Grade: D]

**Schedule Type:** Lecture

**ENGR 371: Special Topics**

An upper-level course designed to take advantage of resident/adjunct/visiting faculty members' expertise or a special focus wanted by the School for one or two terms. These courses might provide an in-depth treatment of recent advances in subjects of current interest in a given field whose subject matter is not necessarily needed to be offered long term. A specific "topic" may be delivered a maximum of two term.

**Credits:** 3

**College:** School of Design & Engineering

**Schedule Type:** Independent Study, Lecture

**ENGR 381: Independent Study in Engr I**

**Credits:** 3

**College:** School of Design & Engineering

**Schedule Type:** Independent Study

**ENGR 382: Independent Study in Engr II**

**Credits:** 3

**College:** School of Design & Engineering

**Schedule Type:** Independent Study

**ENGR 399: Engineering Design Seminar**

The purpose of the Engineering Design Seminar is to support student success as Engineering students prepare to move into their senior design experience. As a pre-requisite for the Engineering senior design experience, the course is built around didactic and experiential educational components, pre-project research assignments, and independent research. Included in the course are elements that teach and reinforce the project proposal process, refine technical report writing skills, and promote lifelong learning and continuing professional development.

**Credits:** 0.5

**College:** School of Design & Engineering

**Prerequisites:** ENGR 311 and ENGR 322 [Min Grade: D]

**Schedule Type:** Lecture

**ENGR 404: Composites Design Analysis**

The factors which govern analytical composite design will be discussed. Two dimensional stress strain relationships along the planar axes of the composites, orthotropic material constitutive relationships will be investigated. The course includes instruction in finite element analysis for composites including complex structures which include core materials. The various accepted failure criteria including maximum stress, Tsai-Hill, and Tsai-Wu criterion will be compared. A procedure for laminate strength analysis and failure envelopes will be introduced.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** ENGR 301 and ENGR 316 and ENGR 317 [Min Grade: D]

**Schedule Type:** By Appointment, Lecture

**ENGR 405: Engineering Simulations**

Finite Element Analysis (FEA) is a computer-based numerical technique for simulating and analyzing engineering products and systems. In this course, students will mainly explore the use of FEA to obtain stress/strain characteristics of typical machine elements. Following a brief recap of matrix algebra, developing stiffness matrices, constraints, shape functions, material properties, and others will be discussed. FEA results will be compared with predictions by classical stress equations. Students will also be introduced to thermal and fluid flow analysis using FEA. In addition to FEA, the course will have hands-on experiments with strain gauges and photoelastic analysis of stress levels in a few machine elements.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** ENGR 301 [Min Grade: D]

**Schedule Type:** Lecture

**ENGR 406: Compo Struc Indust & Consu Ap**

Analysis of composites for use in automotive, other mechanical structures will be addressed. The focus will be on system design, structure design and engineering economics associated with actual composite structures and systems.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** ENGR 303 and ENGR 316 and ENGR 404 [Min Grade: D]

**Schedule Type:** Lecture

**ENGR 498: Senior Design Project I**

This course exposes the students to a series of real-world industry problems that require applications of Industrial Engineering principles. A preliminary analysis of various selected problems will be performed collectively. The students will then form a team and select their senior design project. The course also covers (through invited speakers) topics related to the engineering profession such as ethics, intellectual property, project management and social responsibility. Students will present a written and oral proposal of their senior design project preparation.

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** WRIT 211 or WRIT 215 or WRIT 217 or WRIT 201 or WRIT 202 [Min Grade: D]

**Schedule Type:** By Appointment - 1 student, Lab, Lecture, Lecture/Lab

**ENGR 499: Senior Design Project II**

Students in this course will apply engineering principles to solve a real-world problem. Student works as member of a team assigned to a problem in a manufacturing, processing, service or government organization. The capstone senior design project will consist of a project that builds on engineering, business, ethics and social issues. This course requires a professional written and oral report and will serve as the program's major writing intensive course. [Writing Intensive]

**Credits:** 3

**College:** School of Design & Engineering

**Prerequisites:** ENGR 498 [Min Grade: D]

**Schedule Type:** By Appointment - 1 student, Lab, Lecture