

## ENGR: Courses in Engineering

### Department of Mathematics, Engineering, and Computer Science

#### ENGR 104 Engineering Graphics & CAD Applications 3 Cr

An introduction to modern computer drafting and engineering design using a CAD (computer aided design) software system. Fundamental concepts of technical drawing in two and three dimensions including orthographic projections, isometric projections, three-dimensional and solids modeling, and rendering. Spring Semester.

#### ENGR 201 Engineering Design Process 1 Cr

An introduction to civil engineering and the engineering process. A project-oriented course including proposal-writing, preparing and giving presentations, problem formulation, project scheduling, contract documents, and bid procedures. Fall semester.

#### ENGR 202 Water Distribution Systems 1 Cr

An introduction to water distribution theory and design practice. A project-oriented course that includes water supply, storage, distribution, and computer analysis of water distribution networks. Spring semester.

#### ENGR 302 Engineering Mechanics I: Statics 3 Cr

Equilibrium of bodies under the action of forces. Force systems and resultants; equilibrium of mechanical systems; trusses, frames, and machines; centroids and centers of mass; shear and moments in beams; hydrostatics; friction; and virtual work. Introduction to mechanics of solids and computer analysis of structures, as time permits. Emphasis on solving practical engineering problems in complete, documented style. Prerequisite: PHYS 205. Spring semester.

#### ENGR 303 Engineering Mechanics II: Solids 3.5 Cr

An introduction to the mechanics of deformable solids. Topics covered include stress, strain, rotation-of-axes transformations, constitutive relations, equilibrium, compatibility requirements, stability, and deformation of structural elements. Uni-axial, torsion, bending, and shear loads on and deformations of prismatic bars are also studied together with Euler buckling of slender columns. Three credits of lecture and one-half credit of laboratory. Prerequisites: ENGR 302 and MA 334. Fall semester.

#### ENGR 304 Engineering Mechanics III: Dynamics 3 Cr

Continuation of ENGR 301. Motions of bodies under the action of forces; kinematics and kinetics of particles, systems of particles, and rigid bodies; work-energy and impulse-momentum; area and mass moments of inertia. Emphasis on solving practical engineering problems in complete, documented style. Prerequisites: ENGR 301 and MA 334. Spring semester.

#### ENGR/PHYS 305 Electronics and Circuit Analysis I 4 Cr

An introductory course providing fundamental knowledge for students planning engineering or scientific careers. Review of current, voltage, and passive circuit elements (resistors, capacitors, and inductors). Kirchhoff's laws, network theorems, and basic network analysis. General characteristics of amplifiers and electronic instrumentation. Introduction to operational amplifiers and active elements (transistors). Laplace transform analysis of transient response and complex phasor analysis of sinusoidal steady-state response. Three (3) hours lecture and one two-hour laboratory per week. Prerequisites: PHYS 206 and MA 334. Fall semester.

#### ENGR/PHYS 306 Electronics and Circuit Analysis II 4 Cr

A continuation of ENGR/PHYS 305, especially recommended for students planning 3-2 programs or graduate study in electrical engineering. Systematic node-voltage and mesh-current methods of circuit analysis. Network transfer functions and frequency spectra. Resonance, complex power, mutual inductance, and transformers. Diode circuits and detailed analysis of amplifiers using bipolar-junction and field-effect transistors. Three (3) hours lecture and one two-hour laboratory per week. Prerequisite: ENGR/PHYS 305. Spring semester, if sufficient demand.

#### ENGR 307 Fluid Mechanics 3 Cr

A first course in fluid mechanics for engineering majors. Topics covered include fluid properties, fluid statics, fluid motion, pressure variations in fluid flows, momentum principles, energy principles, dimensional analysis and similitude, surface resistance, flow in conduits, flow measurements, drag, and lift. Two and one-half credits of lecture and one-half credit of laboratory. Prerequisites: MA 334 and ENGR 302. Fall semester.

#### ENGR/PHYS 308 Thermodynamics 3 Cr

A practical introduction to thermodynamics for engineering students. Fundamental state variables are defined (e.g., temperature, pressure, energy, enthalpy, entropy, etc.), and the three laws of thermodynamics are extensively discussed and illustrated. Applications include power systems, gas turbines, and refrigerators. Three (3) hours lecture per week. Prerequisites: PHYS 205-206 and MA 334. Spring semester.

#### ENGR 309 Geotechnical Engineering 3.5 Cr

An introduction to geotechnical engineering. Topics covered include an introduction to geology and the classifications of soils, and rocks, and geologic structures. Soil exploration, testing, and classifications are introduced, and soil characteristics and mechanical properties such as compressibility and compaction, permeability and seepage, and stresses in soil structures are also studied. Three credits of lecture and one-half credit of laboratory. Prerequisites: ENGR 303 and ENGR 307. Spring semester.

#### ENGR 310 Structures I 3 Cr

This is the first in a series of three courses in structural analysis and design. The primary objective of this course is to introduce the principles and methods of analysis for trusses, beams, and frames so that students develop the understanding and the skills necessary to analyze and design statically determinate as well as statically indeterminate structures. While emphasis is on modern computer methods of analysis, elementary methods are also studied so students gain an understanding and "feel" for the behavior of structures. Prerequisites: ENGR 303. Spring Semester.

#### ENGR 313 Hydrology 3 Cr

This course focuses primarily on the basic principles of the hydrologic cycle such as precipitation, hydrologic abstractions, catchment properties, groundwater flow, and the relationships between precipitation, abstractions, and runoff. A brief portion of the course deals with the measurement of various components of the hydrologic cycle. The engineering applications of basic hydrologic principles are studied. The purpose of this course is to introduce the fundamentals of hydrologic science, which are used to solve typical engineering problems. Prerequisites: MA 334 and PH 205. Fall semester.

**ENGR 401 Hydraulics 3 Cr**

Hydraulic engineering is the application of fluid mechanic principles to deal with collection, storage, conveyance, distribution, control, regulation, measurement, and use of water. This course will focus primarily on analysis and design of pipelines, pumps, and open channel flow systems. The course will also have a design project to provide an opportunity to apply the information in a real engineering situation. Three class hours per week. Prerequisite: ENGR 307 Fluid Mechanics. Fall semester.

**ENGR 402 Environmental Engineering 3 Cr**

This course focuses on environmental problems, including their causes, the scientific background needed to understand them, and the methods used to solve them. The fundamental principles of environmental engineering, including sources of water and air pollution, water and wastewater treatment, solid and hazardous waste management, and regulatory issues are presented. Three class hours per week. Prerequisites: general chemistry and calculus. Spring semester.

**ENGR 403 Structures II (LRFD Steel Design) 3 Cr**

The purpose of this course is to learn the philosophy and methods of AISC Load and Resistance Factor Design (LRFD) of steel structures. Emphasis is on the determination of loads and load distribution, and the design of structural components (i.e., tension members, compression members, beams, and beam-columns) and their connections, in accordance with the AISC LRFD Specification and the LRFD Manual of Steel Construction. The function and behavior of simple frame structures is also introduced and each student works on a team to complete a design project (a simple, two story structure for an office building). Three class hours per week. Prerequisite: ENGR 310. Fall semester.

**ENGR 405 Water and Wastewater 4 Cr**

This course focuses on the fundamental principles for analysis and design of water processing, water distribution, wastewater collection, wastewater treatment, and sludge processing systems. Three class hours and two lab hours per week. Prerequisites: ENGR 313 and ENGR 401. Spring semester.

**ENGR 406 Structures III (Reinforced Concrete Design) 2 Cr**

The purpose of this course is to learn the philosophy and methods of ACI strength design of reinforced concrete structures. Emphasis is the design of concrete structural elements including beams, one-way slabs, and columns. The student works on a team to complete a simple design project. There are two class hours per week. Prerequisite: ENGR 403. Spring semester.

**ENGR 407 Transportation Engineering 3 Cr**

This is an introductory level transportation-engineering course. The class will discuss traffic characteristics, transportation planning, geometric design of highways, drainage design, traffic safety, highway materials, and pavement design. Three class hours per week. Prerequisites: Differential and integral calculus, probability and statistics. Fall semester.

**ENGR 411 Senior Design Project I 1 Cr**

This course requires the students, working in teams, to take an actual engineering project from the initial proposal stage through the preliminary design phase. Students will conduct the necessary activities and prepare the various documents needed to complete the preliminary design. One class hour per week. Fall semester.

**ENGR 412 Senior Design Project II 2 Cr**

A continuation of ENGR 411, the design process will continue from the preliminary phase to the completion of a conceptual design of the project. The students, working in teams, will prepare design criteria, calculations, and representative engineering drawings of the project's major components. A list and general description of the many details and other miscellaneous activities required to complete the project will also be prepared. Finally, general cost estimates will be computed. Two class hours per week. Prerequisite: ENGR 411. Spring semester.