Lower Division

ENGR 1618 Introduction to Engineering I (2)
This course will provide an introduction to the practice of engineering and the various areas within the engineering disciplines. Students will be informed of engineering curricula and career opportunities within the various engineering disciplines. This course will also introduce students to important topics for academic success, both at the major level and at the university level. 100 minutes lecture. (GE FYS)

ENGR 1628 Introduction to Engineering II (2)
This course builds on the foundational skills in engineering design and practices developed in ENGR/ECE 1618. Students will design, build, test, and present engineering projects designed to solve specified problems within given constraints. Additionally, the impact of engineering from a global, social, economic, and environmental perspective is presented through case studies. 100 minutes lecture/discussion. Prerequisite: ENGR/ECE 1618. (GE FYS)

ENGR 2070 Electric Circuits (4)
An introduction to the analysis of electrical circuits. Use of analytical techniques based on the application of circuit laws and network theorems. Analysis of DC and AC circuits containing resistors, capacitors, inductors, dependent sources and/or switches. Natural and forced responses of first and second order RLC circuits; the use of phasors; AC power calculations; power transfer; and energy concepts. 150 minutes lecture and150 minutes laboratory. Prerequisites: PHYS 2220 with a grade of C- or better.

ENGR 2110 Analytic Mechanics - Statics (3)
Introduces students to fundamental principles of force systems acting on particles and rigid bodies in static equilibrium. Applications to structural and mechanical problems, both two-dimensional and three-dimensional. 150 minutes lecture/discussion. Prerequisite: PHYS 2210 with a grade of C- or better. Pre-requisite or Co-requisite: MATH 2320 or 2520.

ENGR 2120 Analytic Mechanics - Dynamics (3)
Topics include vector representation of kinematics and kinematics of particles; Newton's laws of motion; force-mass-acceleration, work-energy, and impulse-momentum methods; kinematics of systems of particles; kinematics and kinetics of rigid bodies. 150 minutes lecture/discussion per week. Prerequisites: ENGR 2110 with a grade of C- or better.

ENGR 2130 Mechanics of Materials (3)
This course covers stress and strain and mechanical properties of materials. The axial load, torsion, bending and transverse shear; combined loadings; stress transformation; pressure vessels, deflection of beams and shafts; and buckling of columns are reviewed as well. 150 minutes lecture/discussion per week. Prerequisites: ENGR 2110 with a grade of C- or better.

ENGR 2140 Properties of Materials (4)
Introductory course to engineering materials. The student will develop an understanding of the atomic structure of the major classes of materials. The properties (mechanical, thermal, optical, and electrical) of metals, polymers, ceramics, and electronic materials will be reviewed. The student will understand the effect of processing in the internal structures of materials. It is expected that at the end of the course the student will understand material deterioration and failure processes. 150 minutes lecture/discussion and 150 minutes laboratory per week. Prerequisites: PHYS 2210, CHEM 1000 and 1001, all with a grade of C- or better.

ENGR 2350 Engineering Graphics (2)
This course covers the principles of engineering drawings in visually communicating engineering designs and an introduction to computer-aided design (CAD). Topics include the development of visualization skills; orthographic projections; mechanical dimensioning and tolerancing practices. Assignments develop sketching and 2-D CAD skills. The use of CAD software is an integral part of the course. 50 minutes lecture/discussion and 150 minutes laboratory per week.

ENGR 2360 Intermediate CAD in Engineering (2)
Intermediate topics in computer-aided design using CAD software. Introduction to 3-dimensional drawing and modeling with engineering applications, adding text to drawings, creating dimensions, using blocks and external references, managing content, creating a layout to plot, and plotting your drawings. 50 minutes lecture/discussion and 150 minutes laboratory per week. Prerequisite: ENGR 2350 with a grade of C- or better.

ENGR 2700 Special Topics in Engineering (1-3)
Topics and prerequisites to be announced. May be repeated for different topics.

Upper Division

ENGR 3070 Principles of Electronics (3)
Introduces basic analog circuit designs that emphasize practical applications. Includes properties of diodes and transistors; operational amplifies for use as filters, amplifiers, oscillators, and function generators. 100 minutes lecture/discussion and 150 minutes laboratory per week. Prerequisites: PHYS 2070 or ENGR 2070 or ECE 2070 with a grade of C- or better.

ENGR 3110 Thermodynamics (4)
Study of the first law of thermodynamics, properties of pure substances, entropy, the second law of thermodynamics, reversible and irreversible processes, availability (exergy), ideal vapor power cycles, ideal gas power cycles, and refrigeration and heat pump cycles. 150 minutes lecture/discussion and 150 minutes laboratory per week. Prerequisites: PHYS 2220, CHEM 1000 both with a grade C- or better.

ENGR 3120 Fluid Mechanics (4)
Hydrostatics and fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, laminar and turbulent flow, compressible flow. Experiments involving flow measurement and control, conservation equations, pressure and velocity distributions, dimension analysis lift and drag. 150 minutes lecture/discussion, one 150 minutes laboratory. Prerequisites: ENGR 2120 and 3300, both with a grade C- or better.

ENGR 3300 Engineering Modeling and Analysis (3)
Formulation of mathematical models for engineering systems; applying mass, momentum, and energy balances to derive governing differential equations; solution of differential equations and eigenvalue problems typically encountered within an engineering context; fitting linear and nonlinear models to experimental data; concepts in probability and statistics. 150 minutes lecture/discussion. Prerequisites: PHYS 2220, and MATH 2320 or 2520, both with a grade of C- or better.

ENGR 3310 Numerical Methods and Applications in Engineering (3)
Formulation and solution of mathematical models for engineering systems, continuation from ENGR 3300. Numerical methods including: interpolation and polynomial approximation, numerical differentiation and integration, numerical solution of ordinary differential equations. Advanced methods in a numerical computing environment and computer-aided design. 100 minutes lecture/discussion and 150 minutes laboratory per week. Prerequisite: ENGR 3300 with a grade of C- or better.

ENGR 3400 Soil and Water Resource Management (3)
Soil and water management systems and practices including hydrology, surface drainage, open channels, and erosion, subsurface drainage, impoundments and irrigation. 150 minutes lecture/discussion per week. Prerequisites: ENGR 2110. Prerequisite or corequisite: ENGR 3300 with a grade of C- or better.

ENGR 3410 Agricultural Machines and Instrumentation (4)
Introduces students to application of machine systems and instrumentation to agricultural production and biological processing. Functional design and analysis of equipment. This course is designed to provide a broad foundation for understanding machine system and instrumentation. Machine systems are an integral part of many agricultural operations from field production to post-harvest processing, storage, transportation, and bio-based processing. 150 minutes lecture/discussion and 150 minutes laboratory per week. Prerequisites: ENGR 2110 with a grade of C- or better.

ENGR 4110 Heat Transfer (4)
Introduces the analysis of steady and transient heat conduction, forced and natural convection, radiation heat transfer, and design of heat exchangers. Analytical and numerical methods in heat transfer and fluid mechanics. Topics include heat conduction and convection, gaseous radiation, boiling and condensation, general aspects of phase change, mass transfer principles, multimode heat transfer and the simulation of thermal fields, and the heat transfer process. 150 minutes lecture/discussion and 150 minutes laboratory per week. Prerequisites: ENGR 3110 and 3120.

ENGR 4120 Machine Design (4)
This course is an introduction to the principles of mechanical design. Methods for determining static, fatigue, and surface failure are presented. Analysis and selection of machine components such as shafts, keys, couplings, bearings, gears, springs, power screws, and fasteners is covered. 150 minutes lecture/discussion and 150 minutes laboratory per week. Prerequisites: ENGR 2120, 2130, both with a grade C- or better.

ENGR 4200 Operations Research (3)
Introduction to deterministic optimization modeling and algorithms in operations research. Emphasis on formulation and solution of linear programs, networks flows, and integer programs. Introduction to probabilistic models in operations research. Emphasis on Markov chains, Poisson processes, and their application to queueing systems. 150 minutes lecture/discussion per week. Prerequisites: MATH 2310 or 2510 with a grade of C- or better.

ENGR 4220 Project Management (3)
Projects are unique, strategically important, complex endeavors with definite beginning and ending dates. The course develops the skills required to manage the component processes of a project throughout its life cycle: scope, time and sequencing, cost, quality, human resources, communications, risk, procurement, and project integration management. The project life cycle encompasses development of the initiative out of strategic planning activities, articulation of project goals and objectives, planning project components and their integration, execution and control, project close out, and follow-up activities. 150 minutes lecture/discussion per week. Prerequisites: MATH 2310 or 2510 with a grade of C- or better.

ENGR 4240 Quality Management (3)
An overview of management literature relating to quality planning, quality control, quality assurance, and quality improvement. A consideration of the core principles and methods common to most quality improvement programs and their relationship to management principles. Comparison of prevalent quality improvement programs such as ISO9004: 2008, SixSigma, and TQM and the Malcolm Baldrige Standards. Case studies. 150 minutes lecture/discussion per week. Prerequisites: MATH 2310 or 2510 with a grade of C- or better.

ENGR 4260 Economics of Engineering Design (3)
Cost measurement and control in engineering studies. Basic accounting concepts, income measurement, and valuation problems. Manufacturing cost control and standard cost systems. Capital investment, engineering alternatives, and equipment replacement studies. 150 minutes lecture/discussion per week. Prerequisites: MATH 2310 or 2510 with a grade of C- or better.

ENGR 4410 Environmental Engineering (3)
An introduction to environmental engineering, including: water usage and conservation; water chemistry including pH and alkalinity relationships, solubility and phase equilibria; air quality; solid waste disposal; fate and transport of contaminants in lakes, streams and groundwater; design and analysis of mechanical, physicochemical and biochemical water and wastewater treatment processes. 100 minutes lecture/discussion and 150 minutes laboratory per week. Prerequisites: CHEM 1000, 1001, both with a grade of C- or better. Prerequisite or corequisite: ENGR 3120.

ENGR 4420 Food and Bioprocess Engineering Unit Operations (3)
Principles of the engineering design, testing and analysis of unit processing operations employed in the food and bioprocess industries, such as sterilization, pasteurization, freezing/refrigeration, drying, evaporation, and fermentation, along with physical, chemical and phase separations. Design and analysis of thermal, freezing, evaporation, dehydration; and mechanical, chemical and phase separations processes as governed by reaction kinetics and rheology of food and biological materials. 150 minutes lecture/discussion. Prerequisites: CHEM 1000, 1001, both all with a grade of C- or better. Prerequisite or corequisite: ENGR 3110.

ENGR 4520 Petroleum Production Engineering (3)
Covers topics in modern petroleum production engineering, including production technologies, production equipment, equipment design and optimization, well completion, tubing design, well performance evaluation (productivity index), inflow performance relationships (IPR), artificial lift and surface facilities. 150 minutes lecture/discussion per week. Prerequisite: GEOL 4060 with a grade of C- or better. Prerequisite or corequisite: ENGR 3110.

ENGR 4530 Reservoir Engineering (4)
Fundamental equations of fluid flow through porous media, reservoir material balances, aquifer influx, well testing, and decline curve analysis. Methods for forecasting reservoir performance are covered using analytical models, enhanced oil recovery methods, numerical simulation of improved recovery processes, and reservoir aspects of horizontal well. 150 minutes lecture/discussion and 150 minutes laboratory per week. Prerequisites: MATH 2320 or 2520, and GEOL 4060.

ENGR 4540 Drilling Engineering and Completion Technology (4)
Fundamentals of drilling equipment, engineering design calculations, wellbore diagrams, drilling fluids, cement calculations, and casing design. Additional topics such as directional drilling as well as completion technologies are covered using practical examples and field applications as applied in the oil and natural gas well drilling operations. 150 minutes lecture/discussion and 150 minutes laboratory per week. Prerequisites: ENGR 2140, and GEOL 4060, both with a grade of C- or better.

ENGR 4610 Conventional Energy Production (3)
Study of combustion of fossil fuels, thermal power plant and cogeneration, gas turbine power plant and cogeneration, combined gas turbine-thermal power plant, integrated gasification combined cycle (IGCC) power plants, nuclear power plants, and environmental impacts associated with conventional energy production methods. 150 minutes lecture/discussion. Prerequisite: ENGR 3110.

ENGR 4620 Renewable Energy Production (3)
Study of hydro energy systems, geothermal energy systems, wind energy systems, solar energy systems, fuel cells, thermoelectric power generator, biomass, carbon capturing and sequestration, energy storage, economic analysis of energy generating systems, and environmental impacts associated with renewable energy production methods. 150 minutes lecture/discussion. Prerequisite: ENGR 3110.

ENGR 4700 Special Topics in Engineering Sciences (1-3)
This course will often be used to supplement other courses with additional work at a more advanced level. May be repeated in different topics. Prerequisite: Permission of instructor.

ENGR 4800 Research Participation (1-3)
Individual study, under supervision, on a current research problem. (Experience as a research assistant does not count for credit.) May include research in the areas of curriculum and materials development. May be repeated. Prerequisite: Consent of instructor.

ENGR 4900 Senior Design Project A (2)
Selection and initiation of an engineering design project under faculty supervision. Collaborative projects with local industry partners are encouraged. Projects are presented in a formal report and in a formal presentation. 100 minutes lecture/discussion per week. Prerequisite: ENGR 3300 with a grade of C- or better, open only to senior Engineering Sciences majors.

ENGR 4910 Senior Design Project B (2)
Completion of a project under faculty supervision. This course is a continuation of ENGR 4900. Projects are presented in formal report and in formal presentations. 100 minutes lecture/discussion per week. Prerequisite: ENGR 4900, open only to senior Engineering Sciences majors.