Degree Description

Engineering Marketable Skills are based on required objectives from the Accreditation Board for Engineering and Technology (ABET). ABET accredits 4-year engineering schools, so all engineering schools must establish they meet these objectives (among others).

Marketable Skills

1. An ability to apply knowledge of mathematics, science, and engineering

2. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

3. An ability to function on multidisciplinary teams

4. An ability to identify, formulate, and solve engineering problems

5. An ability to communicate effectively

Semester I	**Hours**
CHEM 1411 General Chemistry I **OR** CHEM 1409 General Chemistry for Engineering Majors	4 hours
ENGR 1201 Introduction to Engineering [1]	2 hours
MATH 2413 Calculus I	4 hours
	10 hours

Semester II	**Hours**
ENGR 2304 Programming for Engineers	3 hours
PHYS 2425 University Physics I	4 hours
MATH 2414 Calculus II	4 hours
	11 hours

Semester III	**Hours**
Elective [2]	
ENGR 1304 Engineering Graphics I **OR** ENGR 1307 Plane Surveying **OR** ENGR 2301 Engineering Mechanics: Statics **OR** ENGR 2302 Engineering Mechanics: Dynamics **OR** ENGR 2406 Introduction to Digital Systems **OR** ENGR 2308 Engineering Economics **OR** ENGR 2305 Electrical Circuits I Lecture **AND** ENGR 2105 Electrical Circuits I Laboratory **OR** ENGR 2332 Mechanics of Materials **OR** ENGR 2333 Elementary Chemical Engineering **OR** ENGR 2334 Chemical Engineering Thermodynamics I	3-4 hours
Elective [3]	
MATH 2415 Calculus III **OR** MATH 2320 Differential Equations **OR** MATH 2305 Discrete Mathematics **OR** MATH 2318 Linear Algebra	3-4 hours
Elective [4]	
PHYS 2426 University Physics II **OR** CHEM 1412 General Chemistry II	4 hours
	10-12 hours

Total hours: **31-33 hours**

[1] All engineering courses require a minimum of MATH 1314 (College Algebra) or equivalent. Speak with an advisor for details, including information about math placement. All courses in the degree plan must be completed with a C or better.

[2] Engineering Electives (Choose 2)

[3] Mathematics Electives (Choose 1)

[4] Science Electives (Choose 1)

Course Descriptions

CHEM 1411 General Chemistry I

Fundamental principles of chemistry for majors in the sciences, health sciences, and engineering; topics include measurements, fundamental properties of matter, states of matter, chemical reactions, chemical stoichiometry, periodicity of elemental properties, atomic structure, chemical bonding, molecular structure, solutions, properties of gases, and an introduction to thermodynamics and descriptive chemistry. Includes basic laboratory experiments supporting theoretical principles presented in CHEM 1411, as well as an introduction of the scientific method, experimental design, data collection and analysis, and preparation of laboratory reports. Prerequisite: MATH 1314 with a minimum grade of C, passing score on non-credit equivalency exam for MATH 1314, or consent of division chair. High school chemistry is strongly recommended. Semester Hours 4 (3 lec/3 lab)

CHEM 1409 General Chemistry for Engineering Majors

Fundamental principles of chemistry for engineering majors; topics include measurements, fundamental properties of matter, states of matter, chemical reactions, acid-base concepts, chemical stoichiometry, periodicity of elemental properties, atomic structure, chemical bonding, molecular structure, solutions, properties of gases, phase-diagrams, introduction to chemical equilibrium, chemical thermodynamics, electrochemistry, and an introduction to descriptive inorganic chemistry and organic chemistry. Basic laboratory experiments supporting theoretical principles presented in CHEM 1309; introduction of the scientific method, experimental design, chemical instrumentation, data collection and analysis, and preparation of laboratory reports. Prerequisites: MATH 1314 with a minimum grade of C or equivalent preparation. Semester Hours 4 (3 lec/4 lab)

ENGR 1201 Introduction to Engineering

An introduction to the engineering profession with emphasis on technical communication and team-based engineering design. Prerequisite: Math 1314 or equivalent preparation. Semester Hours 2 (1 lec/3 lab)

MATH 2413 Calculus I

Limits and continuity; the Fundamental Theorem of Calculus; definition of the derivative of a function and techniques of differentiation; applications of the derivative to maximizing or minimizing a function; the chain rule, mean value theorem, and rate of change problems; curve sketching; definite and indefinite integration of algebraic, trigonometric, and transcendental functions, with an application to calculation of areas. Graphing calculator required. Prerequisite: MATH 2412 with a minimum grade of C, or both MATH 1314 and MATH 1316 with minimum grades of C, or passing score on non-credit equivalency exam for MATH 2412, or consent of division chair. Semester Hours 4 (4 lec)

ENGR 2304 Programming for Engineers

Programming principles and techniques for matrix and array operations, equation solving, and numeric simulations applied to engineering problems and visualization of engineering information. Platforms include spreadsheets, symbolic algebra packages, engineering analysis software, and laboratory control software. Prerequisite: MATH 2413 Semester Hours 3 (3 lec/2 lab)

PHYS 2425 University Physics I

Fundamental principles of physics, using calculus, for science, computer science, and engineering majors; the principles and applications of classical mechanics, including harmonic motion, physical systems and thermodynamics; and emphasis on problem solving. Basic laboratory experiments supporting theoretical principles involving the principles and applications of classical mechanics, including harmonic motion and physical systems; experimental design, data collection and analysis, and preparation of laboratory reports. Prerequisite: MATH 2413 with a grade of C or better. Semester Hours 4 (3 lec/3 lab)

MATH 2414 Calculus II

Differentiation and integration of transcendental functions; parametric equations and polar coordinates; techniques of integration; sequences and series; improper integrals. Graphing calculator required. Prerequisite: MATH 2413 with a grade of C or better or consent of division chair. Semester Hours 4 (4 lec)

ENGR 1304 Engineering Graphics I

Introduction to computer-aided drafting using CAD software and sketching to generate two- and three-dimensional drawings based on the conventions of engineering graphical communication. Topics include spatial relationships, multi-view projections and sectioning, dimensioning, graphical presentation of data, and fundamentals of computer graphics. Prerequisite: MATH 1314. Semester Hours 3 (2 lec/3 lab)

ENGR 1307 Plane Surveying

Development of skills necessary to recognize and solve problems in surveying; introduction and use of various precision instruments used for surveying, including level, theodolites, electronic distance measuring equipment, and total stations for collecting field data; introduction of Global Positioning Systems (GPS) and Geographic Information Systems (GIS) and their use in surveying; and use of graphic design software, such as AutoCAD or Microstation, in surveying problems. Prerequisite: MATH 1316 or ENGR 1304 with a grade of C or better. Semester Hours 3 (3 lec)

ENGR 2301 Engineering Mechanics: Statics

Basic theory of engineering mechanics, using calculus, involving the description of forces, moments, and couples acting on stationary engineering structures; equilibrium in two and three dimensions; free-body diagrams; friction; centroids; centers of gravity; and moments of inertia. Prerequisite: PHYS 2425, concurrent enrollment in MATH 2414 (calculus II) or previous completion of MATH 2414. Semester Hours 3 (3 lec/1 lab)

ENGR 2302 Engineering Mechanics: Dynamics

Basic theory of engineering mechanics, using calculus, involving the motion of particles, rigid bodies, and systems of particles; Newton's Laws; work and energy relationships; principles of impulse and momentum; application of kinetics and kinematics to the solution of engineering problems. Prerequisite: ENGR 2301. Semester Hours 3 (3 lec/1 lab)

ENGR 2406 Introduction to Digital Systems

Introduction to theory and design of digital logic, circuits, and systems. Number systems, operations and codes; logic gates; Boolean Algebra and logic simplification; Karnaugh maps; combinational logic; functions of combinational Logic; flip-flops and related devices; counters; shift registers; sequential logic; memory and storage. Basic laboratory experiments supporting theoretical principles involving design, construction, and analysis of combinational and sequential digital circuits and systems, including logic gates, adders, multiplexers, encoders, decoders, arithmetic logic units, latches, flip-flops, registers, and counters; preparation of laboratory reports. Prerequisite: MATH 1314 with a grade of C or better. Semester Hours 4 (3 lec/3 lab)

ENGR 2308 Engineering Economics

Methods used for determining the comparative financial desirability of engineering alternatives. Provides the student with the basic tools required to analyze engineering alternatives in terms of their worth and cost, an essential element of engineering practice. The student is introduced to the concept of the time value of money and the methodology of basic engineering economy techniques. The course will address some aspects of sustainability and will provide the student with the background to enable them to pass the Engineering Economy portion of the Fundamentals of Engineering exam. Prerequisite: MATH 2413 with a grade of C or better. Semester Hours 3 (3 lec)

ENGR 2305 Electrical Circuits I Lecture

Principles of electrical circuits and systems. Basic circuit elements (resistance, inductance, mutual inductance, capacitance, independent and dependent controlled voltage, and current sources). Topology of electrical networks, Kirchhoff's laws, node and mesh analysis, DC circuit analysis, operational amplifiers, transient and sinusoidal steady-state analysis, AC circuit analysis, first- and second-order circuits, Bode plots, and use of computer simulation software to solve circuit problems. Prerequisite: PHYS 2426 or MATH 2320. Corequisite: ENGR 2105. Semester Hours 3 (3 lec)

ENGR 2105 Electrical Circuits I Laboratory

Laboratory experiments supporting theoretical principles presented in ENGR 2305 involving DC and AC circuit theory, network theorems, time, and frequency domain circuit analysis. Introduction to principles and operation of basic laboratory equipment; laboratory report preparation. Prerequisite: PHYS 2426. Corequisite: ENGR 2305. Semester Hour 1 (4 lab)

ENGR 2332 Mechanics of Materials

Stresses, deformations, stress-straining relationships, torsions, beams, shafts, columns, elastic deflections in beams, combined loading, and combined stresses. Prerequisite: MATH 2414 with a minimum grade of C and ENGR 2301 or ENGR 2401 with a minimum grade of C. Semester Hours 3 (3 lec/1 lab)

ENGR 2333 Elementary Chemical Engineering

This course is the foundation for nearly all future chemical engineering courses and analysis. A strong foundation in mathematics, physics, and chemistry is required for application to the solution of problems in industrial chemistry. Students will receive an introduction to chemical engineering calculations, unit equations, process stoichiometry, material and energy balances, and states of matter, and will apply the laws of conservation of mass and energy to reacting and non-reacting, simple and complex chemical systems. Prerequisite: ENGR 1201, CHEM 1412, MATH 2414, PHYS 2425 with a grade of C or better. Semester Hours 3 (3 lec)

ENGR 2334 Chemical Engineering Thermodynamics I

Fundamental concepts of energy and thermodynamics (e.g., temperature, thermodynamic equilibrium, and heat) will be introduced; the course emphasizes techniques in the application of the fundamentals of thermodynamics to various processes as they frequently occur in chemical and bimolecular engineering. Provides the basic skills and tools necessary in designing and analyzing real-life engineering systems. Serves as preparation for other advanced courses in thermodynamics, energy conversion, heat transfer, etc. Prerequisite: MATH 2415 with a grade of C or better. Semester Hours 3 (3 lec)

MATH 2415 Calculus III

Advanced topics in calculus, including vectors and vector-valued functions, partial differentiation, Lagrange multipliers, multiple integrals, and Jacobians; application of the line integral, including Green's Theorem, the Divergence Theorem, and Stokes' Theorem. Graphing calculator required. Prerequisite: MATH 2414 with a grade of C or better or consent of division chair. Semester Hours 4 (4 lec)

MATH 2320 Differential Equations

Ordinary differential equations, including linear equations, systems of equations, equations with variable coefficients, existence and uniqueness of solutions, series solutions, singular points, transform methods, and boundary value problems; application of differential equations to real-world problems. Graphing calculator required. Prerequisite or corequisite: MATH 2414 minimum grade of C. Semester Hours 3 (3 lec)

MATH 2305 Discrete Mathematics

A course designed to prepare math, computer science, and engineering majors for a background in abstraction, notation, and critical thinking for the mathematics most directly related to computer science. Topics include: logic, relations, functions, basic set theory, countability and counting arguments, proof techniques, mathematical induction, combinatorics, discrete probability, recursion, sequence and recurrence, elementary number theory, graph theory, and mathematical proof techniques. Prerequisite: MATH 2413 with a grade of C or better. Semester Hours 3 (3 lec)

MATH 2318 Linear Algebra

Introduces and provides models for application of the concepts of vector algebra. Topics include finite dimensional vector spaces and their geometric significance; representing and solving systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion; matrices; determinants; linear transformations; quadratic forms; eigenvalues and eigenvector; and applications in science and engineering. Graphing calculator required. Prerequisite or corequisite: MATH 2414 or consent of division chair. Semester Hours 3 (3 lec)

PHYS 2426 University Physics II

Principles of physics for science, computer science, and engineering majors, using calculus, involving the principles of electricity and magnetism, including circuits, electromagnetism, waves, sound, light, and optics. Laboratory experiments supporting theoretical principles involving the principles of electricity and magnetism, including circuits, electromagnetism, waves, sound, light, and optics; experimental design, data collection and analysis, and preparation of laboratory reports. Prerequisites: PHYS 2425 and MATH 2414 with a grade of C or better. Semester Hours 4 (3 lec/3 lab)

CHEM 1412 General Chemistry II

Chemical equilibrium, phase diagrams and spectrometry, acid-base concepts, thermodynamics, kinetics, electrochemistry, nuclear chemistry, an introduction to organic chemistry and descriptive inorganic chemistry. Includes basic laboratory experiments supporting theoretical principles presented in CHEM 1412, as well as an introduction of the scientific method, experimental design, chemical instrumentation, data collection and analysis, and preparation of laboratory reports. Prerequisite: CHEM 1411 with a grade of C or better. Semester Hours 4 (3 lec/4 lab)