ENGINEERING (ENGR)

ENGR 102
INTRODUCTION TO ENGINEERING CAREERS
2 UNITS

Pass/No Pass or Grade is Allowed
Lecture 1 hour, laboratory 3 hours
Offered: ALL
Explores different branches of engineering, the functions of an engineer, and the industries in which engineers work. Investigates educational requirements and explains the engineering education pathways as well as explores effective strategies for students to reach their full academic potential. Provides an understanding of engineering processes, various tools including experimentation and data analysis needed for solving problems in various engineering fields. Emphasizes developing communication skills pertinent to the engineering profession, engineering problem solving and the interface of the engineer with society, and engineering ethics. [D; CSU; UC; C-ID ENGR 110] (Formerly: ENGR 101)

ENGR 104
ESSENTIAL MATH SKILLS FOR ENGINEERS AND SCIENTISTS
6 UNITS

Grade Only
Prerequisite: Intermediate algebra proficiency, as determined through the Southwestern College Multiple Measures Process.
Lecture 6 hours
Offered: FALL, SUMMER
Introduces and teaches mathematical techniques for engineers and scientists. Covers functions, dimensional analysis, inequalities, matrices, vectors, logarithms and curve fitting. Emphasizes functions and graphing. Includes graphic and numerical applications of trigonometry, circular and inverse functions, and practical applications of right and oblique triangles. Requires a CAS graphing calculator. [D; CSU; UC] (Same as: CHEM 104;PHYS 104)

ENGR 110
ENGINEERING DESIGN AND GRAPHICS
3 UNITS

Grade Only
Prerequisite: MATH 104 or MATH 244 or equivalent.
Lecture 2 hours, laboratory 3 hours
Offered: FALL, SPRING
Develops skills and techniques of solid modeling (Solidworks) to create basic to intermediate solid parts, assemblies, and drawings; including orthographic, detail, sectional, and auxiliary views. Includes dimensioning and dimensional tolerance, and thread notation per ASME Y14.5M-2009 standards. [D; CSU; UC; C-ID ENGR 150]

ENGR 120C
INTRODUCTION TO COMPUTER PROGRAMMING - C/C++ LANGUAGE
4 UNITS

Grade Only
Recommended Concurrent Enrollment: MATH 250.
Prerequisite: MATH 101 and MATH 104 or MATH 244 or equivalent or through the Southwestern College multiple measures placement processes.
Lecture 3 hours, laboratory 3 hours
Offered: FALL, SPRING
Introduces programming methodology and problem-solving using C and C++. Emphasizes concepts of computer systems, algorithm design and development, data types, program structures, object-oriented programming, documentation, structures, functions, arrays, pointers, testing, verification techniques and how to interface software with the physical world (e.g., the use of sensors). [D; CSU; UC]

ENGR 221
COMPUTER PROGRAMMING AND APPLICATIONS - MATLAB
3 UNITS

Grade Only
Prerequisite: MATH 251 or equivalent or through the Southwestern College multiple measures placement processes.
Lecture 2 hours, laboratory 3 hours
Offered: FALL, SPRING
Utilizes the MATLAB environment to provide students with a working knowledge of computer-based problem-solving methods relevant to science and engineering. Teaches students to formulate and solve engineering problems through modeling and the application of numerical methods, then evaluate and rationalize the results using MATLAB. Introduces the fundamentals of procedural and object-oriented programming, numerical analysis, and data structures. Includes functions and arrays, curve fitting, data and file management, loops, control flow, and standard library packages and software. Covers numerical methods such as matrix operations, Gauss Reduction, Newton Raphson, curve fitting, interpolation, numerical differentiation, and numerical integration. Includes engineering applications like finite element analysis, dynamics, computational fluid mechanics, data visualization, and image analysis. This course is designed for students majoring in engineering. [D; CSU; UC]

ENGR 230
DIGITAL SYSTEMS
4 UNITS

Grade Only
Prerequisite: MATH 251 or equivalent.
Lecture 3 hours, laboratory 3 hours
Offered: FALL, SPRING
Introduces modeling, analysis, and design of digital systems primarily at the Logic Design Level. Applies the basic theory of switching networks, use of Boolean Algebra to analyze and synthesize switching networks, design of logic gate networks, use of simplification schemes to minimize part count and cost while providing optimum performance, and design and analyze sequential and combinational circuits using flip-flops and logic gate networks. [D; CSU; UC]

ENGR 250
ENGINEERING STATICS
3 UNITS

Grade Only
Prerequisite: MATH 251 or equivalent; PHYS 270 or equivalent.
Lecture 3 hours
Offered: ALL
Analyzes engineering structures in equilibrium. Includes topics of two- and three-dimensional equilibrium of particles and rigid bodies, moments, couples, vector mathematics, friction forces, distributed forces, center of gravity, centroids, analysis of frames, machine and trusses, moments of inertia, shear and bending moment diagrams, and virtual work. [D; CSU; UC; C-ID ENGR 130]

ENGR 251
ENGINEERING DYNAMICS
3 UNITS

Grade Only
Prerequisite: ENGR 250 or equivalent.
Lecture 3 hours
Offered: ALL
Analyzes kinematics and kinetics of particles and rigid bodies in two- and three-dimensional motion. Includes topics of kinematics of particle motion; Newton's second law, work-energy and momentum methods; kinematics of planar motions of rigid bodies; work-energy and momentum principles for rigid body motion as well as an introduction to mechanical vibrations including free and forced vibration, with and without damping (optional). [D; CSU; UC; C-ID ENGR 230]

ENGR 260
ENGINEERING MATERIALS
3 UNITS

Grade Only
Prerequisite: CHEM 200 or equivalent; MATH 250 or equivalent; PHYS 270 or equivalent.
Lecture 3 hours
Offered: FALL
Provides the study of atomic and molecular structure of materials utilized in engineering. Investigates defects in materials, phase diagrams, and microstructural control. Analyzes the relationships between structure of materials and their mechanical, thermal, electrical, corrosion, and radiation properties, and their application to engineering problems. [D; CSU; UC; C-ID ENGR 140]

ENGR 261
MATERIALS LABORATORY
1 UNIT

Grade Only
Prerequisite: CHEM 200 or equivalent; PHYS 270 or equivalent.
Corequisite: ENGR 260.
Laboratory 3 hours
Offered: FALL, SPRING
Explores connections between the structure of materials and materials properties. Provides laboratory opportunities to directly observe the structures and behaviors discussed in the lecture course (ENGR 260 - Engineering Materials), to operate testing equipment, to analyze experimental data, and to prepare reports. Utilizes experimental methods to characterize engineering materials and their mechanical behavior. [D; CSU; UC; C-ID ENGR 140L]

ENGR 270
ELECTRICAL CIRCUITS
3 UNITS

Grade Only
Prerequisite: PHYS 272 or equivalent.
Corequisite: ENGR 280 (may be taken previously); MATH 253 (may be taken previously).
Lecture 3 hours
Offered: SPRING
Covers DC and AC circuits containing resistors, capacitors, inductors, dependent sources, operational amplifiers, and/or switches. Provides circuit analysis by reduction method, source transformations, mesh and nodal analysis, reduction of circuit to Norton or Thevenin's equivalent for impedance and power. Explores analysis of operational amplifiers, mutual inductance, transient analysis of first and second-order circuits, steady-state sinusoidal analysis and balanced three-phase power networks. Includes computer software tools and applications for circuit analysis. [D; CSU; UC; C-ID ENGR 260]

ENGR 271
ELECTRICAL CIRCUITS LABORATORY
1 UNIT

Grade Only
Corequisite: ENGR 270.
Laboratory 3 hours
Offered: FALL, SPRING
Introduces the construction and measurement of electrical circuits. Provides laboratory opportunities to directly observe and test behaviors discussed in the lecture course (ENGR 270 - Electrical Circuits). Covers basic use of electrical test and measurement instruments including multimeters, oscilloscopes, power supplies, function generators, and circuit simulation software. Provides interpretation of measured and simulated data based on principles of circuit analysis for DC, transient, sinusoidal steady-state (AC) conditions, and elementary circuit design. Explores practical considerations such as component value tolerance and non-ideal aspects of laboratory instruments, construction, and measurement of basic operational amplifier circuits. [D; CSU; UC; C-ID ENGR 260]

ENGR 280
METHODS OF ANALYSIS
4 UNITS

Grade Only
Prerequisite: MATH 251 or equivalent.
Lecture 4 hours
Offered: FALL
Covers ordinary differential equations, Complex analysis, the Laplace transform, Fourier series, Fourier transform, linear algebra, matrix algebra, multivariable calculus, power series, all with engineering applications in Electrical, Mechanical, Aerospace, and Civil engineering. [D; CSU; UC]

ENGR 299
INDEPENDENT STUDY
1-3 UNITS

Pass/No Pass or Grade is Allowed
Limitation on Enrollment: Eligibility for independent study.
Lecture 3 hours
Offered: ALL
Individual study or research in some area of engineering of particular interest to the student and not included in regular courses of the college. [D; CSU; **UC] (**UC Limitation: credit for variable topics courses is given only after a review of the scope and content of the courses by the enrolling UC campus.)