

ENGINEERING**ENGR 012****Civil/Architectural Blueprint Reading***Formerly: AEC Print Reading*

Unit(s): 2.0 Class Hours: 36.0 Lecture total.

Reading and interpreting blueprints for civil engineering, architecture, and construction fields. No prior blueprint reading experience is needed. Course provides preparation for more advanced civil and architectural drafting coursework.

ENGR 051**Introduction to Drafting and CAD***Formerly: Basic Technical Drawing*

Unit(s): 1.0 Class Hours: 18.0 Lecture total.

Introductory course on civil, mechanical, and electrical drafting. Topics include: drafting careers, reading and creating basic engineering drawings (modeling, dimensioning, annotations) using industry-standard CAD software (AutoCAD, Solidworks, and more). Course is an appropriate starting course for students with no drafting or CAD experience and are interested in the fields. Course provides direction for continuing drafting coursework.

ENGR 060**Robotics Survey**

Unit(s): 0.5 Class Hours: 9.0 Lecture total.

This course introduces students to basic robotics. Students will program a robot to receive sensor input, control motors, and produce behaviors. Course provides student exposure to robotics, which now plays a major role in modern manufacturing and industrial automation.

Pass/No Pass Only

ENGR 100A (C-ID ENGR 110)**Introduction to Engineering**

Unit(s): 3.0 Class Hours: 54.0 Lecture total.

The course explores the branches of engineering, the functions of an engineer, and the industries in which engineers work. Explains the engineering education pathways and explores effective strategies for students to reach their full academic potential. Presents an introduction to the methods and tools of engineering problem solving and design including the interface of the engineer with society and engineering ethics. Develops communication skills pertinent to the engineering profession.

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ENGR 100B**Introduction to Civil Engineering***Formerly: Introduction to Architecture/Civil Engineering/Construction (AEC)*

Unit(s): 2.0 Class Hours: 36.0 Lecture total.

Introduction to the Civil Engineering and the related fields of architecture and construction. Includes an overview of academic programs, career information and preparation requirements, possible field trips and guest speakers.

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ENGR 101**Programming Survey**

Unit(s): 0.5 Class Hours: 9.0 Lecture total.

This survey course introduces students to C programming language. Students will code, compile and execute programs that control hardware. Students will be learning the input-process-output (IPO) model, a widely used approach in systems analysis and software engineering, that receives inputs from a user or other source, does computations on the inputs, and returns the results of the computations. Same as CMPR-101.

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ENGR 103**Solidworks Beginning Solid Modeling***Formerly: Beginning Solid Modeling*

Unit(s): 3.0 Class Hours: 54.0 Lecture total.

Introductory course in parametric solid modeling using Solidworks, an industry standard engineering design software (CAD). This course will include a solid modeling overview, solid model construction techniques (extrude, revolve, fillet, chamfer, etc.), including the preparation of individual solid components and basic solid model assemblies. Same as Manufacturing Technology 103.

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ENGR 104**Solidworks Intermediate Solid Modeling**

Unit(s): 3.0 Class Hours: 54.0 Lecture total.

Prerequisite: Completion with a grade of "C" or better or a Passing grade in ENGR 103, or MNFG 103

Intermediate course for solid modeling using Solidworks, an industry standard engineering design software (CAD). Includes a review of the introductory class and changes to the Solidworks interface. Instruction in the use of intermediate Solidworks part modeling skills such as assembly modeling and sub-assemblies is included. Same as Manufacturing Technology 104.

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ENGR 105**Solidworks Advanced Solid Modeling**

Unit(s): 3.0 Class Hours: 54.0 Lecture total.

Prerequisite: Completion with a grade of "C" or better or a Passing grade in ENGR 104, or MNFG 104

Advanced course for solid modeling includes a review of the intermediate class and changes to the Solidworks interface. Instruction in the use of Solidworks part modeling, assembly modeling, sub-assemblies, advanced photoworks and advanced animator emphasized. Same as Manufacturing Technology 105.

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ENGR 110**Advanced Laboratory Skills***Formerly: Advanced CAD Applications*

Unit(s): 0.5-2.0 Class Hours: 27.0-108.0 Lab total.

Laboratory skill development for advanced students. Topics include - equipment calibration, maintenance, and operation; development and documentation of laboratory procedures; maintaining supplies and tooling; lab organization and inventory; and data collection.

Pass/No Pass Only

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ENGR 111**Basic Mechanical Blueprint Reading**

Unit(s): 2.0 Class Hours: 36.0 Lecture total.

Reading and interpreting blueprints for manufacturing technologies. Same as Manufacturing Technology 111.

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ENGR 114**Geometric Dimensioning and Tolerancing**

Unit(s): 3.0 Class Hours: 54.0 Lecture total.

Drawing interpretation utilizing geometric dimensioning and tolerancing per ASME Y14.5M (formerly ANSI Y14.5M) as applied in engineering, manufacturing, and inspection. Suggested preparation: prior course or experience in drafting with conventional dimensioning and tolerancing. Same as Manufacturing Technology 114.

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ENGR 115**Cooperative Work Experience Education-Occupational**

Unit(s): 1.0-4.0 Class Hours: 60.0-300.0 Lab total.

This work experience course of supervised employment is designed to assist students to acquire desirable work habits, attitudes and skills in a field related to the students' major so as to enable them to become productive employees. This course also provides students with career awareness for jobs. 75 hours of paid work or 60 hours of un-paid work equals one unit of course credit. Student repetition is allowed per Title 5, Section 55253.

Pass/No Pass Only

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ENGR 118 (C-ID ENGR 180)**Surveying**

Unit(s): 3.0 Class Hours: 36.0 Lecture, 54.0 Lab total.

Prerequisite: Completion with a grade of "C" or better or a Passing grade in MATH 162, or MATH 170; or transcribed high school trigonometry or pre-calculus

The course applies theory and principles of plane surveying: office computations and design; operation of surveying field equipment; and production of engineering plans/maps. Topics include distances, angles, and directions; differential leveling; traversing; property/boundary surveys; topographic surveys/mapping; volume/earthwork; horizontal and vertical curves; land description techniques; and GPS. Extensive field work using tapes, levels, transits, theodolites, total stations, and GPS. Assists in passing the land surveyor-in-training exam.

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ENGR 119**Advanced Plane Surveying**

Unit(s): 3.0 Class Hours: 36.0 Lecture, 54.0 Lab total.

Prerequisite: Completion with a grade of "C" or better or a Passing grade in ENGR 118; or Instructor may waive if student can show proof of industry experience in surveying equal to or greater than ENGR 118.

A second course in surveying with emphasis on coordinate geometry calculations. Topics include: route surveying with horizontal and vertical curves, topographic surveying and mapping, construction surveying, introduction to geospatial technologies, boundary surveying and surveys of public lands. Field surveying projects.

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ENGR 122**Engineering Drawing**

Unit(s): 3.0 Class Hours: 45.0 Lecture, 27.0 Lab total.

Principles of engineering drawing: projections, views, sections, dimensions, tolerancing, assemblies, manufacturing processes, engineering drafting practices. Utilizing 2D CAD and 3D solid modeling CAD software. Suggested preparation: prior course or experience in drafting and CAD.

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ENGR 124**Advanced Mechanical Drafting and Design***Formerly: Advanced Drawing*

Unit(s): 3.0 Class Hours: 45.0 Lecture, 27.0 Lab total.

Advanced topics in mechanical drafting and design: working drawings, fasteners, cams, gears, secondary auxiliary views, advanced sectioning, dimensioning, tolerancing, introduction to GD&T, design for manufacturability, and a focus on using 3D solid modeling CAD software. Suggested preparation: prior drafting or CAD course or experience (e.g., Engr 122 or 125).

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ENGR 125 (C-ID ENGR 150)**Engineering Graphics**

Unit(s): 3.0 Class Hours: 45.0 Lecture, 27.0 Lab total.

Prerequisite: Completion with a grade of "C" or better or a Passing grade in MATH 162

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; the engineering design process. Assignments develop sketching skills for 2-D and 3-D CAD. The use of CAD software is an integral part of the course. Suggested preparation: prior course or experience with drafting and CAD.

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ENGR 130A**CATIA I***Formerly: CATIA Beginning Solid Modeling*

Unit(s): 3.0 Class Hours: 54.0 Lecture total.

Introductory course in parametric solid modeling CAD using CATIA software, which is used extensively in the aerospace and automotive fields. Topics include: CAD overview, sketching, basic solid model creation (base features, pads, pockets, grooves, shafts, etc.) sketch constraints, reference elements, hole features, feature editing, assembly and drawing creation. Same as Manufacturing Technology 130A.

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ENGR 130B**CATIA II***Formerly: CATIA Intermediate Solid Modeling*

Unit(s): 3.0 Class Hours: 54.0 Lecture total.

Recommended Preparation: Completion with a grade of "C" or better or a Passing grade in ENGR 130A, or MNFG 130A

Intermediate course in parametric solid modeling CAD using CATIA software, which is used extensively in the aerospace and automotive fields. Topics: intermediate/ advanced level sketching and modeling (sweeps, ribs, slots), feature editing and transformation, assemblies, drafting workbench, surface modeling, and other CATIA modules. Same as Manufacturing Technology 130B.

CSU

ENGR 131**Introduction to Mechatronics***Formerly: Engineering Mechatronics Technology Survey*

Unit(s): 0.5 Class Hours: 9.0 Lecture total.

Course provides hands-on exposure to modern techniques in rapid prototyping, including: 3D printing, laser cutting, 3D scanning, and other processes used in mechatronics and engineering. Course provides a good introduction to the Engineering Mechatronics program.

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ENGR 132**Introduction to Robotics**

Unit(s): 2.5 Class Hours: 36.0 Lecture, 27.0 Lab total.

Introductory course in robotics. Topics include history of robotics, role of robotics in modern engineering, industrial automation, emerging technologies, basic design, sensors, circuitry, actuators, mechanics, programming, and a hands-on robot design and construction project.

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ENGR 133**Basic Mechatronics***Formerly: Basic Mechatronics Engineering Technology*

Unit(s): 3.0 Class Hours: 36.0 Lecture, 54.0 Lab total.

Introductory course in mechatronics (mechanical systems controlled with electronics or computer technology) with an emphasis on hands-on design, fabrication, and testing. Topics include: mechanical design and fabrication (solid-modeling CAD, mechanical elements, rapid prototyping with 3D printing, laser cutting and engraving, and other processes), micro-controllers (Arduino), actuators (servo motors), sensors, and electronics systems (basic circuit analysis, construction, breadboarding, sensors, and more). Some prior experience with Solidworks, Arduino, and basic algebra is suggested but not required.

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ENGR 134**Intermediate Mechatronics***Formerly: Intermediate Mechatronics Engineering Technology*

Unit(s): 3.0 Class Hours: 36.0 Lecture, 54.0 Lab total.

Intermediate course in mechatronics with an emphasis on hands-on design, fabrication, and testing. Topics include: mechanical design and fabrication (solid-modeling CAD, 3D printing, laser cutting, SLA, G-code, CNC engraving, hand tools), micro-controllers (Arduino), actuators (electric motors, pneumatics), sensors, and electronics systems (circuits, soldering, DMM, oscilloscope), and a hands-on design project. Some prior experience or coursework with mechatronics (Engr 133 or similar), Solidworks, Arduino, and basic algebra is suggested.

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ENGR 135**Advanced Mechatronics***Formerly: Advanced Mechatronics Engineering Technology*

Unit(s): 3.0 Class Hours: 36.0 Lecture, 54.0 Lab total.

Advanced course in mechatronics engineering technology with an emphasis on hands-on fabrication and testing. Topics include: design (solid modeling CAD, mechanics considerations, machine elements), mechanical fabrication (3D printing, SLA, laser, G-code, introduction to CNC), electrical systems (circuit construction, circuit elements, op amps, transistors), control systems (micro-controllers, PID control, sensors, actuators/motor control), lab work, and hands-on projects. Prior experience with mechatronics (ENGR 134 or similar), Solidworks, Arduino, and basic algebra is suggested.

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ENGR 154**Revit and Civil Drafting***Formerly: Revit*

Unit(s): 4.0 Class Hours: 72.0 Lecture total.

Course introduces Autodesk Revit, a 3D parametric CAD software that is an industry standard for architectural/civil design. Topics include 3D modeling, design, drawing creation, and BIM (building information modeling) concepts. Course also teaches creation of industry-standard drawings in civil engineering, architecture, and construction using industry-standard CAD software (AutoCAD, Civil 3D, and Revit). Topics include - views, line types, projection, annotations, and callouts. Prior course or experience with AutoCAD (e.g., ENGR 183) and drafting is strongly suggested.

CSU

ENGR 158**Basic Machining Concepts and Operations**

Unit(s): 3.0 Class Hours: 18.0 Lecture, 126.0 Lab total.

Fundamental operations on lathes, milling machines, grinders, and drill presses, including precision measurements and layout. Equips students with skills and theory necessary to enter or upgrade within the machinist trade. Same as Manufacturing Technology 158.

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ENGR 183**AutoCAD I***Formerly: CAD I - Computer Aided Drafting*

Unit(s): 4.0 Class Hours: 72.0 Lecture total.

A first course in AutoCAD by Autodesk, an industry standard engineering CAD software, especially in the civil and architectural fields. Topics include display and file management, units, entities, object selection, advanced editing, layers, dimensions, text, and graphic exchange.

CSU/UC

ENGR 184**AutoCAD II***Formerly: CAD II - Computer Aided Drafting*

Unit(s): 4.0 Class Hours: 72.0 Lecture total.

A second course in Autodesk AutoCAD, an industry standard engineering CAD software, especially in the civil and architectural fields. Topics include: advanced dimensioning, viewports, hatches, blocks, plotting, attributes, inquiry, intermediate apps, working drawings, introduction to 3D CAD. Suggested preparation: prior course or experience with AutoCAD.

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ENGR 185**Civil 3D***Formerly: 3D CAD with Civil 3D*

Unit(s): 4.0 Class Hours: 72.0 Lecture total.

Course teaches Autodesk Civil 3D – an industry standard CAD software for civil engineers. Topics include advanced modeling, model merging, project management, parcels, surveys, surfaces, alignments, profiles, 3D rendering, and presentation. Prior coursework or experience with AutoCAD is strongly suggested.

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ENGR 235 (C-ID ENGR 130)**Statics**

Unit(s): 3.0 Class Hours: 54.0 Lecture total.

Prerequisite: Completion with a grade of "C" or better or a Passing grade in PHYS 217, and MATH 185

A first course in engineering mechanics: properties of forces, moments, couples and resultants; two- and three-dimensional force systems acting on engineering structures in equilibrium; analysis of trusses, and beams; distributed forces, shear and bending moment diagrams, center of gravity, centroids, friction, and area and mass moments of inertia. Utilizes SI metrics.

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ENGR 240 (C-ID ENGR 230)**Dynamics**

Unit(s): 3.0 Class Hours: 54.0 Lecture total.

Prerequisite: Completion with a grade of "C" or better or a Passing grade in ENGR 235

Fundamentals of kinematics and kinetics of particles and rigid bodies. Topics include 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; introduction to mechanical vibrations.

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ENGR 250**Electric Circuits**

Unit(s): 3.0 Class Hours: 54.0 Lecture total.

Corequisite: Completion with a grade of "C" or better or a Passing grade in MATH 280, and PHYS 227; (both may be taken concurrently)

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, operational amplifiers, 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.

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ENGR 250L**Electric Circuits Laboratory**

Unit(s): 1.0 Class Hours: 54.0 Lab total.

Corequisite: Completion with a grade of "C" or better or a Passing grade in ENGR 250

An introduction to the construction and measurement of electrical circuits. Basic use of electrical test and measurement instruments including multimeters, oscilloscopes, power supplies, and function generators. Interpretation of measured data under DC, transient, and sinusoidal steady-state (AC) conditions.

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ENGR 280

Strength of Materials

Unit(s): 3.0 Class Hours: 54.0 Lecture total.

Prerequisite: Completion with a grade of "C" or better or a Passing grade in ENGR 235

This course is a study of stresses, strains and deformations associated with axial, torsional and flexural loading of bars, shafts and beams, as well as pressure loading of thin-walled pressure vessels. The course also covers stress and strain transformation, Mohr's Circle, ductile and brittle failure theories, and the buckling of columns. Statically indeterminate systems are also studied.

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ENGR 281

Properties of Engineering Materials

Unit(s): 3.0 Class Hours: 54.0 Lecture total.

Prerequisite: Completion with a grade of "C" or better or a Passing grade in CHEM 209, and PHYS 217

Study of atomic, microscopic, and macroscopic structure of metals; properties' enhancement by alloying and heat treatment; effects of temperature and corrosion on metals; fatigue; and other materials (wood, plastic, and concrete).

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