

# ENGINEERING

## Contact Information

### Division

Sciences and Mathematics

### Dean

Randy Lehr

### Associate Dean

Megan D'Errico

### Division Office

V 211, Rocklin Campus

## Overview

The Engineering Department offers courses that satisfy the lower division engineering requirements of most California colleges and universities. Students may begin their study of chemical, civil, electrical, or mechanical engineering at Sierra College. Job openings abound in many engineering fields.

TRANSFER MAJOR REQUIREMENTS in Engineering are available in the Counseling Center. In all cases, students should consult with a counselor for specific transfer requirements. Four-year graduates in Engineering are qualified for positions in research, building industry, manufacturing and business.

## Faculty

### Philip H. Pattengale

#### Professor, Engineering

A.A., Fresno City College

B.S., California Polytechnic State University, San Luis Obispo

M.S., California State University, Sacramento

## Engineering Advisory Committee

- Roya Borman, Sacramento Municipal Utility District
- Don Carroll, Western Engineering Contractors, Loomis
- Ronald Chiaratti, Norris Electric, Auburn
- Steve Culley, CalTrans, Auburn
- Jeffrey Hahn, Covanta Energy, Lafayette
- John Haskell, Western Engineering Contractors, Loomis
- Tom Holdredge, Holdredge and Kull, Nevada City
- B. George Kniazewycz, Renovare International, Inc., Alameda
- Steve Leach, R.C.D. Engineering, North San Juan
- Patrick Leonhardt, Energy Absorption Systems, Rocklin
- Leo R. Martinez, Contractual Engineer, Grass Valley
- Arthur Perkins, P.E., Consultant, Moraga
- Steve Sarantopolis, Cranmer Engineering, Grass Valley
- Tom Tinucci, Wellhead Electric Company, Inc., Sacramento
- Terence Vollrath, Consultant, Placerville
- Brian Yeh, General Electric Company, Walnut Creek

## Degrees/Certificates

### Associate Degree

- Engineering (p. 1)

### Certificates of Achievement

- Civil Engineering Technology (p. 2)
- General Engineering Technology (p. 2)

## Engineering

### AA or AS Degree

The Engineering major recognizes a concentration in the field of Engineering. Successful completion of the curriculum in Engineering prepares engineering students for transfer to four-year colleges or universities. In all cases, students should consult with a counselor for more information on university admission and transfer requirements. Students must fulfill the following major requirements with grades of "C" or better, complete a minimum of 60 degree-applicable semester units (12 of which must be completed at Sierra College) with a grade point average of at least 2.0 and complete one of the following three general education patterns:

- Sierra College Associate Degree Requirements (<http://catalog.sierracollege.edu/archive/2021-2022/student-resources/general-education/associate-degree-requirements/>);
- California State University General Education Breadth (<http://catalog.sierracollege.edu/archive/2021-2022/student-resources/general-education/california-state-university-general-education-breadth-requirements/>) pattern;
- Intersegmental General Education Transfer Curriculum (IGETC) (<http://catalog.sierracollege.edu/archive/2021-2022/student-resources/general-education/intersegmental-general-education-transfer-curriculum-igetc/>).

### Required Courses

Code	Title	Units
CHEM 0001A	General Chemistry I (OR)	5-6
or CHEM 0003A & CHEM 0003B	General Chemistry I - Part 1 and General Chemistry I - Part 2	
ENGR 0035	Statics	3
ENGR 0045	Materials Science	3
MATH 0030	Analytical Geometry and Calculus I	4
MATH 0031	Analytical Geometry and Calculus II	4
MATH 0032	Analytical Geometry and Calculus III	4
<b>Select one of the following physics course combinations:</b>		<b>4</b>
PHYS 0210 & 0210L	Principles of Physics: Electricity and Magnetism and Principles of Physics Laboratory: Electricity and Magnetism	
PHYS 0215 & 0215L	Principles of Physics: Heat, Waves and Modern Physics and Principles of Physics Laboratory: Heat, Waves and Modern Physics	
<b>Select 6 units from the following (if not used above):</b>		<b>6</b>
CHEM 0001B	General Chemistry II	
ENGR 0017	Introduction to Circuit Theory	
ENGR 0017L	Circuit Theory Laboratory	
ENGR 0022A	Engineering Drawing and CAD	
ENGR 0022B	Descriptive Geometry and Solid Modeling	
ENGR 0095	Internship in Engineering (up to 4 units)	
ENGR 0110	Introduction to Engineering Design	

ENGR 0150	Introduction to the Engineering Profession
ENGR 0220	Programming and Problem Solving in Engineering
MATH 0033	Differential Equations and Linear Algebra
PHYS 0210 & 0210L	Principles of Physics: Electricity and Magnetism and Principles of Physics Laboratory: Electricity and Magnetism
PHYS 0215 & 0215L	Principles of Physics: Heat, Waves and Modern Physics and Principles of Physics Laboratory: Heat, Waves and Modern Physics
<b>Total Units</b>	<b>33-34</b>

## Civil Engineering Technology

### Certificate of Achievement

Successful completion of the curriculum in Civil Engineering Technology will prepare students for entry-level positions as civil engineering technicians. The certificate is designed to provide knowledge and career technical skills in mathematics, physics, chemistry and civil engineering to assist engineers in fields such as surveying, construction, architecture, environmental, material testing, public utilities and land use. The certificate is not equivalent to an associate degree.

#### Required Courses

Code	Title	Units
BUS 0250	Computer Applications for Business	3
CHEM 0001A or CHEM 0003A & CHEM 0003B	General Chemistry I (OR) General Chemistry I - Part 1 and General Chemistry I - Part 2	5-6
ENGR 0010	Engineering Survey Measurements	4
ENGR 0022A	Engineering Drawing and CAD	3
ENGR 0150	Introduction to the Engineering Profession	1
MATH 0027	Trigonometry	4
MECH 0010	Fundamentals of Electronics	4

#### Select one of the following physics course combinations: 5

PHYS 0105 & 0105L	General Physics I and General Physics I Laboratory
PHYS 0205 & 0205L	Principles of Physics: Mechanics and Principles of Physics Laboratory: Mechanics

#### Select 3-5 units from the following: 3-5

ENGR 0022B	Descriptive Geometry and Solid Modeling
ENGR 0037	Manufacturing Processes
ENGR 0110	Introduction to Engineering Design
GEOG 0090	Introduction to Geographic Information Systems (GIS)
PHYS 0110 & 0110L	General Physics II and General Physics II Laboratory

PHYS 0210 & 0210L	Principles of Physics: Electricity and Magnetism and Principles of Physics Laboratory: Electricity and Magnetism
<b>Total Units</b>	<b>32-35</b>

## General Engineering Technology

### Certificate of Achievement

Successful completion of the curriculum in General Engineering Technology will prepare students for entry-level positions as engineering technicians. The certificate is designed to provide knowledge and career technical skills in mathematics, physics, chemistry and engineering to assist engineers in fields such as fabrication, HVAC, building maintenance, environmental, industrial, safety, mechanical equipment and medical equipment. The certificate is not equivalent to an associate degree.

#### Required Courses

Code	Title	Units
BUS 0250	Computer Applications for Business	3
CHEM 0001A or CHEM 0003A & CHEM 0003B	General Chemistry I (OR) General Chemistry I - Part 1 and General Chemistry I - Part 2	5-6
ENGR 0022A	Engineering Drawing and CAD	3
ENGR 0150	Introduction to the Engineering Profession	1
MATH 0027	Trigonometry	4
MECH 0010	Fundamentals of Electronics	4

#### Select one of the following physics course combinations: 5

PHYS 0105 & 0105L	General Physics I and General Physics I Laboratory
PHYS 0205 & 0205L	Principles of Physics: Mechanics and Principles of Physics Laboratory: Mechanics

#### Select 6-10 units from the following: 6-10

CHEM 0001B	General Chemistry II
ENGR 0022B	Descriptive Geometry and Solid Modeling
ENGR 0037	Manufacturing Processes
ENGR 0110	Introduction to Engineering Design
ENGR 0220	Programming and Problem Solving in Engineering
MATH 0029	Pre-Calculus Mathematics
PHYS 0110 & 0110L	General Physics II and General Physics II Laboratory
PHYS 0210 & 0210L	Principles of Physics: Electricity and Magnetism and Principles of Physics Laboratory: Electricity and Magnetism

#### Total Units 31-36

## Courses

Understanding course descriptions (<http://catalog.sierracollege.edu/archive/2021-2022/student-resources/course-information/understanding-course-descriptions/>)

**ENGR 0010. Engineering Survey Measurements***Units: 4*

Prerequisite: Completion of MATH 27 with grade of "C" or better  
 Advisory: Completion with grade of "C" or better or concurrent enrollment in ENGR 22A

Hours: 108 (54 lecture, 54 laboratory)

Theory and practice with total stations (with and without data collectors), leveling instruments, and tapes. Creation of a boundary and topographic survey requiring traverse adjustment and area within irregular boundaries. Mock construction project requiring a construction survey including field staking. Problems including horizontal and vertical curves, slopes and alignments, cut and fill, topographic maps and volume calculation. Introduction to GPS. Designed for engineering students and required for Civil Engineering majors. (C-ID ENGR 180) (CSU, UC)

**ENGR 0017. Introduction to Circuit Theory***Units: 3*

Prerequisite: Completion of MATH 32, PHYS 210 and PHYS 210L with grades of "C" or better; completion with grade of "C" or better or concurrent enrollment in MATH 33

Hours: 54 lecture

Introduction to circuit analysis. Includes all basic, passive circuit elements and operational amplifiers. Covers constant and time variant circuit networks; network analysis and simplification techniques; response of circuit networks, natural and forced; steady state sinusoidal circuit analysis development from the network differential equations; power calculations; analysis involving operational amplifiers. (CSU, UC)

**ENGR 0017L. Circuit Theory Laboratory***Unit: 1*

Prerequisite: Completion with grade of "C" or better or concurrent enrollment in ENGR 17; and completion of PHYS 210 and 210L with grades of "C" or better

Hours: 54 laboratory

Designed to parallel ENGR 17. Experimental verification of circuit analysis concepts. Laboratory exercises include DC, transient and AC measurements on circuits including resistors, capacitors, inductors and operational amplifiers. Digital logic circuits are also addressed. Basic electrical instrumentation is used. (CSU, UC)

**ENGR 0022A. Engineering Drawing and CAD***Units: 3*

Hours: 90 (36 lecture, 54 laboratory)

Introduction to the graphical methods, equipment and software used to produce and interpret engineering drawings. Fundamentals of technical drawing including sketching, geometric constructions, orthographic projection, dimensioning, sectional views, auxiliary views, threads and fasteners, and pictorial projection. Emphasis on the production of two-dimensional working drawings utilizing freehand sketching and computer-aided drafting (CAD) hardware and software. (CSU)

**ENGR 0022B. Descriptive Geometry and Solid Modeling***Units: 3*

Formerly known as ENGR 23

Prerequisite: Completion of ENGR 22A; or DES 1 and 2 with grade(s) of "C" or better

Hours: 90 (36 lecture, 54 laboratory)

Fundamental principles of descriptive geometry with application to technical drawing and engineering problems. Visualizing spatial relationships from orthographic drawings. Includes sketches and computer-aided drafting (CAD) projects. Provides an introduction to solid modeling including part and assembly modeling. Designed for Engineering and Drafting and Engineering Support majors. (CSU, UC)

**ENGR 0028. Independent Study***Units: 1-3*

Designed for students interested in furthering their knowledge at an independent study level in an area where no specific curriculum offering is currently available. Independent study might include, but is not limited to, research papers, special subject area projects, and research projects. See Independent Study page in catalog. (CSU, UC-with unit limitation)

**ENGR 0035. Statics***Units: 3*

Prerequisite: Completion of PHYS 205, PHYS 205L, and MATH 31 with grades of "C" or better

Advisory: Completion of ENGR 22A with grade of "C" or better

Hours: 54 lecture

Introduces the concepts of engineering based on forces in equilibrium. Includes concentrated forces, distributed forces, forces due to friction, and inertia as they apply to machines, structures, and systems. Upon completion, students should be able to solve problems which require the ability to analyze systems of forces and bodies in static equilibrium. (C-ID ENGR 130) (CSU, UC)

**ENGR 0037. Manufacturing Processes***Units: 3*

Advisory: Completion of ENGR 22A with grade of "C" or better

Hours: 90 (36 lecture, 54 laboratory)

Application of multiple fabrication techniques including tools and materials required for the manufacture of a mechanical assembly. Introduction to design and documentation of a final product. Manufacturing processes in the areas of forming, joining, material removal, casting, assembly and prototyping which includes hands on use of manufacturing equipment. Each student fabricates a final project based on principles of manufacturing. (CSU, UC)

**ENGR 0045. Materials Science***Units: 3*

Prerequisite: Completion of PHYS 205 and 205L with grades of "C" or better; and completion with grade of "C" or better or concurrent enrollment in CHEM 1A

Basic principles of physical and chemical behavior of metals, polymers, composites and ceramics in engineering applications; topics include bonding, crystalline structure and imperfections, diffusion, kinetics, phase diagrams, corrosion, mechanical and electrical properties. Laboratory experiments analyze actual behavior of materials; topics include metallography, mechanical properties of metals and heat treatment. (CSU, UC)

**ENGR 0095. Internship in Engineering***Units: 0.5-4*

Designed for advanced students to work in an area related to their educational or occupational goal. Provides new on-the-job technical training under the direction of a worksite supervisor, allowing students to expand knowledge and skills in the chosen field. Mandatory orientation session and faculty approval to determine eligibility. One unit of credit is equal to each 60 hours of non-paid work, or each 75 hours of paid work. Students may earn up to a total of 16 units in internship courses (any course numbered 95 and PDEV 94). (CSU-with unit limitation)

**ENGR 0110. Introduction to Engineering Design**

*Units: 3*

Hours: 54 lecture

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. Introduces the fundamentals of engineering design, problem solving, planning, prototyping and some fabrication. (C-ID ENGR 110) (CSU, UC)

**ENGR 0150. Introduction to the Engineering Profession**

*Unit: 1*

Hours: 18 lecture

Exploration of the engineering profession, focusing on branches of engineering and relationships between them, spectrum of work functions, professionalism and ethics. Includes orientation to Sierra College engineering program, evaluation of engineering as a personal career choice and participating in engineering activities. (CSU, UC)

**ENGR 0220. Programming and Problem Solving in Engineering**

*Units: 4*

Prerequisite: Completion of MATH 30 and PHYS 205 and 205L with grades of "C" or better. Advisory: PHYS 205 may be taken concurrently

Hours: 108 (54 lecture, 54 laboratory)

Utilizes the MATLAB environment to provide students with a working knowledge of computer-based problem-solving methods relevant to science and engineering. It introduces the fundamentals of procedural and object-oriented programming, numerical analysis, and data structures. Examples and assignments in the course are drawn from practical applications in engineering, physics, and mathematics. (C-ID ENGR 220)(CSU, UC)

## **Program Student Learning Outcomes (PSLOs)**

- Identify and differentiate between the attributes of the various engineering disciplines as related to education and the workforce.
- Read, analyze, and compose industry standard technical engineering drawings.
- Model physical systems correctly through the use of engineering concepts and then apply advanced mathematical techniques to solve the system.
- Create technical reports that identify, analyze, and assess results taken from experiments that are performed within the engineering lab.
- Construct actual physical models from instructions and diagrams given to them by an instructor.