ENGINEERING

Contact Information

Division
Sciences and Mathematics

Dean
Randy Lehr

Associate Dean
Ishtar Thomas-Lane (Interim)

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/student-resources/general-education/associate-degree-requirements);
- California State University General Education Breadth (http://catalog.sierracollege.edu/student-resources/general-education/california-state-university-general-education-breadth-requirements) pattern;

Required Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 0001A</td>
<td>General Chemistry I (OR)</td>
<td>5-6</td>
</tr>
<tr>
<td>or CHEM 0003A &amp; CHEM 0003B</td>
<td>General Chemistry I - Part 1 and General Chemistry I - Part 2</td>
<td></td>
</tr>
<tr>
<td>ENGR 0035</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 0045</td>
<td>Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>MATH 0030</td>
<td>Analytical Geometry and Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 0031</td>
<td>Analytical Geometry and Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 0032</td>
<td>Analytical Geometry and Calculus III</td>
<td>4</td>
</tr>
</tbody>
</table>

Select one of the following physics course combinations: 4

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 0210 &amp; 0210L</td>
<td>Principles of Physics: Electricity and Magnetism and Principles of Physics Laboratory: Electricity and Magnetism</td>
</tr>
</tbody>
</table>

Select 6 units from the following (if not used above): 6

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 0001B</td>
<td>General Chemistry II</td>
</tr>
<tr>
<td>ENGR 0017</td>
<td>Introduction to Circuit Theory</td>
</tr>
<tr>
<td>ENGR 0017L</td>
<td>Circuit Theory Laboratory</td>
</tr>
<tr>
<td>ENGR 0022A</td>
<td>Engineering Drawing and CAD</td>
</tr>
<tr>
<td>ENGR 0022B</td>
<td>Descriptive Geometry and Solid Modeling</td>
</tr>
<tr>
<td>ENGR 0095</td>
<td>Internship in Engineering (up to 4 units)</td>
</tr>
<tr>
<td>ENGR 0110</td>
<td>Introduction to Engineering Design</td>
</tr>
</tbody>
</table>
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

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

Select one of the following physics course combinations:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 0105 &amp; 0105L</td>
<td>General Physics I and General Physics I Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>PHYS 0205 &amp; 0205L</td>
<td>Principles of Physics: Mechanics and Principles of Physics Laboratory: Mechanics</td>
<td>5</td>
</tr>
</tbody>
</table>

Select 3-5 units from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 0022B</td>
<td>Descriptive Geometry and Solid Modeling</td>
<td>3-5</td>
</tr>
<tr>
<td>ENGR 0037</td>
<td>Manufacturing Processes</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 0110</td>
<td>Introduction to Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>GEOG 0090</td>
<td>Introduction to Geographic Information Systems (GIS)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 0110 &amp; 0110L</td>
<td>General Physics II and General Physics II Laboratory</td>
<td>3</td>
</tr>
</tbody>
</table>

Courses

Understanding course descriptions (http://catalog.sierracollege.edu/student-resources/course-information/understanding-course-descriptions)
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, UC)

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 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
Exploration of the engineering profession, focusing on branches of engineering and relationships between them, spectrum of work functions, professionalism and ethics. Introduces the fundamentals of engineering design, problem solving, planning, prototyping and some fabrication. Includes orientation to Sierra College engineering program, evaluation of engineering as a personal career choice and participation in multiple engineering activities. (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. PHYS 205 may be taken concurrently
Hours: 108 (54 lecture, 54 laboratory)
Introduction to methods and techniques of programming software in MATLAB to solve engineering problems. Includes coverage of MATLAB user environment and functions, engineering problems, engineering variables, advanced math (matrices), engineering solutions (plotting) and verification. Designed to train students in solving engineering problems with MATLAB software. (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.