

## Definition

Engineering is concerned with the application of scientific and mathematical theories and principles to solve practical technical problems. The engineering discipline includes the Engineering Technology program for students who desire to work in jobs related to engineering.

## Staff

To access faculty and staff, dial (661) 722-6300, then the 4-digit extension.

Program Advisement:

Dr. Les Uhazy, Dean ext. 6417

Administrative Assistant:

Wendy Cios ext. 6415

Clerical Assistant:

Suzanne Olson ext. 6046

Department Chair:

Christos Valiotis ext. 6422

Faculty:

Dr. Jonathan Compton ext. 6809

Adjunct Faculty:

To access adjunct faculty voice mail, dial (661) 722-6300, then the 4-digit number.

	V.M.
Jose Alvarado	2160
Steven Brown	2238
Seyed Ahmad Mohades Kassai	2618
Victor Laxamana	2196
Karl Major	2137
Jonathan Over	2135

## Program Description

The Engineering program at Antelope Valley College has three distinct components: 1) a certificate program in Engineering Technology; 2) associate degree programs in Engineering and Engineering Technology; and 3) Engineering transfer to programs such as CSULB-AV Engineering program.

Students must receive a minimum grade of "C" or better in all required core courses and the specific courses listed as program electives in order to qualify for the degree or certificate.

## Distinctive Features

The Engineering program offers the student challenging and rewarding classes that transfer to four-year universities in California. The Engineering courses listed under the Associate Degree in Engineering should suffice for most engineering majors transferring to a major university. See a counselor for specific general education requirements.

## Career Options

Aerospace Engineering  
Architectural Engineering  
Biomedical Engineering  
Chemical Engineering  
Civil Engineering

Computer Engineering

Electrical Engineering

Industrial Engineering

Mechanical Engineering

(Most of these careers require education beyond the two-year college level.)

## Program Learning Outcomes

### Engineering

1. Integrate the engineering problem solving method, teamwork, and design process to complete a project demonstrating basic engineering skills.
2. Develop a strong computational background in fundamental engineering computer programs.
3. Analyze internal structural loading and predict behavior of materials in 2-D and 3-D structures with mathematical calculations, collected data, and graphical information.

### Engineering Technology

1. Students will plan, create, test, and run their own programs in C code to solve typical programs.
2. Create multiple views, orientations, and reference frames for hand-drawn, and computer drawn models.
3. Design and construct drawings of basic circuits and electronics in computer aided design program.

## Associate Degrees

### Engineering

The goal of the Associates Degree in Engineering is to provide students with a fundamental knowledge of Engineering, to enhance their computational and problem solving skills, sharpen their critical thinking, and to ensure proper preparation for junior level Engineering coursework at a university. Students completing this degree should realize that there are many sub disciplines in Engineering and most require a similar core education, but not all. The requirements for an associate degree in Engineering may be satisfied by completing the courses listed below in addition to the associate degree requirements. Students who intend to transfer are strongly encouraged to complete either the Intersegmental General Education Transfer Curriculum (IGETC) or the California State University General Education – Breadth (CSU GE) requirements. (See Graduation/ Associate Degree Requirements and Transfer Information.)

Required Courses:	units
ENGR 110, Engineering Orientation and Basic Skills	3
ENGR 125, Programming and Problem Solving in MATLAB	4
ENGR 130, Materials Science <i>and</i> ENGR 130L, Materials Science Lab	
<i>or</i> ENGR 185, Digital Logic and Design	4
ENGR 140, Engineering 3D Graphics	3
ENGR 210, Statics	4
ENGR 230, Circuit Analysis	4
	<b>Total 22</b>

### Engineering Technology

(Currently not accepting new applicants for this major)

The requirements for an associate degree in Engineering Technology may be satisfied by completing the certificate program in addition to the associate degree requirements. (See Graduation/Associate Degree Requirements.)

Students who complete the associate degree in Engineering Technology will have drafting and programming skills of value in all fields of engineering and applied technologies including aerospace manufacturing, construction technology, public works, and industrial research and development. They will have entry level skills that would serve as a foundation for advancement in their field of employment. Moreover, the associate degree will also provide students with a broad range of knowledge with which: to evaluate and appreciate the physical environment, the culture, and the society in which they live; the ability to think critically; and the ability to communicate clearly and effectively.

Except in cases of a prerequisite requirement, it is not required to take courses in exactly this sequence; they are recommended in this order to facilitate success.

#### Recommended Plan of Study

<b>First Semester</b>	<b>units</b>
ENGR 115, Basic Engineer Drawing	3
ENGR 120, Intro. to 2-D AutoCAD	3
MATH 130, College Algebra	4
Course from GE requirement Area B	3
Course from GE requirement Area D1	3
<b>Total 16</b>	<b>16</b>
<b>Second Semester</b>	<b>units</b>
DRFT 125, Mechanical Drafting <b>or</b> DRFT 130, Architectural Draft. I	3
DRFT 150, Interm. 2-D AutoCAD	3
ELTE 125, Direct and Alternating Current Principles	5
Course from GE requirement Area C	3
<b>Total 14</b>	<b>14</b>
<b>Third Semester</b>	<b>units</b>
CIS 161, Introduction to C Programming	3
DRFT 240, Electronic Drafting	3
Course from GE requirement Area F	3
Program Electives	5
<b>Total 14</b>	<b>14</b>
<b>Fourth Semester</b>	<b>units</b>
Course from GE requirement Area A	3
Course from GE requirement Area D2	3
Course from GE requirement Area E	3
Electives	7
<b>Total 16</b>	<b>16</b>
<b>Degree Total 60</b>	<b>60</b>

### Certificate Program

#### Engineering Technology

(Currently not accepting new applicants for this major)

The following courses (32 units minimum) are required for the certificate.

<b>Required Courses:</b>	<b>units</b>
CIS 161, Introduction to C Programming	3
DRFT 125, Mechanical Drafting <b>or</b> DRFT 130, Architectural Draft. I	3
DRFT 150, Interm. 2-D AutoCAD	3
DRFT 240, Electronic Drafting	3
ELTE 125, Direct and Alternating Current Principles	5
ENGR 115, Basic Engineer Drawing	3
ENGR 120, Introduction to 2-D AutoCAD	3
MATH 130, College Algebra	4
Program Electives	5
<b>Total 32</b>	<b>32</b>

For a recommended plan of study for the certificate, please refer to the Associate Degree plan minus the general education requirements.

<b>Program Electives:</b>	<b>units</b>
DRFT 230, Architectural Drafting II	3
DRFT 250, Intro. to 3-D AutoCAD	2
MATH 150, Calculus and Analytical Geometry	5

(See Drafting/Computer Aided Design for Drafting/CAD program.)

### Transfer

A student planning to pursue a bachelor's degree in Engineering should consult with the Transfer Center for specific program information.

#### Engineering Major—CSU and UC

The following foundation courses are common to many programs.

CHEM 110, General Chemistry	5
ENGR 110, Engineering Orientation and Basic Skills	3
ENGR 120, Introduction to 2-D AutoCAD	3
ENGR 130, Materials Science	3
ENGR 210, Statics	4
ENGR 220, 220L, 220PS, Strength of Materials/Lab/ Problem Solving Session	5
ENGR 230, Circuit Analysis	4
MATH 150, 160, 250, Calculus and Analytic Geometry	13
MATH 230, Intro. to Ordinary Differential Equations	4
PHYS 110, 120, 211, General Physics/Lab	13

**NOTE:** A minimum grade of "C" in courses required for the major is required for transfer to baccalaureate programs. Always check the appropriate transfer institution catalog and consult with a counselor.

### Prerequisite Completion

If a course is listed as a prerequisite for another course, that prerequisite course must be completed with a satisfactory grade

in order to enroll in the next course. According to Title 5, Section 55200(d), a satisfactory grade is a grade of "A," "B," "C" or "P". Classes in which the Pass/No Pass option is available are indicated with an asterisk (\*) before the course title. See "Pass/No Pass Option" in the catalog for full explanation.

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## Engineering Courses

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### ENGR 110 \*ENGINEERING ORIENTATION AND BASIC SKILLS

3 units

3 hours weekly

**Prerequisite:** Completion of MATH 102.

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. (CSU, AVC)

### ENGR 115 \*BASIC ENGINEERING DRAWING

3 units

6 hours weekly

**Advisory:** Eligibility for MATH 070.

Introductory engineering drawing covers lettering, use of instruments and rulers, applied geometry, sketching, sectional views, orthographic projection and auxiliary views. Computerized software will be introduced. This course is intended for vocational training leading to a certificate and a basic drawing background for engineers transferring to a university. (CSU, AVC)

### ENGR 120 \*INTRODUCTION TO 2-D CAD

3 units

6 hours weekly

**Advisory:** Eligibility for READ 099.

Introduction to the study of 2-dimensional (2D) computer aided design (CAD) and drafting using engineering design software. Includes lectures, demonstrations, and laboratory practice. Student will gain experience in the preparation of industry quality drawings as a result of the training. Previous skills in computer operation are not required. Work is to be performed by the students using engineering design/CAD software. (CSU, AVC)

### ENGR 125 PROGRAMMING AND PROBLEM-SOLVING IN MATLAB

4 units

6 hours weekly

(3 hours lecture, 3 hours lab)

**Prerequisite:** Completion of MATH 150.

This course 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. (CSU, UC, AVC)

### ENGR 130 MATERIALS SCIENCE

3 units

3 hours weekly

**Prerequisite:** Completion of CHEM 110 and PHYS 110.

**Corequisite:** Concurrent enrollment in ENGR 130L.

This course presents the internal structures and resulting behaviors of materials used in engineering applications, including metals, ceramics, polymers, composites, and semiconductors. The emphasis is upon developing the ability both to select appropriate materials to meet engineering design criteria and to understand the effects of heat, stress, imperfections, and chemical environments upon material properties and performance. (CSU, UC, AVC)

### ENGR 130L MATERIALS SCIENCE LAB

1 unit

3 hours weekly

**Corequisite:** Concurrent enrollment in ENGR 130.

This course is the experimental exploration of the connections between the structure of materials and materials properties. Laboratories provide opportunities to directly observe the structures and behaviors discussed in the lecture course, to operate testing equipment, to analyze experimental data, and to prepare reports. (CSU, AVC)

### ENGR 140 ENGINEERING 3D GRAPHICS

3 unit

6 hours weekly

**Prerequisite:** Completion of MATH 135 (AVC Assessment).

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; and the engineering design process. Assignments develop sketching and 2-D and 3-D CAD skills. The use of CAD software is an integral part of the course. (CSU, AVC)

### ENGR 185 \*DIGITAL LOGIC AND DESIGN

4 units

6 hours weekly

(3 hours lecture, 3 hours lab)

**Prerequisite:** Completion of MATH 102.

**Advisory:** Eligibility for ENGL 101/ENGL 101SL and READ 099.

This course covers discrete mathematics, logic Boolean algebra, binary arithmetic, logic gates, combinatorial logic, and minimization techniques. Includes an introduction to sequential circuits, state machines and synchronous state machine design. Students will design combinatorial circuits, flipflops, multivibrators, registers and counters. (CSU, UC,

AVC)

### ENGR 199 \*OCCUPATIONAL WORK EXPERIENCE

1–8 units

hours vary

**Prerequisite:** To participate in work experience, students must have a job or internship which is either paid or voluntary and have the approval of the supervisor and instructor supervising work experience in the specific subject area. **PRIOR TO ENROLLING**, students must attend a scheduled orientation or meet individually with the supervising instructor for an individual orientation.

Occupational Work Experience Education is supervised employment designed to provide students a realistic learning experience through work. The ultimate goal is to teach students those skills and attitudes that will equip them to function and adapt as an employee in a variety of situations and jobs. Occupational Work Experience Education is supervised employment extending classroom-based occupational learning at an on-the-job learning station related to the students' educational major or occupational goal. Credit may be accrued at the rate of one to eight units per semester. For the satisfactory completion of all types of Cooperative Work Experience Education (WE 197 and WE 199), students may earn up to a total of sixteen semester credit hours. (CSU, AVC) (R3)

### ENGR 210 STATICS

4 units

4 hours weekly

**Prerequisite:** Completion of MATH 160 and PHYS 110.

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. Optional additional topics include fluid statics, cables, Mohr's circle and virtual work. **NOTE:** Offered fall semester only. (CSU, AVC)

### ENGR 215 DYNAMICS

3 units

3 hours weekly

**Prerequisite:** Completion of ENGR 210.

This course covers the 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. (CSU, AVC)

### ENGR 220 \*STRENGTH OF MATERIALS

3 units

3 hours weekly

**Prerequisite:** Completion of ENGR 210.

**Corequisite:** Concurrent enrollment in ENGR 220L.

**Advisory:** Concurrent enrollment in ENGR 220PS.

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. (CSU, UC, AVC)

### ENGR 220PS \*STRENGTH OF MATERIALS PROBLEM SOLVING SESSION

1 unit

1 hour weekly

**Corequisite:** Concurrent enrollment in ENGR 220.

Problem solving session for the ENGR 220 class, which reinforces the lecture topics. (CSU, AVC)

### ENGR 220L \*STRENGTH OF MATERIALS LAB

1 unit

3 hours weekly

**Corequisite:** Concurrent enrollment in ENGR 220.

This is a laboratory course designed to accompany the ENGR 220 lecture course. This course will solidify concepts involving the 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.. (CSU, AVC)

### ENGR 221 ENGINEERING THERMODYNAMICS

3 units

3 hours weekly

**Prerequisite:** Completion of PHYS 110, MATH 160, and CHEM 110.

The definitions, concepts, and laws of thermodynamics. Applications to ideal and real gases, vapor and gas power systems and heat pump systems. Combustion, chemical equilibrium, chemical kinetics and phase transitions. The course will introduce students to real world energy systems and develop analysis techniques for these systems. A systematic problem solving process will be emphasized. (CSU, UC, AVC)

### ENGR 230 CIRCUIT ANALYSIS

4 units

6 hours weekly

(3 hours lecture, 3 hours lab)

**Prerequisite:** Completion of PHYS 120.

**Corequisite:** Concurrent enrollment in MATH 230.

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. (CSU, UC, AVC)