

## 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 the engineering industry.

## Staff

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

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## Program Description

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

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 Degrees in each engineering area should suffice for those specific engineering majors, and possibly those beyond transferring to a major university. See a counselor for specific details and general education requirements.

## Career Options

Mechanical Engineering  
 Electrical Engineering  
 Computer Engineering  
 Biomedical Engineering  
 Aerospace Engineering

## Civil Engineering

and many more sub areas of engineering (see a counselor for details)

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

## Program Learning Outcomes

### Electrical Engineering

1. Apply knowledge of math, science, and engineering to identify, define, and solve electrical engineering related problems.
2. Design and perform tests/experiments, analyze and interpret data, and prepare technical reports as a member of a group.
3. Effectively employ techniques, skills, and computational tools necessary for electrical engineering.

### Mechanical Engineering

1. Apply knowledge of math, science, and engineering to identify, define, and solve engineering problems.
2. Communicate effectively and work efficiently in a team environment.
3. Design and perform tests/experiments, analyze and interpret data, and prepare technical reports.
4. Effectively employ techniques, skills, and computational tools necessary for engineering.

### 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

### Electrical Engineering

The Associate in Sciences in Electrical Engineering will provide students with a fundamental knowledge of Electrical Engineering, to enhance their computational and problem solving skills, sharpen their critical thinking, and to ensure proper preparation for junior level Electrical Engineering coursework at a university. Students completing this degree should realize that there are many sub disciplines in Electrical Engineering and most require a similar core education, but not all. The requirements for an associate degree in Electrical Engineering may be satisfied by completing the courses listed below in addition to the associate degree requirements. (See Graduation/Associate Degree Requirements.)

Required Courses:	units
CIS 161, Introduction to C Programming	3
ENGR 110, Engineering Orientation and Basic Skills	3
ENGR 125, Programming and Problem Solving in MATLAB	4
ENGR 185, Digital Logic and Design	4
ENGR 230, Circuit Analysis	4
MATH 150, Calculus and Analytic Geometry	5
MATH 160, Calculus and Analytic Geometry	4
MATH 230, Introduction to Ordinary Differential Equations	4

MATH 250, Calculus and Analytic Geometry	4
PHYS 110, General Physics	4
PHYS 120, General Physics	4
PHYS 211, General Physics	5
<b>Total</b>	<b>48</b>

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 110, Engineering Orientation and Basic Skills	3
MATH 150, Calculus and Analytic Geometry (AVC GE D2)	5
Course from GE requirement Area B	3
Course from GE requirement Area D1	3
<b>Total</b>	<b>14</b>

<b>Second Semester</b>	<b>units</b>
CIS 161, Introduction to C Programming (AVC GE E)	3
ENGR 125, Programming and Problem Solving in MATLAB	4
MATH 160, Calculus and Analytic Geometry	4
PHYS 110, General Physics (AVC GE A)	4
<b>Total</b>	<b>15</b>

<b>Third Semester</b>	<b>units</b>
ENGR 185, Digital Logic and Design	4
MATH 250, Calculus and Analytic Geometry	4
PHYS 120, General Physics	4
Course from GE requirement Area C	3
<b>Total</b>	<b>15</b>

<b>Fourth Semester</b>	<b>units</b>
ENGR 230, Circuit Analysis	4
MATH 230, Introduction to Ordinary Differential Equations	4
PHYS 211, General Physics	5
Course from GE requirement Area F	3
<b>Total</b>	<b>16</b>
<b>Degree Total</b>	<b>60</b>

#### **Mechanical Engineering**

The Associate in Sciences in Mechanical Engineering will provide students with a fundamental knowledge of Mechanical Engineering, to enhance their computational and problem solving skills, sharpen their critical thinking, and to ensure proper preparation for junior level Mechanical Engineering coursework at a university. Students completing this degree should realize that there are many sub disciplines in Mechanical Engineering and most require a similar core education, but not all. The requirements for an associate degree in Mechanical Engineering may be satisfied by completing the courses listed below in addition to the associate degree requirements. (See Graduation/Associate Degree Requirements.)

<b>Required Courses:</b>	<b>units</b>
CHEM 110, General Chemistry	5
ENGR 110, Engineering Orientation and Basic Skills	3
ENGR 125, Programming and Problem Solving in MATLAB	4
ENGR 130, Materials Science	3

ENGR 130L, Materials Science Lab	1
ENGR 140, Engineering 3D Graphics	3
ENGR 210, Statics	4
MATH 150, Calculus and Analytic Geometry	5
MATH 160, Calculus and Analytic Geometry	4
MATH 230, Introduction to Ordinary Differential Equations	4
MATH 250, Calculus and Analytic Geometry	4
PHYS 110, General Physics	4
PHYS 120, General Physics	4
<b>Total</b>	<b>48</b>

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>
CHEM 110, General Chemistry (AVC GE A)	5
ENGR 110, Engineering Orientation and Basic Skills	3
MATH 150, Calculus and Analytic Geometry (AVC GE D2)	5
<b>Total</b>	<b>13</b>

<b>Second Semester</b>	<b>units</b>
ENGR 125, Programming and Problem Solving in MATLAB	4
MATH 160, Calculus and Analytic Geometry	4
PHYS 110, General Physics (AVC GE E)	4
Course from GE requirement Area D1	3
<b>Total</b>	<b>15</b>

<b>Summer</b>	<b>units</b>
ENGR 130, Materials Science	3
ENGR 130L, Materials Science Lab	1
<b>Total</b>	<b>4</b>

<b>Third Semester</b>	<b>units</b>
ENGR 140, Engineering 3D Graphics	3
MATH 230, Introduction to Ordinary Differential Equations	4
PHYS 120, General Physics	4
Course from GE requirement Area C	3
<b>Total</b>	<b>14</b>

<b>Fourth Semester</b>	<b>units</b>
ENGR 210, Statics	4
MATH 250, Calculus and Analytic Geometry	4
Course from GE requirement Area B	3
Course from GE requirement Area F	3
<b>Total</b>	<b>14</b>
<b>Degree Total</b>	<b>60</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
DRFT 120, Intro. to 2-D AutoCAD	3
MATH 128, College Algebra for Liberal Arts (AVC GE D2)	3
Course from GE requirement Area B	3
Course from GE requirement Area D1	3
<b>Total</b>	<b>15</b>
<b>Second Semester</b>	<b>units</b>
DRFT 125, Mechanical Drafting <i>or</i>	
DRFT 130, Architectural Draft. I	3
DRFT 150, Intern. 2-D AutoCAD	3
ELTE 125, Direct and Alternating Current Principles	5
Course from GE requirement Area C	3
<b>Total</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	6
<b>Total</b>	<b>15</b>
<b>Fourth Semester</b>	<b>units</b>
Course from GE requirement Area A	3
Course from GE requirement Area E	3
Electives	10
<b>Total</b>	<b>16</b>
<b>Degree Total</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 120, Introduction to 2-D AutoCAD	3
DRFT 125, Mechanical Drafting <i>or</i>	
DRFT 130, Architectural Draft. I	3
DRFT 150, Intern. 2-D AutoCAD	3
DRFT 240, Electronic Drafting	3
ELTE 125, Direct and Alternating Current Principles	5
ENGR 115, Basic Engineer Drawing	3

MATH 128, College Algebra for Liberal Arts	3
Program Electives	6
<b>Total</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**

Students planning to continue studies at a four-year college or university after AVC should visit the Transfer Resource Center and consult with a counselor as soon as possible. Additional information on official transfer articulation agreements from AVC to many CSU/UC campuses can be found at the following Web site: [www.assist.org](http://www.assist.org)

**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.

**Engineering Courses**

**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. (C-ID: ENGR 110) (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 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. (C-ID: ENGR 220) (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. (C-ID: ENGR 140) (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. (C-ID: ENGR 150) (CSU, UC, 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 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. (C-ID: ENGR 130) (CSU, UC, 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, UC, 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 230 CIRCUIT ANALYSIS**

4 units

6 hours weekly

(3 hours lecture, 3 hours lab)

*Prerequisite:* Completion of PHYS 120.

*Corequisite:* Completion of or 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)