

# Engineering

Engineering involves the application of science, mathematics and technology to solve and analyze a wide range of problems. In today's society, engineering specialties include civil, electrical, mechanical, chemical, materials, industrial, aeronautical, environmental and computer engineering, among others. In general, engineers participate in the activities which make the resources of nature available in a form beneficial to society and provide systems which will perform optimally and economically.

The Engineering transfer program at Santa Barbara City College provides lower-division engineering coursework equivalent to the first two years of education at a 4-year university leading to a Bachelor of Science Degree. At Santa Barbara City College, all Engineering transfer students major in Engineering and do not declare a specific branch of engineering study until after they have transferred to a 4-year university. An Associate in Science and an Associate in Arts may also be obtained.

## Program Student Learning Outcomes

1. Knowledge of the engineering profession, and the engineering analysis and design process.
2. Utilize mathematical analysis and graphical methods to solve engineering problems.
3. Demonstrate proficiency in the application and use of engineering software and laboratory equipment.
4. Develop teamwork and technical writing skills to be successful on an engineering design team.

## Department Offices

Mike Young, *Chair* (PS-119, ext. 2697)  
Donald Ion, *Supervising Lab Technician* (PS-120, ext. 2312)

## Faculty and Offices

Nick Arnold (PS-118, ext. 4253)  
Jodi Simpson (PS-121, ext. 2505)

## Degrees and Certificates Awarded

Associate in Arts and Associate in Science:  
Engineering

## A.S./A.A. Degree Requirements: Engineering

### Department Requirements (49-54 units)

CHEM 155 — General Chemistry I .....	5
ENGR 101 — Introduction to Engineering.....	2
MATH 150 — Calculus with Analytic Geometry I.....	5
MATH 160 — Calculus with Analytic Geometry II.....	5
MATH 200+ — Multivariable Calculus .....	4
MATH 210+ — Linear Algebra.....	4
PHYS 121 — Mechanics of Solids and Fluids.....	5
PHYS 122 — Electricity and Magnetism .....	5
<i>+MATH 250 satisfies this requirement.</i>	

*Plus one of the following courses is required:*

ENGR 115 — Statics and Strength of Materials <b>or</b> .....	4
ENGR 117 — Electronic Circuits <b>and</b> .....	3
ENGR 117L — Electronic Circuits Laboratory.....	1

*Plus at least 3 additional courses from the following:*

CHEM 156 — General Chemistry II .....	5
CS 131 — Assembly Language Programming .....	4
CS 135 — Programming Fundamentals.....	3
CS 137 — C Programming.....	3
ENGR 105/DRFT 105 — Engineering Graphics .....	4
ENGR 115 — Statics and Strength of Materials.....	4
ENGR 116 — Dynamics .....	4
ENGR 117 — Electronic Circuits <b>and</b> .....	3
ENGR 117L — Electronic Circuits Laboratory.....	1
DRFT 130/ENGR 130 — CAD Design I .....	5
MATH 220♦ — Differential Equations.....	4
PHYS 123 — Heat, Light and Modern Physics .....	5

*♦MATH 260 may also count toward the elective requirement.*

*Note: A course may not be used to satisfy more than one requirement (double counting not allowed).*

## College Requirements

For complete information, see "Graduation Requirements" in the *Catalog Index*.

## Planning a Program of Study

Students should work with Santa Barbara City College's counseling staff in planning semester-by-semester programs of study. Important conditions to be met by students majoring in the Physical Sciences include:

1. The number of units taken each semester is a matter of personal choice. Students who work full-time should take a reduced course load.
2. Many required courses are in sequences—which must be taken in the prescribed order (e.g. MATH 150, 160, 200/210 and 220).
3. Some courses are prerequisites for courses in the sequences (e.g., MATH 150 is a prerequisite for Physics 121). Some sequences are especially important for the sciences. The sciences do require reading, writing and mathematical skills. Science textbooks are typically at a grade 13-14 reading level. Students deficient in such skills have a unique opportunity at Santa Barbara City College to quickly and efficiently reach the levels required in the majors programs through the following sequences:

### English Sequence

1. Passing score on placement exam (to) ENG 110 (to) ENG 111; *or*
2. English Skills (to) ENG 100 (to) ENG 110 (to) ENG 111

### Mathematics Sequence

1. MATH 100 (to) MATH 111 (to) MATH 137 (to) MATH 138 (to) 150, 160, 200, 210, 220; *or*
2. High school algebra and trigonometry, plus passing score on placement exam (to) MATH 150, 160, 200, 210, 220

*Special Note: If you have not been tested for appropriate course placement in respect to the aforementioned sequences, contact the Counseling Center for up-to-date pre-enrollment testing schedule information. You should make sure that you have the necessary skills for each class taken—in order to succeed and/or progress in your chosen major.*

*Other important sequences include:*

### Chemistry Sequence

CHEM 101 or high school chemistry (to) 155 (to) 156.

### Physics Sequence

PHYS 102 or high school physics (to) 121 (to) 122 (or) 123.

### Engineering Sequence

Most Engineering courses may be taken in any order. However, many Engineering courses have Physics and Mathematics prerequisites and corequisites. Students are encouraged to contact a counselor or faculty adviser for preferred sequences.

### Preparation for Transfer

Course requirements for transfer vary depending upon the college or university a student wishes to attend. Therefore it is *most important* for a student to consult with his/her counselor and departmental adviser before planning an academic program for transfer.

### Honors and Awards

The Physics and Engineering Departments select one student each year in each department as an Outstanding Student. Selections are made by faculty in the department areas involved. Selections are based solely on academic excellence and no applications by students are required.

## Course Descriptions

### ENGR 100 /HIST 150 — Technology and Society

**(3) F, S — CSU, UC\***

*Skills Advisories: Eligibility for ENG 110 or ENG 110H*

Survey of the history of technology, from antiquity to the 20th century, stressing the role of technology as a major determinant in the development of Western civilization. Emphasis on technology's changing impact upon society. (\*UC Transfer Limit: ENGR100/HIST 150 and HIST 151, 152 combined: maximum credit, 6 units).

**ENGR 101 — Introduction to Engineering****(2) F, S — CSU, UC***Skills Advisories: Eligibility for ENG 100 and ENG 103*

Introduction to the engineering profession, engineering schools and four-year transfer programs. Discussion of methods and history of engineering, guest speakers. Discussion of current areas of interest, including engineering in the Santa Barbara area community. Recommended for all Engineering majors.

**ENGR 102 — Engineering Calculations with MatLab****(1) F, S***Skills Advisories: Eligibility for ENG 100 and ENG 103; MATH 107 or 111*

Introduction to engineering calculations, using the MatLab interactive environment software package for performing technical computations. Topics include matrix computation, numerical analysis, graphics and m-files (source code). Designed for people who do not have MatLab experience, and who may not have any previous computer or programming experience. Foundational in the coverage and usages of many MatLab features.

**ENGR 105/DRFT 105 — Engineering Graphics****(4) F, S — CSU, UC***Skills Advisories: MATH 1 and Eligibility for ENG 100 and ENG 103*

Graphic/visual communication, emphasizing the engineering design process. Topics include the design process, freehand sketching, multiviews, dimensioning, tolerancing, auxiliary views, sectional views and computer-aided drafting, using CADKEY or AutoCAD software.

**ENGR 115 — Statics and Strength of Materials****(4) F — CSU, UC***Prerequisites: PHYS 121**Skills Advisories: Eligibility for ENG 100 and ENG 103*

Study of force systems, statics of particles and rigid bodies, and distributed forces. Analysis of structures, friction, centroids, moments of inertia, Mohr's Circle, Shear and Bending Moment Diagrams, and distributed forces.

**ENGR 116 — Dynamics****(4) S — CSU, UC***Prerequisites: ENGR 115 and MATH 160**Skills Advisories: Eligibility for ENG 100 and ENG 103*

Study and analysis of motions of particles and rigid bodies. Velocity, acceleration, relative motion, work, energy, impulse, and momentum. Vector mathematics where appropriate.

**ENGR 117 — Electronic Circuits****(3) F — CSU, UC***Prerequisites: MATH 160**Corequisites: PHYS 122**Skills Advisories: Eligibility for ENG 100 and ENG 103*

Introduction to electronic circuits. Includes AC and DC circuit analysis, transient and complete response, and operational amplifiers.

**ENGR 117L — Electronic Circuits Laboratory****(1) F — CSU, UC***Prerequisites: MATH 160**Corequisites: ENGR 117 and PHYS 122**Skills Advisories: Eligibility for ENG 100 and ENG 103*

Laboratory to accompany ENGR 117.

**ENGR 130/DRFT 130 — Computer-Assisted Drafting and Design I****(5) F, S, Summer — CSU, UC\****Prerequisites: DRFT 101 or DRFT 105/ENGR 105 or DRFT 110 or DRFT 120 or DRFT126**Skills Advisories: MATH 1 and eligibility for ENG 103*

Overall introduction to AutoCAD, including overview of equipment, operating systems and CAD applications in various engineering, drafting and design environments. Designed for people who have no AutoCAD experience and who may not have any previous microcomputer or CAD experience. Course is foundational in the coverage and usages of the many features of AutoCAD. (\*UC Transfer Limit: ENGR 130/DRFT 130, ENGR 131/DRFT 131, ENGR 132/DRFT 132 combined: maximum credit, one course.)

**ENGR 131/DRFT 131 — Computer-Assisted Drafting and Design II**

**(5) F, S — CSU, UC\***

*Prerequisites: DRFT 130/ENGR 130*

*Skills Advisories: MATH 1 and eligibility for ENG 103*

Designed to provide experienced 2D AutoCAD users with an understanding of creating 3D models, shading and rendering techniques in AutoCAD and AutoVision, and customizing features of AutoCAD. (\*UC Transfer Limit: ENGR 130/DRFT 130, ENGR 131/DRFT 131, ENGR 132/DRFT 132 combined: maximum credit, one course.)

**ENGR 132/DRFT 132 — Computer-Assisted Drafting and Design III**

**(5) F, S — CSU, UC\***

*Prerequisites: DRFT 131/ENGR 131*

*Skills Advisories: MATH 1 and eligibility for ENG 103*

Introduction to building information modeling. Designed to meet the needs of students who want to learn the basics of industry-standard building information modeling software. (\*UC Transfer Limit: ENGR 130/DRFT 130, ENGR 131/DRFT 131, ENGR 132/DRFT 132 combined: maximum credit, one course.)