Engineering

The Engineering Associate in Science degree is designed to meet lower division requirements for various majors in engineering. Completion of the Associate in Science degree should qualify the student to transfer at the upper division level to an engineering program at a four-year institution. The degree has a common engineering core requirement as well as specific field requirements. The specific field requirements do vary depending on the four-year institution to which the student will transfer. Thus, requirements for specific universities should be checked before selecting specific field courses.

Career Options

Engineering is the branch of science and technology concerned with the design, building, and use of engines, machines, and structures. The Engineering Associate in Science degree is designed to qualify the student to transfer at the upper-division level to an engineering program at a four-year institution. Careers in engineering will depend on the emphasis selected at the four-year institution, however, all engineering fields apply the principles of science and mathematics to develop economical solutions to technical problems. Their work is the link between scientific discoveries and the commercial applications that meet societal and consumer needs. Many engineers develop new products.

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Associate Degrees

A.S. in Engineering, Civil Engineering

The Engineering Associate in Science degree is designed to meet lower division requirements for various majors in engineering. Completion of the Associate in Science degree should qualify the student to transfer at the upper division level to an engineering program at a four-year institution. The degree has a common engineering core requirement as well as specific field requirements. The specific field requirements do vary depending on the four-year institution to which the student will transfer. Thus, requirements for specific universities should be checked before selecting specific field courses.

Catalog Date: June 1, 2020

Degree Requirements

COURSE CODE	COURSE TITLE	UNITS
CHEM 400	General Chemistry I	5
ENGR 300	Introduction to Engineering	1
ENGR 312	Engineering Graphics	3
ENGR 400	Introduction to Electrical Circuits and Devices	3
ENGR 405	Engineering Problem Solving (3)	3 - 4
or CISP 360	Introduction to Structured Programming (4)	
ENGR 412	Properties of Materials	4
ENGR 422	Engineering Mechanics, Statics	3
MATH 400	Calculus I	5
MATH 401	Calculus II	5
MATH 402	Calculus III	5
MATH 420	Differential Equations	4
PHYS 410	Mechanics of Solids and Fluids	5
PHYS 420	Electricity and Magnetism	5
Subtotal Units:		51 - 52

Additional Civil Engineering Requirements (Consult Engineering Department Chair and Counseling)

COURSE CODE	COURSE TITLE	UNITS
ENGR 310	Engineering Survey Measurements	4
MATH 410	Introduction to Linear Algebra	3

COURSE CODE	COURSE TITLE	UNITS
PHYS 430	Heat, Waves, Light and Modern Physics (5)	5
or CHEM 401	General Chemistry II (5)	
Additional Civil Engineering Requirements (Consult Engineering Department Chair and Counseling) Units:		12
Total Units:		63 - 64

The Engineering, Civil Engineering Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See SCC graduation requirements.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- solve problems by applying knowledge of mathematics including differential and integral calculus, differential equations, and linear algebra.
- solve problems by applying knowledge of science including chemistry and physics.
- use technology to enhance his or her productivity.
- apply knowledge of mathematics, science, and engineering to identify, formulate, and solve basic civil engineering problems.
- demonstrate an understanding of the ethical and professional responsibilities of an engineer and how engineering solutions can impact society.
- communicate thoughts in both written and oral forms to team members and larger audiences.
- seek transfer at the junior level into a Civil Engineering program at a four-year institution.

A.S. in Engineering, Electrical/Computer Engineering

The Engineering Associate in Science degree is designed to meet lower division requirements for various majors in engineering. Completion of the Associate in Science degree should qualify the student to transfer at the upper division level to an engineering program at a four-year institution. The degree has a common engineering core requirement as well as specific field requirements. The specific field requirements do vary depending on the four-year institution to which the student will transfer. Thus, requirements for specific universities should be checked before selecting specific field courses.

Catalog Date: June 1, 2020

Degree Requirements

COURSE CODE	COURSE TITLE	UNITS
CHEM 400	General Chemistry I	5
ENGR 300	Introduction to Engineering	1
ENGR 400	Introduction to Electrical Circuits and Devices	3
ENGR 405	Engineering Problem Solving (3)	3 - 4
or CISP 360	Introduction to Structured Programming (4)	
MATH 400	Calculus I	5
MATH 401	Calculus II	5
MATH 402	Calculus III	5
MATH 420	Differential Equations	4
PHYS 410	Mechanics of Solids and Fluids	5
PHYS 420	Electricity and Magnetism	5
Subtotal Units:		41 - 42

Additional Electrical/Computer Engineering Requirements (Consult Engineering Department Chair and Counseling)

COURSE CODE	COURSE TITLE	UNITS
CISP 310	Assembly Language Programming for Microcomputers	4
ENGR 412	Properties of Materials	4
ENGR 422	Engineering Mechanics, Statics	3
MATH 410	Introduction to Linear Algebra	3
PHYS 430	Heat, Waves, Light and Modern Physics (5)	5
or CHEM 401	General Chemistry II (5)	

COURSE CODE	COURSE TITLE	UNITS
Additional Electrical/Computer Engineering Requirements (Consult Engineering Department Chair and Counseling) Units:		19
Total Units:		60 - 61

The Engineering, Electrical/Computer Engineering Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See SCC graduation requirements.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- solve problems by applying knowledge of mathematics including differential and integral calculus, differential equations, and linear algebra.
- solve problems by applying knowledge of science including chemistry and physics.
- use technology to enhance his or her productivity.
- apply knowledge of mathematics, science, and engineering to identify, formulate, and solve basic electrical/computer engineering problems.
- demonstrate an understanding of the ethical and professional responsibilities of an engineer and how engineering solutions can impact society.
- communicate thoughts in both written and oral forms to team members and larger audiences.
- seek transfer at the junior level into an Electrical/Computer Engineering program at a four-year institution.

A.S. in Engineering, General

The Engineering Associate in Science degree is designed to meet lower division requirements for various majors in engineering. Completion of the Associate in Science degree should qualify the student to transfer at the upper division level to an engineering program at a four-year institution. The degree has a common engineering core requirement as well as specific field requirements. The specific field requirements do vary depending on the four-year institution to which the student will transfer. Thus, requirements for specific universities should be checked before selecting specific field courses.

Catalog Date: June 1, 2020

Degree Requirements

COURSE CODE	COURSE TITLE	UNITS
CHEM 400	General Chemistry I	5
ENGR 300	Introduction to Engineering	1
ENGR 400	Introduction to Electrical Circuits and Devices	3
ENGR 405	Engineering Problem Solving (3)	3 - 4
or CISP 360	Introduction to Structured Programming (4)	
MATH 400	Calculus I	5
MATH 401	Calculus II	5
MATH 402	Calculus III	5
MATH 420	Differential Equations	4
PHYS 410	Mechanics of Solids and Fluids	5
PHYS 420	Electricity and Magnetism	5
Subtotal Units:		41 - 42

Additional General Engineering Requirements (Consult Engineering Department Chair and Counseling)

COURSE CODE	COURSE TITLE	UNITS
ENGR 312	Engineering Graphics	3
ENGR 412	Properties of Materials	4
ENGR 422	Engineering Mechanics, Statics	3
MATH 410	Introduction to Linear Algebra	3
PHYS 430	Heat, Waves, Light and Modern Physics (5)	5
or CHEM 401	General Chemistry II (5)	

COURSE CODE	COURSE TITLE	UNITS
Additional General Engineering Requirements (Consult Engineering Department Chair and Counseling) Units:		18
Total Units:		59 - 60

The Engineering, General Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See SCC graduation requirements.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- solve problems by applying knowledge of mathematics including differential and integral calculus, differential equations, and linear algebra.
- solve problems by applying knowledge of science including chemistry and physics.
- use technology to enhance his or her productivity.
- apply knowledge of mathematics, science, and engineering to identify, formulate, and solve basic engineering problems.
- demonstrate an understanding of the ethical and professional responsibilities of an engineer and how engineering solutions can impact society.
- communicate thoughts in both written and oral forms to team members and larger audiences.
- seek transfer at the junior level into an Engineering program at a four-year institution.

A.S. in Engineering, Mechanical/Aeronautical Engineering

The Engineering Associate in Science degree is designed to meet lower division requirements for various majors in engineering. Completion of the Associate in Science degree should qualify the student to transfer at the upper division level to an engineering program at a four-year institution. The degree has a common engineering core requirement as well as specific field requirements. The specific field requirements do vary depending on the four-year institution to which the student will transfer. Thus, requirements for specific universities should be checked before selecting specific field courses.

Catalog Date: June 1, 2020

Degree Requirements

COURSE CODE	COURSE TITLE	UNITS
CHEM 400	General Chemistry I	5
ENGR 300	Introduction to Engineering	1
ENGR 312	Engineering Graphics	3
ENGR 400	Introduction to Electrical Circuits and Devices	3
ENGR 405	Engineering Problem Solving (3)	3 - 4
or CISP 360	Introduction to Structured Programming (4)	
ENGR 412	Properties of Materials	4
ENGR 422	Engineering Mechanics, Statics	3
MATH 400	Calculus I	5
MATH 401	Calculus II	5
MATH 402	Calculus III	5
MATH 420	Differential Equations	4
PHYS 410	Mechanics of Solids and Fluids	5
PHYS 420	Electricity and Magnetism	5
Subtotal Units:		51 - 52

Additional Mechanical/Aeronautical Engineering Requirements (Consult Engineering Department Chair and Counseling)

COURSE CODE	COURSE TITLE	UNITS
MATH 410	Introduction to Linear Algebra	3
PHYS 430	Heat, Waves, Light and Modern Physics (5)	5
or CHEM 401	General Chemistry II (5)	

COURSE CODE	COURSE TITLE	UNITS
Additional Mechanical/Aeronautical Engineering Requirements (Consult Engineering Department Chair and Counseling) Units:		8
Total Units:		59 - 60

The Engineering, Mechanical/Aeronautical Engineering Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See SCC graduation requirements.

Student Learning Outcomes

Upon completion of this program, the student will be able to:

- solve problems by applying knowledge of mathematics including differential and integral calculus, differential equations, and linear algebra.
- solve problems by applying knowledge of science including chemistry and physics.
- use technology to enhance his or her productivity.
- apply knowledge of mathematics, science, and engineering to identify, formulate, and solve basic mechanical/aeronautical engineering problems.
- demonstrate an understanding of the ethical and professional responsibilities of an engineer and how engineering solutions can impact society.
- communicate thoughts in both written and oral forms to team members and larger audiences.
- seek transfer at the junior level into a Mechanical/Aeronautical Engineering program at a four-year institution.

Engineering (ENGR)

ENGR 300 Introduction to Engineering

Units: 1
Hours: 18 hours LEC
Prerequisite: None.
Transferable: CSU; UC
Catalog Date: June 1, 2020

This course provides an introduction to the different engineering disciplines and careers, the role of the engineer in society, the engineering approach to problem solving, the design process, and engineering ethics. The development of effective communication and study skills required of engineers is emphasized. This course is required of most engineering majors.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- evaluate professional engineering careers and educational requirements.
- examine the ethics, design process, and the importance of computer applications in engineering.
- formulate a plan for implementing academic skills such as priority/time management, study techniques, study groups, and communication skills (written, oral, and listening) for successful pursuit of an engineering degree.

ENGR 310 Engineering Survey Measurements

Units: 4
Hours: 54 hours LEC; 54 hours LAB
Prerequisite: MATH 335 with a grade of "C" or better
Advisory: Completion of or concurrent enrollment in a basic drafting course such as ENGR 312.
Transferable: CSU; UC
C-ID: C-ID ENGR 180
Catalog Date: June 1, 2020

This course covers the basic fundamentals of surveying for engineers. This includes the theory and practice of measurements for distance, elevations and angles, analysis and adjustment of errors (systematic and random), and traverse calculation and adjustments. Additional topics include discussions on profiles and cross-sections, horizontal curves, and vertical curves. This course has an indoor lecture component as well as a required outdoor field component. This course is designed for engineering students and is usually required for civil engineering majors depending on the transfer institution.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- operate and compare surveying equipment typically encountered by engineers.
- interpret, evaluate, and perform calculations to solve engineering problems related to surveying.
- construct a neat, well organized, logical presentation of problems and their solutions.

- demonstrate the ability to work effectively with others in typical field tasks.

ENGR 312 Engineering Graphics

Units: 3
Hours: 36 hours LEC; 72 hours LAB
Prerequisite: MATH 335 with a grade of "C" or better
Advisory: It is expected that the student has experience and knowledge of the use of a personal computer.
Transferable: CSU; UC
C-ID: C-ID ENGR 150
Catalog Date: June 1, 2020

This course provides fundamental training in the use of hand-drawing instruments and Computer Aided Design/Drafting (CADD) software to analyze, interpret, and solve engineering problems. Topics covered include elements of drafting, descriptive geometry, multi-view drawing, design process, and solution of engineering problems, culminating in a design project.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- draw fully dimensioned orthographic projection drawings of objects by hand and using CADD software.
- construct multi-view, oblique, and isometric drawings.
- construct sectional and auxiliary views of objects.
- use scales to determine the true: length, grade, and bearing of drawn objects.
- generate an engineering design plan by following the engineering design process steps.
- formulate an engineering design problem solution that includes working drawings.

ENGR 400 Introduction to Electrical Circuits and Devices

Units: 3
Hours: 54 hours LEC
Prerequisite: PHYS 420 with a grade of "C" or better
Corequisite: MATH 420
Transferable: CSU; UC
C-ID: C-ID ENGR 260
Catalog Date: June 1, 2020

This course provides the engineering student with the basic fundamentals of DC and sinusoidal electrical circuit theory and analysis. The following circuit elements are covered: resistors, capacitors, inductors, independent sources, and dependent sources. Topics that are covered include circuit analysis techniques, sinusoidal analysis, phasors, Thevenin and Norton equivalence, natural and step response of first-and second-order circuits, three-phase analysis, complex power, and operational amplifiers.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- analyze DC and AC circuits and determine the voltage and current response as well as the power delivered or absorbed by a circuit element.
- evaluate different circuit analysis techniques, choose the appropriate technique to use for a particular circuit, and implement it to solve for the desired quantity.
- analyze circuits that contain independent sources and calculate the Thevenin and Norton equivalent.
- analyze three-phase circuits and calculate voltages, currents, and power.
- analyze basic operational amplifier circuits using their ideal characteristics as well as a simplified model of an operational amplifier.

ENGR 405 Engineering Problem Solving

Units: 3
Hours: 36 hours LEC; 54 hours LAB
Prerequisite: MATH 401 with a grade of "C" or better or concurrent enrollment in MATH 401.
Advisory: It is expected that the student has experience and knowledge in the use of a personal computer.
Transferable: CSU; UC
Catalog Date: June 1, 2020

This course provides an introduction to the use of computers in solving engineering problems using MATLAB. Students will learn to use basic programming techniques including program control, relational and logical operators, selection scripting, and file management while implementing computational solutions.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply the mathematical principles that form the foundation of engineering, including complex numbers, curve fitting, differentiation, integration, interpolation, linear algebra, phasors, polynomials, and statistics.
- apply basic science, mathematics, and engineering principles to solve computational problems, including defining the problem, describing input and output variables, mathematical modeling, and the design, development, and testing of the algorithm.
- develop solutions to problems in which the problem statement is only partially defined, including describing and defining the problem, defining specifications, designing and implementing an algorithm to meet the specifications, testing the algorithm, and redesigning the algorithm as needed through an iterative process.
- design, implement, and debug an algorithm in MATLAB to solve an engineering problem and interpret the results.

ENGR 412 Properties of Materials

Units: 4
Hours: 54 hours LEC; 54 hours LAB
Prerequisite: CHEM 400 and PHYS 410 with grades of "C" or better
Transferable: CSU; UC
C-ID: C-ID ENGR 140B
Catalog Date: June 1, 2020

This course covers atomic and crystal structures and mechanical, electrical, and magnetic properties of engineering materials. Also covered are steady and non-steady state diffusion, phase diagram analysis, heat treatment of metals, and corrosion. Laboratory exercises cover both destructive and non-destructive testing of materials.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- identify the crystalline structure of metals and correlate the characteristics of the structure with the material properties.
- describe the major types of imperfections that may occur in crystalline structures and compare how they affect material properties.
- calculate rates of diffusion using Fick's Laws.
- perform tensile, compression, shear, hardness, and impact tests on materials and evaluate the results.
- describe and compare the effects of material strengthening methods.
- identify and describe failure mechanisms.
- interpret phase diagrams to determine phase equilibrium and microstructure development.
- predict the properties of ceramics, polymers, and composites by assessing their structures.
- evaluate large scale composites based on the ability to mix, pour, and test concrete.
- identify components of various corrosion mechanisms and select appropriate methods of preventing corrosion.
- describe the components of semiconductors and electrical conduction mechanisms in semiconductors.

ENGR 422 Engineering Mechanics, Statics

Units: 3
Hours: 54 hours LEC
Prerequisite: MATH 401 and PHYS 410 with grades of "C" or better
Advisory: Completion of a drafting course prior to enrolling in this course will facilitate the analysis of statics problems.
Transferable: CSU; UC
C-ID: C-ID ENGR 130
Catalog Date: June 1, 2020

This is the first course in engineering mechanics. Topics in this course include two and three dimensional force system analysis using vector techniques, moments and couples in two and three dimensions, centroids and moment of inertia, friction, forces in beams, and truss analysis. This course is required for Mechanical, Civil, Aeronautical engineering transfer students and by some electrical engineering programs. Contact an engineering instructor and/or the transfer center for specific transfer institution requirements.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- solve engineering problems by applying vector mathematical principles.
- formulate equations for the analysis of static equilibrium of two and three dimensional systems involving forces and moments.
- formulate equations for the analysis in both two and three dimensions of static quantities such as centroids, friction, and moments of inertia.
- evaluate trusses and generate equations based on the method of joints and the method of sections to determine the external forces acting on the individual members of the truss.
- assess the impact of external forces acting on beams and determine the resulting axial forces as well as generate resulting shear and bending moment diagrams.

ENGR 495 Independent Studies in Engineering

Units: 1 - 3
Hours: 54 - 162 hours LAB
Prerequisite: None.
Transferable: CSU
Catalog Date: June 1, 2020

This course involves an individual student or small group of students in study, research, or activities beyond the scope of regularly offered courses. UC transfer credit will be awarded only after the course has been evaluated by the enrolling UC campus. The units completed for this course cannot be counted towards the minimum 60 units required for admissions.

Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate competence in the skills essential to master the major discipline of study that are necessary to accomplish the independent study.
- summarize the concepts learned through the independent study in a written and/or oral report.

ENGR 499 Experimental Offering in Engineering

Units: 0.5 - 4
Prerequisite: None.
Transferable: CSU
Catalog Date: June 1, 2020

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