



ENGINEERING

Engineering Degree Program code: sac.engr.as

The associate degree curriculum in the engineering program is primarily intended to provide a basic program of engineering courses for students planning to transfer to four-year college or university engineering programs.

The student should be aware the Santa Ana College associate degree requirements are less than full university lower-division engineering requirements and that additional coursework is required. See “Engineering Transfer,” below.

Completion of the associate degree in engineering can also provide the necessary background for immediate employment as a designer, technician, or engineering assistant. Job opportunities exist in both private industry and city, county, and state agencies.

Students interested in the design or practical phases of the engineering profession should take the engineering sequence 122, 124, and 228. These are transferable college or university level courses, giving students a comprehensive preparation in graphic communication and graphic solution of engineering problems. Students interested in the math and science-oriented engineering fields should take Engineering 125.

Learning Outcome(s):

Students will develop the skills and knowledge necessary to select as well as develop engineering careers; produce engineering drawings that conform to industry standards; create engineering drawings in 2D CAD program; and solve problems of calculus, calculus-based physics, and chemistry.

Major requirements for the associate degree:

Course	Units
Engineering 100A, Introduction to Engineering	2
Engineering 122, Engineering Drawing —OR—	3
Engineering 125, Engineering Graphics	3
Engineering 183, CAD I-Computer Aided Drafting	3
Engineering 235, Statics	3
Mathematics 180, Analytic Geometry and Calculus I —OR—	4
Mathematics 180H, Honors Analytic Geometry and Calculus	4
Mathematics 185, Analytic Geometry and Calculus II	4
Physics 217, Engineering Physics I	4
Physics 227, Engineering Physics II —OR—	4
Physics 237, Engineering Physics III	4
Chemistry 219, General Chemistry —OR—	5
Chemistry 219H, Honors General Chemistry	5
Total	32

Engineering Transfer

Santa Ana College offers a wide variety of lower-division engineering coursework for transfer to any four-year university or college in California.

Although lower-division engineering course requirements are similar at most universities, important differences do occur. These differences depend upon the university and the specific engineering option the student has selected. Engineering students planning to transfer with upper-division standing at a university should contact the Transfer Center for detailed information concerning specific lower-division course requirements for the various engineering options.

Engineering Technology, Manufacturing Technology, and Industrial Technology Transfer

Technology programs are offered by most area universities. They are bachelor degree curriculums usually offered by the school's Engineering Department. Generally, technology degree programs are less rigorous than traditional engineering programs. Typically, they require one or two semesters of mathematics and one semester of physics. Upper division work is more practical application-oriented than traditional engineering programs.

Additional details concerning technology program transfer are available from the counseling and engineering offices.

Engineering Civil Technology Degree Program code: sac.enrct.as

The associate degree curriculum provides a background for employment in a civil engineering office or for field work in support of and under the direction of a professional engineer or licensed surveyor. Typical employment is in a surveying office recording data, preparing subdivision maps, street and highway proposals, and grading maps. Employment opportunities exist in both private industry and local and county government agencies that employ engineering assistants..

Learning Outcome(s):

Students will be able to identify, analyze, and explain the basic parts of common land surveying instruments and their function by way of a multiple field exercises and cite how accurate surveys can be used to avoid or resolve property legal disputes.

**Major requirements for the associate degree:**

Course	Units
Engineering 100B, Introduction to Architecture/ Civil Engineering/Construction (AEC)	2
Engineering 118, Plane Surveying	4
Engineering 183, CAD I-Computer Aided Drafting	3
Engineering 184, CAD II-Computer Aided Drafting	3
Engineering 191, Civil CAD Concepts	3
Geology 101, Introduction to Geology	3
Geology 101L, Introduction to Geology Laboratory	1
Mathematics 160, Trigonometry	4

Select ONE of the Following:

Engineering 122, Engineering Drawing —OR—	3
Engineering 125, Engineering Graphics	

Select ONE of the Following:

Engineering 119, Advanced Plane Surveying (4) —OR—	3-4
Engineering 205, Civil Digital Computations (3)	

Total 29-30**Engineering-Civil Technology Certificate (Transcripted)****Program code: sac.enrct.ca**

This certificate training provides a background for employment in a civil engineering office or for field work in support of and under the direction of a professional engineer or licensed surveyor. Typical employment is in a surveying office recording data, preparing subdivision maps, street and highway proposals, and grading maps. Employment opportunities exist in both private industry and local and county government agencies that employ engineering assistants.

Learning Outcome(s):

Students will be able to identify, analyze, and explain the basic parts of common land surveying instruments and their function by way of a multiple field exercises and cite how accurate surveys can be used to avoid or resolve property legal disputes.

Major requirements for the certificate:

Course	Units
Engineering 100B, Introduction to Architecture/ Civil Engineering/Construction (AEC)	2
Engineering 118, Plane Surveying	4
Engineering 183, CAD I-Computer Aided Drafting	3
Engineering 184, CAD II-Computer Aided Drafting	3
Engineering 191, Civil CAD Concepts	3
Geology 101, Introduction to Geology	3
Geology 101L, Introduction to Geology Laboratory	1
Mathematics 160, Trigonometry	4

Select ONE of the Following:

Engineering 122, Engineering Drawing —OR—	3
Engineering 125, Engineering Graphics	

Select ONE of the Following:

Engineering 119, Advanced Plane Surveying (4) —OR—	3-4
Engineering 205, Civil Digital Computations (3)	

Total 29-30**Engineering Computer Aided Drafting and Design Degree****Program code: sac.enrca.as**

The Engineering Computer Aided Drafting and Design degree program is for students who have or are working toward an engineering discipline background for transfer or employment and seek competency in Computer Aided parametric 2D and 3D drafting and design. Class problems and project work includes civil, surveying, mechanical, electronic, architecture, and other CADD applications.

Learning Outcome(s):

Students will produce a series of 2D and 3D Parametric CAD technical drawings using several industry CADD applications.

Major requirements for the associate degree:

Core Courses	Units
Engineering 100A, Introduction to Engineering —OR—	2
Engineering 100B, Introduction to Architecture/ Civil Engineering/Construction (AEC)	
Engineering 103, Solidworks Basic Solid Modeling	3
Engineering 122, Engineering Drawing —OR—	3
Engineering 125, Engineering Graphics	
Engineering 183, CAD I-Computer Aided Drafting	3
Engineering 184, CAD II-Computer Aided Drafting	3
Engineering 185, AutoCAD & Customization	3
Engineering 186, AutoCAD 3-Dimensional Drawing	3
Engineering 154, Architecture/Civil Engineering/Construction (AEC) Parametric and BIM Applications	4

Students may also wish to take other Engineering courses from the following recommended list:

Engineering 012, AEC Blueprint Reading (3)	
Engineering 027, Electronic Drafting (3)	
Engineering 051, Basic Technical Drawing (3)	
Engineering 110, Advanced CAD Applications (0.5-4)	
Engineering 114, Geometric Dimensioning and Tolerancing (3)	
Engineering 115, Cooperative Work Experience Education-Occupational (1-16)	
Engineering 124, Advanced Drawing (3)	
Engineering 130A, CATIA Beginning Solid Modeling (3)	
Engineering 130B, CATIA Intermediate Solid Modeling (3)	
Engineering 142, Architecture/Civil Engineering/Construction (AEC) Drawing (4)	
Engineering 187, Advanced 3D Civil CAD (3)	
Engineering 191, Civil CAD Concepts (3)	
Engineering 193, MicroStation 3D (3)	
Total	24

Engineering Computer Aided Drafting and Design Certificate (Transcripted)**Program code: sac.enrca.ca**

The certificate program is for students who have or are working toward an engineering discipline background, and seek competency in Computer Aided parametric 2D and 3D drafting and design. Class problems and project work include civil, surveying, mechanical, electronic, architecture, and other CADD applications.

Learning Outcome(s):

Students will produce a series of 2D and 3D Parametric CAD technical drawings using several industry CADD applications.



Core Courses	Units
Engineering 100A, Introduction to Engineering —OR—	2
Engineering 100B, Introduction to Architecture/ Civil Engineering/Construction (AEC)	
Engineering 122, Engineering Drawing —OR—	3
Engineering 125, Engineering Graphics	
Engineering 183, CAD I-Computer Aided Drafting	3
Engineering 184, CAD II-Computer Aided Drafting	3
Engineering 185, AutoCAD & Customization	3
Engineering 186, AutoCAD 3-Dimensional Drawing	3
Engineering 103, Solidworks Basic Solid Modeling	3
Engineering 154, Architecture/Civil Engineering/Construction (AEC) Parametric and BIM Applications	4
Students may also wish to take other engineering courses from the following recommended list:	
Engineering 012, AEC Blueprint Reading (3)	
Engineering 027, Electronic Drafting (3)	
Engineering 051, Basic Technical Drawing (3)	
Engineering 110, Advanced CAD Applications (0.5-4)	
Engineering 114, Geometric Dimensioning and Tolerancing (3)	
Engineering 115, Cooperative Work Experience Education- Occupational (1-16)	
Engineering 124, Advanced Drawing (3)	
Engineering 130A, CATIA Beginning Solid Modeling (3)	
Engineering 130B, CATIA Intermediate Solid Modeling (3)	
Engineering 140A, Creo Beginning Solid Modeling (3)	
Engineering 140B, Creo Intermediate Solid Modeling (3)	
Engineering 142, Architecture/Civil Engineering/Construction (AEC) Drafting Standards (4)	
Engineering 187, Advanced 3D Civil CAD (3)	
Engineering 191, Civil CAD Concepts (3)	
Engineering 193, MicroStation 3D (3)	
Total	24

Engineering Drafting and Design Option I—Engineering Drafting and Design Degree

Program code: sac.enrdd.as

The associate degree curriculum in engineering drafting and design has two options to prepare a student for employment in an engineering, architectural, civil engineering, or a construction office as a drafter, designer, or an engineering technician. Actual work in this field for both options is similar. Job tasks include preparation of drawings and plans (board and computer), sketches, layouts, diagrams, schematics, illustrations, material lists, and size and material specifications. Opportunity for employment exists in both private industry and city and county government agencies which employ drafters, designers, and engineering technicians.

The Option I degree prepares the student for employment as a professional drafter or designer in the mechanical, aerospace, manufacturing, biomedical, or industrial engineering fields. Designer Jobs may additionally require some industry experience. Many courses are applicable to lower-division preparation leading to a bachelor's degree in engineering technology at a four-year institution

Learning Outcome(s):

Students will develop knowledge and skills necessary to select as well as develop engineering careers; be able to produce engineering drawings that conform to industry standards; be able to create parts & drawings using 3D solid modeling software; and fabricate basic parts using standard machining equipment.

Major requirements for the associate degree:

(For the associate degree, students must also complete General Education coursework from plan A, B, or C, per the college catalog.)

Course	Units
Engineering 100A, Introduction to Engineering	2
Engineering 122, Engineering Drawing —OR—	3
Engineering 125, Engineering Graphics	
Engineering 124, Advanced Drawing	3
Engineering 130A, CATIA Beginning Solid Modeling	3
Engineering 158, Basic Machining Concepts and Operations	3
Engineering 183, CAD I-Computer Aided Drafting	3
Select six (6) additional units from the following list:	6
Engineering 027, Electronic Drafting (3)	
Engineering 051, Basic Technical Drawing (3)	
Engineering 103, Solidworks Basic Solid Modeling (3)	
Engineering 110, Advanced CAD Applications (0.5-1)	
Engineering 114, Geometric Dimensioning and Tolerancing (3)	
Engineering 130B, CATIA Intermediate Solid Modeling (3)	
Manufacturing Technology, 028 Basic Metals Technology (3)	
Mathematics 160, Trigonometry (4)	
Total	23

Engineering Drafting and Design Option I—Engineering Drafting and Design Certificate (Transcribed)

Program code: sac.enrdd.ca

The certificate curriculum in engineering drafting and design has two options to prepare a student for employment in an engineering, architectural, civil engineering, or a construction office as a drafter, designer, or an engineering technician. Actual work in this field for both options is similar. Job tasks include preparation of drawings and plans (board and computer), sketches, layouts, diagrams, schematics, illustrations, material lists, and size and material specifications. Opportunity for employment exists in both private industry and city and county government agencies which employ drafters, designers, and engineering technicians.

The Option I certificate prepares the student for employment as a professional drafter or designer in the mechanical, aerospace, manufacturing, biomedical, or industrial engineering fields. Designer Jobs may additionally require some industry experience. Many courses are applicable to lower-division preparation leading to a bachelor's degree in engineering technology at a four-year institution.

Learning Outcome(s):

Students will develop knowledge and skills necessary to select & develop engineering careers; be able to produce engineering drawings that conform to industry standards; be able to create parts & drawings using 3D solid modeling software; fabricate basic parts using standard machining equipment.

**Major requirements for the certificate:**

Course	Units
Engineering 100A, Introduction to Engineering	2
Engineering 122, Engineering Drawing —OR—	3
Engineering 125, Engineering Graphics	
Engineering 124, Advanced Drawing	3
Engineering 130A, CATIA Beginning Solid Modeling	3
Engineering 158, Basic Machining Concepts and Operations	3
Engineering 183, CAD I-Computer Aided Drafting	3
Select six (6) additional units from the following list:	6
Engineering 027, Electronic Drafting (3)	
Engineering 051, Basic Technical Drawing (3)	
Engineering 103, Solidworks Basic Solid Modeling (3)	
Engineering 110, Advanced CAD Applications (0.5-1)	
Engineering 114, Geometric Dimensioning and Tolerancing (3)	
Engineering 130B, CATIA Intermediate Solid Modeling (3)	
Manufacturing Technology, 028 Basic Metals Technology (3)	
Mathematics 160, Trigonometry (4)	
Total	23

Engineering Drafting and Design Degree Option II— Architectural/Civil Engineering/Construction Drafting and Design Degree Program code: sac.enrce.as

This option is designed specifically to prepare the student for employment as a professional drafter/designer in the Architectural, Civil Engineering and Construction fields (AEC). The drafter/designer works closely with the architect, developer and other professionals in the development and construction of AEC projects.

Learning Outcome(s):

Students will acquire knowledge of AEC terms, abbreviations, graphics and standards for application and preparation of AEC drawings and plans.

Major requirements for the associate degree:

Course	Units
Engineering 100B, Introduction to Architecture/Civil Engineering/Construction (AEC)	2
Engineering 112, Society and the Built Environment	3
Engineering 142, Architecture/Engineering/Construction Drafting Standards	4
Engineering 154, Architecture/Civil Engineering/Construction (AEC) Parametric and BIM Applications	4
Engineering 183, CAD I-Computer Aided Drafting	3
Engineering 184, CAD II-Computer Aided Drafting	3
Engineering 186, AutoCAD 3-Dimensional Drawing	3
Engineering 201, Architectural Practice	4
Total	26

Engineering Drafting and Design Certificate: Option II—Architectural/Civil Engineering/ Construction Drafting and Design (Transcripted) Program code: sac.enrce.ca

This option is designed specifically to prepare the student for employment as a professional drafter/designer in the Architectural, Civil Engineering and Construction fields (AEC). The drafter/designer works closely with the architect, developer and other professionals in the development and construction of AEC projects.

Learning Outcome(s):

Students will acquire knowledge of AEC terms, abbreviations, graphics and standards for application and preparation of AEC drawings and plans.

Major requirements for the certificate:

Course	Units
Engineering 100B, Introduction to Architecture/Civil Engineering/Construction (AEC)	2
Engineering 112, Society and the Built Environment	3
Engineering 142, Architecture/Engineering/Construction Drafting Standards	4
Engineering 154, Architecture/Civil Engineering/Construction (AEC) Parametric and BIM Applications	4
Engineering 183, CAD I-Computer Aided Drafting	3
Engineering 184, CAD II-Computer Aided Drafting	3
Engineering 186, AutoCAD 3-Dimensional Drawing	3
Engineering 201, Architectural Practice	4
Total	26

Engineering Electro-Mechanical Technology Degree Program code: sac.enemt.as

The associate degree curriculum in Engineering Electro-Mechanical Technology has a strong emphasis on hands-on design, fabrication, and testing; and leads to employment as a mechanical, industrial, or manufacturing engineering technician. Opportunities for employment exist primarily in private manufacturing industries such as industrial, biomedical, or aerospace.

Learning Outcome(s):

Students will develop skills and knowledge necessary to select as well as develop engineering careers, produce engineering drawings that conform to industry standards, create parts and drawings using 3D solid modeling thru intermediate level, construct basic circuits, program a small robot to achieve a desired behavior, and solve trigonometry or calculus-based physics problems.

Major requirements for the associate degree:

(for the associate degree, students must also complete general education coursework Plan A, B, or C, per the college catalog)

Required Courses	Units
Engineering 100A, Introduction to Engineering	2
Engineering 122, Engineering Drawing —OR—	3
Engineering 125, Engineering Graphics —OR—	3
Engineering 103, Solidworks Basic Solid Modeling	
Engineering 130A, CATIA Beginning Solid Modeling	
Engineering 132, Introduction to Robotics	2
Engineering 133, Introductory Electromechanical Engineering Technology	3
Engineering 134, Intermediate Electromechanical Engineering Technology	3
Engineering 158, Basic Machining Concepts and Operations	3

Select 3 units from the following list:

Engineering 135, Advanced Electromechanical Engineering Technology (3)	3
Engineering 136, LabVIEW Data Acquisition (3)	
Engineering 137, Engineering Design and Development (3)	
Engineering 240, Dynamics (3)	
Engineering 250, Electric Circuits (3)	
Engineering 250L, Electric Circuits Laboratory (1)	
Engineering 281, Properties of Engineering Materials (3)	
Total	22



Engineering Electro-Mechanical Technology Certificate (Transcripted)

Program code: sac.enemt.ca

The certificate curriculum in Engineering Electro-Mechanical Technology has a strong emphasis on hands-on design, fabrication, and testing; and leads to employment as a mechanical, industrial, or manufacturing engineering technician. Opportunities for employment exist primarily in private manufacturing industries such as industrial, biomedical, or aerospace.

Learning Outcome(s):

Students will develop skills and knowledge necessary to select as well as develop engineering careers, produce engineering drawings that conform to industry standards, create parts and drawings using 3D solid modeling thru intermediate level, construct basic circuits, program a small robot to achieve a desired behavior, and solve trigonometry or calculus-based physics problems.

Major requirements for the certificate:

Required Courses	Units
Engineering 100A, Introduction to Engineering	2
Engineering 122, Engineering Drawing —OR—	3
Engineering 125, Engineering Graphics	
Engineering 103, Solidworks Basic Solid Modeling —OR—	3
Engineering 130A, CATIA Beginning Solid Modeling	
Engineering 132, Introduction to Robotics	2
Engineering 133, Introductory Electomechanical Engineering Technology	3
Engineering 134, Intermediate Electomechanical Engineering Technology	3
Engineering 158, Basic Machining Concepts and Operations	3
Select 3 units from the following list:	3
Engineering 135, Advanced Electomechanical Engineering Technology (3)	
Engineering 136, LabVIEW Data Acquisition (3)	
Engineering 137, Engineering Design and Development (3)	
Engineering 240, Dynamics (3)	
Engineering 250, Electric Circuits (3)	
Engineering 250L, Electric Circuits Laboratory (1)	
Engineering 281, Properties of Engineering Materials (3)	
Total	22

Energy Analysis Degree

Program code: sac.enea.as

This degree program trains students for work in energy analysis and auditing. Students completing training will be prepared for work performing Title 24 energy calculations or for work in utility companies or private companies that do energy analysis and auditing.

Learning Outcome(s):

Students will perform Title 24 energy calculations or work in utility companies or private companies that conduct energy analysis and auditing.

Take each of the following courses:

Course	Units
Engineering 012, AEC Blueprint Reading	3
Engineering 100B, Introduction to Architecture/Civil Engineering/Construction (AEC)	2
Engineering 183, CAD I-Computer Aided Drafting	3
Engineering 184, CAD II-Computer Aided Drafting	3
Engineering 165, Introduction to Energy	3
Engineering 175, Introduction to Energy Analysis	3
Total	17

Energy Analysis Certificate (Untranscripted)

Program code: sac.enea.cert

This certificate program trains students for work in energy analysis and auditing. Students completing training will be prepared for work performing Title 24 energy calculations or for work in utility companies, or private companies that do energy analysis and auditing.

Learning Outcome(s):

Students will perform Title 24 energy calculations or work in utility companies or private companies that conduct energy analysis and auditing.

Major requirements for the associate degree and certificate:

Course	Units
Engineering 012, AEC Blueprint Reading	3
Engineering 100B, Introduction to Architecture/Civil Engineering/Construction (AEC)	2
Engineering 183, CAD I-Computer Aided Drafting	3
Engineering 184, CAD II-Computer Aided Drafting	3
Engineering 165, Introduction to Energy	3
Engineering 175, Introduction to Energy Analysis	3
Total	17

AutoCAD 2D Basics Certificate of Proficiency (Untranscripted)

Program code: sac.cad2d.cert

2D Computer Drafting Basics is a program for learning to create and edit technical drawings, as well as annotate designs. 2D drawings are used in a wide variety of industries and applications for industrial design of products, architectural, civil and construction drafting to develop plans, shop drawings, permit and patent drawings.

Learning Outcome(s):

Students will complete a set of basic 2D drawings that demonstrate their knowledge and skills with AutoCAD.

Major requirements for the associate degree:

Core Courses	Units
Engineering 100A, Introduction to Engineering —OR—	2
Engineering 100B, Introduction to Architecture/Civil Engineering/Construction (AEC)	
Engineering 183, AutoCAD I-Computer Aided Drafting	3
Engineering 184, AutoCAD II-Computer Aided Drafting	3
Total	8

3D CAD Skill Builder Certificate of Proficiency (Untranscripted)

Program code: sac.3dcad.cert

This program is for students who have some amount of prior CAD experience and seek to learn 3D skills. Courses in this program prepare students for work in basic 3D or parametric 3D, or for further study in engineering majors.

Learning Outcome(s):

Students will complete a set of 3D drawings that demonstrate their knowledge and skills with Solidworks, Revit and AutoCAD.

**Major requirements for the certificate:**

Course	Units
Engineering 103, Solidworks Basic Solid Modeling	3
Engineering 154, Architecture/Civil Engineering/Construction (AEC) Parametric and BIM Applications	3
Engineering 186, AutoCAD 3-Dimensional Drawing	3
Total	9

Civil 3D CAD Certificate of Proficiency (Untranscripted)

Program code: sac.c3cad.cert

This certificate includes 3D land development/site design software, environmental design, transportation design, and geospatial information. Students will be exposed to engineering design principles using various information modeling techniques and sustainable design methodologies.

Learning Outcome(s):

Students will complete a set of Civil 3D drawings that demonstrate their knowledge and skills for Civil 3D work using Bentley and AutoDesk software.

Major requirements for the certificate:

Course	Units
Engineering 100B, Introduction to Architecture/Civil Engineering/Construction (AEC)	2
Engineering 143, Fundamentals of Construction	3
Engineering 187, Advanced 3-D CAD	3
Engineering 193, MicroStation 3-D	3
Business Applications 150, Introduction to Geographic Information Systems	0-3
Total	11-14

Engineering Mechanical 3D Solid Modeling CAD Certificate (Untranscripted)

Program code: sac.engr3d.cert

Curriculum focuses on developing competency in parametric solid modeling CAD software that is used heavily in the mechanical, aerospace, industrial, and biomedical engineering fields. Skillsets learned are applicable to drafters, designers, engineering technicians, and engineers in these fields.

Learning Outcome(s):

Students will produce engineering drawings that conform to industry standards and be able to create parts as well as drawings using 3D solid modeling thru intermediate level.

Major requirements for the certificate:

Course	Units
Engineering 103, Solidworks Basic Solid Modeling	3
Engineering 104, Solidworks Intermediate Solid Modeling	3
Engineering 122, Engineering Drawing	3
—OR—	
Engineering 125, Engineering Graphics	3
Engineering 130A, CATIA Beginning Solid Modeling	3
Engineering 130B, CATIA Intermediate Solid Modeling	3
Total	15

Sustainable Building Operations Management Degree

Program code: sac.sbom.as

The Associate of Science degree in High Performance Building Operation Management is focused towards career technical education training of students in sustainable methods for improving the operational performance of offices, schools, hospitals, and other residential and commercial buildings while working as Building Commissioning Professionals, Operations Professionals, Facility Managers and supporting positions. It will provide needed skilled and qualified workers, particularly as building technologies become more advanced.

Major requirements for the associate in science degree:

Course	Units
Engineering 100B, Introduction to Architecture/Civil Engineering/Construction (AEC)	2
Engineering 142, Architecture/Civil Engineering/Construction (AEC) Drafting Standards	4
Engineering 143, Fundamentals of Construction	3
Engineering 201, Architectural Practice	4
Engineering 202, Cost Accounting for Construction Engineering (3)	
—OR—	
Accounting 202, Cost Accounting for Construction Engineering (3)	3-4
—OR—	
Accounting 101, Financial Accounting (4)	
Engineering 203, Sustainable Construction and Facilities Management	3
Engineering 235, Statics	3
Total	22-23

and General Education requirements.

Sustainable Building Operations Management Certificate (Transcripted)

Program code: sac.sbom.ca

The certificate in High Performance Building Operation Management is focused towards career technical education training of students in sustainable methods for improving the operational performance of offices, schools, hospitals, and other residential and commercial buildings while working in Building Commissioning, Operations, Facility Manager and supporting positions. It will provide needed skilled and qualified workers, particularly as building technologies become more advanced.

Requirements for the certificate:

Course	Units
Engineering 142, Architecture/Civil Engineering/Construction (AEC) Drafting Standards	4
Engineering 143, Fundamentals of Construction	3
Engineering 201, Architectural Practice	4
Engineering 202, Cost Accounting for Construction Engineering (3)	
—OR—	
Accounting 202, Cost Accounting for Construction Engineering (3)	3
Engineering 203, Sustainable Construction and Facilities Management	3
Engineering 100B, Introduction to Architecture/Civil Engineering/Construction (AEC)	2
Engineering 112, Society and the Built Environment	3
Total	22



Sustainable Facilities Management Certificate (Untranscripted) Program code: sac.sufac.cert

The certificate in Sustainable Facilities Management is focused towards training the student in sustainable methods for improving the operational performance of offices, schools, hospitals, and other residential and commercial buildings. It will provide needed skilled and qualified workers, particularly as building technologies become more advanced.

Note: Students must complete the program within 5 years or repeat any AEC courses which were completed more than 5 years prior to graduation. AEC courses subject to this requirement are marked with an asterisk (*).

Learning Outcome(s):

Students will use ecological terms, abbreviations, AEC graphics, codes, permits, construction accounting, and facility project procedures to allow work or continued study in sustainable facilities management.

Requirements for the certificate:

Course	Units
Engineering 142,* Architecture/Civil Engineering/Construction (AEC) Drafting Standards	4
Engineering 143, Fundamentals of Construction	3
Engineering 201,* Architectural Practice	4
Engineering 202, Cost Accounting for Construction Engineering (3) —OR—	3
Accounting 202, Cost Accounting for Construction Engineering (3)	
Engineering 203, Sustainable Construction and Facilities Management	3
Total	17

Sustainable Facility Skill Builder Certificate (Untranscripted) Program code: sac.sufsb.cert

This program of study introduces students to Renewables, Green HVAC and Building Automation Systems and Controls, which are fundamental building blocks of energy saving sustainable construction projects. It provides preparation for further study or for work or advancing career opportunities.

Career opportunities include employment in “green” building, design and construction, energy management, and sustainable public planning and policy development. Work is available in government agencies, consulting firms, construction, and non-profit organizations.

Learning Outcome(s):

Students of the Sustainable Facilities Skill Builder will gain skills and knowledge for renewable energy technologies, green HVAC systems, as well as building automation systems and controls.

Requirements for the certificate:

Course	Units
Engineering 100B, Introduction to Architecture/Civil Engineering/Construction (AEC)	2
Engineering 177, Green HVAC	3
Engineering 195, Renewable Energy	3
Engineering 204, Building Automation & Controls	3
Total	11

Surveying Skill Builder Certificate (Untranscripted) Program code: sac.ssb.cert

This program of study includes basics for students or industry professionals who wish to learn surveying basics in a certificate program either to continue studies towards a more comprehensive Civil Technology certificate, or A.S. degree or transfer into a B.S. program.

Learning Outcome(s):

Students will complete a set of surveying drawings that demonstrate their knowledge and skills using industry methods, tools and software.

Major requirements for the certificate:

Course	Units
Engineering 100B, Introduction to Architecture/ Civil Engineering/Construction (AEC)	2
Engineering 118, Plane Surveying	4
Engineering 183, CAD I-Computer Aided Drafting —OR—	3
Engineering 191, Civil CAD Concepts	
Total	9