Engineering: A.S. Degree

Program Code: SAC>ENGR.AS

Program Control Number: 04201

This program provides a basic program of engineering coursework for students planning to transfer to a university engineering program. Students are also advised to communicate with their desired university to determine the specific required coursework to transfer with upper-division status at their school of choice.

Transfer students are also advised to take job skills courses to improve their employability. Examples include: ENGR 133, 114, 158 (for mechanical majors); 184, 118 (for civil majors); and 131, 133 (for electrical majors).

Students should select courses from the "engineering or engineering-related courses" block based on major:

Mechanical and aerospace engineering majors: ENGR 235, 240, 250, 250L, 280, 125, 103
Civil and environmental engineering majors: ENGR 235, 240, 280, 125, 183;
Electrical and computer engineering majors: ENGR 250, 250L, 183; CMPR 120, 121

Learning Outcome(s):

1. apply math and science concepts and techniques to engineering problems
2. solve engineering problems of common lower division engineering courses

The associate degree also requires completion of general education coursework per Plans A, B, or C of the college catalog (at least ~ 30 units). **Units:**

Engineering and engineering-related courses (take at least 9 units): **Units:** 9-11

ENGR 100A	Introduction to Engineering	3
ENGR 125	Engineering Graphics	3
ENGR 103	Solidworks Beginning Solid Modeling	3
ENGR 183	AutoCAD I	4
ENGR 235	Statics	3
ENGR 240	Dynamics	3
ENGR 250	Electric Circuits	3
ENGR 250L	Electric Circuits Laboratory	1
ENGR 280	Strength of Materials	3
CMPR 120	Introduction to Programming	3
CMPR 121	Programming Concepts	3

Science and math courses: **Units:** 21

MATH 180	Single Variable Calculus I	4
MATH 185	Single Variable Calculus II	4
PHYS 217	Engineering Physics I	4
PHYS 227	Engineering Physics II	4
OR		
PHYS 237	Engineering Physics III	4
CHEM 219	General Chemistry	5
OR		
CHEM 219H	Honors General Chemistry	5

Total: 30-32

Engineering CAD Drafting: A.S. Degree

Program Code: SAC.ENRCA.AS
Program Control Number: 08720

This program prepares students for employment as a MECHANICAL or CIVIL ENGINEERING COMPUTER-AIDED DESIGN (CAD) DRAFTER, and has a strong focus on teaching industry-standard CAD software in the respective areas. Students select one of two options: (1) MECHANICAL, which focuses on 3D solid modeling CAD, or (2) CIVIL, which focuses on AutoCAD, Civil 3D, and REVIT.

If more units are needed to complete the associates degree (~ 60 units), it is suggested students also select from the following list: For mechanical drafting (Engr 114), for civil drafting (Engr 118, 119).

Learning Outcome(s):

1. use CAD software to produce industry-standard models
2. use CAD software to produce industry-standard technical drawings

The associate degree also requires completion of general education coursework (~ 30 units) per Plans A, B, or C of the college catalog. **Units:**

Required core courses: **Units:** 9-10

ENGR 100A	Introduction to Engineering	3
OR		
ENGR 100B	Introduction to Civil Engineering	2
ENGR 122	Engineering Drawing	3
OR		
ENGR 125	Engineering Graphics	3
ENGR 183	AutoCAD I	4

Select the Mechanical or Civil Option **Units:** 12-14

Mechanical Option **Units:** 0

ENGR 103	Solidworks Beginning Solid Modeling	3
ENGR 104	Solidworks Intermediate Solid Modeling	3
ENGR 105	Solidworks Advanced Solid Modeling	3
MNFG 106	Solidworks Drawings	3

Civil Option **Units:** 0

ENGR 012	Civil/Architectural Blueprint Reading	2
ENGR 184	AutoCAD II	4
ENGR 185	Civil 3D	4
ENGR 154	Revit and Civil Drafting	4

Total: 21-24

Engineering Civil Drafting and Design: A.S. Degree

Program Code: SAC.ENRCE.AS
Program Control Number: 04212

This program prepares students for employment as a DRAFTER or DESIGNER in the CIVIL ENGINEERING, architecture, or construction fields. Civil drafters create detailed technical drawings of buildings, structures, and various construction projects designed by architects and civil engineers. Civil drafters must be proficient in industry-standard CAD software (AutoCAD, Civil 3D, REVIT) and have knowledge of industry-standard drafting practices. Employment is available in private industry and at local and county government agencies.

This program also develops essential job skills for ENGINEERS. Many university engineering programs may not include these job skill courses as part of their curriculum. Other courses in this program may transfer to the university.

If more units are needed to complete the associate degree (~ 60 units), it is suggested students also take: Engr 118, 119 (surveying).

Learning Outcome(s):

1. select and develop engineering careers
2. read and produce industry-standard civil engineering drawings.

3. use a variety of CAD software standard for the civil engineering field

The associates degree also requires completion of general education coursework per Plans A, B, or C of the college catalog		**Units:**
Required core courses:		**Units:** 23-24
ENGR 100A	Introduction to Engineering	3
OR		
ENGR 100B	Introduction to Civil Engineering	2
ENGR 012	Civil/Architectural Blueprint Reading	2
ENGR 122	Engineering Drawing	3
OR		
ENGR 125	Engineering Graphics	3
ENGR 183	AutoCAD I	4
ENGR 184	AutoCAD II	4
ENGR 185	Civil 3D	4
ENGR 154	Revit and Civil Drafting	4

Total: 23-24

Engineering Civil Technology: A.S. Degree

Program Code: SAC.ENRCT.AS
Program Control Number: 04202

This program prepares students for employment as a CIVIL ENGINEERING TECHNICIAN. Civil engineering technicians assist civil engineers and surveyors to plan, design, and build various infrastructure projects (e.g., highways, bridges, utilities, etc.) as well as commercial, industrial, and residential projects.

This program also develops essential job skills for ENGINEERS. Many university engineering programs may not include these job skill courses as part of their curriculum. Other courses in this program may transfer to the university.

Learning Outcome(s):

1. select and develop engineering careers
2. use CAD software to produce industry-standard models and technical drawings.
3. use common land surveying instruments

The associates degree also requires completion of general education coursework per Plans A, B, or C of the college catalog.		**Units:**
Required core courses:		**Units:** 31-32
ENGR 100A	Introduction to Engineering	3
OR		
ENGR 100B	Introduction to Civil Engineering	2
ENGR 122	Engineering Drawing	3
OR		
ENGR 125	Engineering Graphics	3
ENGR 183	AutoCAD I	4
ENGR 184	AutoCAD II	4
ENGR 185	Civil 3D	4
ENGR 118	Surveying	3
ENGR 119	Advanced Plane Surveying	3
GEOL 101	Introduction to Geology	3
GEOL 101L	Introduction to Geology Laboratory	1
MATH 162	Trigonometry	4

Total: 31-32

Engineering Mechanical Drafting and Design: A.S. Degree

Program Code: SAC.ENRDD.AS
Program Control Number: 04203

This program prepares students for employment as a MECHANICAL ENGINEERING DRAFTER or DESIGNER. Mechanical drafters use MCAD (mechanical computer-aided drafting/design) software to create solid models and then detailed technical drawings of machinery or mechanical devices produced by engineers. Mechanical drafters must be proficient in parametric MCAD software and have knowledge of current industry drafting practices. Designers are typically drafters with additional industry experience and training. Designers take generic designs from engineers and add detail to them (e.g., material and fastener selection) using MCAD. Employment is primarily in the private industries such as aerospace, biomedical, industrial, and other manufacturing industries.

This program also develops essential job skills for ENGINEERS. Many university engineering programs may not include these job skill courses as part of their curriculum. Other courses in this program may transfer to the university.

If more units are needed to complete the associate degree (~ 60 units), it is suggested students also select courses from the following list: Engr 184, 131, 133, or trigonometry.

Learning Outcome(s):

1. apply the rules of orthographic projection to create multi-view drawings
2. produce industry-standard models and engineering drawings.
3. effectively use CAD software to produce models and drawings

The associate degree also requires completion of general education coursework per Plans A, B, or C of the college catalog.(~ 30 units)		**Units:**
Required core courses:		**Units:** 28
ENGR 100A	Introduction to Engineering	3
ENGR 122	Engineering Drawing	3
OR		
ENGR 125	Engineering Graphics	3
ENGR 183	AutoCAD I	4
ENGR 103	Solidworks Beginning Solid Modeling	3
OR		
MNFG 103	Solidworks Beginning Solid Modeling	3
ENGR 104	Solidworks Intermediate Solid Modeling	3
OR		
MNFG 104	Solidworks Intermediate Solid Modeling	3
ENGR 105	Solidworks Advanced Solid Modeling	3
OR		
MNFG 105	Solidworks Advanced Solid Modeling	3
MNFG 106	Solidworks Drawings	3
ENGR 114	Geometric Dimensioning and Tolerancing	3
OR		
MNFG 114	Geometric Dimensioning and Tolerancing	3
ENGR 158	Basic Machining Concepts and Operations	3
OR		

MNFG 158	Basic Machining Concepts and Operations	3

Total: 28

Engineering Mechatronics: A.S. Degree

Program Code: SAC.ENMT.AS
Program Control Number: 08711

This program prepares students for employment as a MECHANICAL ENGINEERING TECHNICIAN or as an engineering technician in the related areas of electro-mechanical, aerospace, biomedical, industrial, or manufacturing. The program focuses on mechatronics – mechanical systems controlled with electronics or computer technology. The program emphasizes hands-on learning and covers: robotics, automation, PLC (programmable logic control), rapid prototyping, micro-controllers like Arduino, sensors, actuators, control systems, testing, measurement, programming, and basic circuits.

Employment is mainly in private manufacturing industries such as the mechanical, aerospace, biomedical, or industrial areas.

This program also develops essential job skills for ENGINEERS. Many university engineering programs may not include these job skill courses as part of their curriculum. Other courses in this program may transfer to the university.

If more units are needed to complete the associate degree (~ 60 units), it is suggested students also select from the following list: Cmpr 120 (C programming), Cmpr 121 (C programming), Engr 250L (circuits lab), Engr 131, 104, and Weld 101.

Learning Outcome(s):

1. design, fabricate, program, and operate mechatronics systems
2. program and operate micro-controllers to obtain sensor data and to control various actuators
3. use various rapid prototyping and/or automation equipment

The associate degree also requires completion of general education coursework (~30 units) per Plans A, B, or C of the college catalog.		**Units:**
Required core courses:		**Units:** 20
ENGR 100A	Introduction to Engineering	3
ENGR 122	Engineering Drawing	3
OR		
ENGR 125	Engineering Graphics	3
ENGR 103	Solidworks Beginning Solid Modeling	3
OR		
MNFG 103	Solidworks Beginning Solid Modeling	3
ENGR 132	Introduction to Robotics	2
ENGR 133	Mechatronics I	3
ENGR 134	Mechatronics II	3
ENGR 158	Basic Machining Concepts and Operations	3
OR		
MNFG 158	Basic Machining Concepts and Operations	3

Total: 20

Engineering CAD Drafting: Certificate of Achievement (Transcripted)

Program Code: sac.enrca.ca
Program Control Number: 21773

This program prepares students for employment as a MECHANICAL or CIVIL ENGINEERING COMPUTER-AIDED DESIGN (CAD) DRAFTER, and has a strong focus on teaching industry-standard CAD software in the respective areas. Students select one of two options: (1) MECHANICAL, which focuses on 3D solid modeling CAD or (2) CIVIL, which focuses on AutoCAD, Civil 3D, and REVIT.

Learning Outcome(s):

1. Use CAD software to produce industry-standard models
2. Use CAD software to produce industry-standard technical drawings

Required core courses:		**Units:** 9-10
ENGR 100A	Introduction to Engineering	3
OR		
ENGR 100B	Introduction to Civil Engineering	2
ENGR 122	Engineering Drawing	3
OR		
ENGR 125	Engineering Graphics	3
ENGR 183	AutoCAD I	4

Select the Mechanical Option or the Civil Option		**Units:** 12-14
Mechanical Option		**Units:** 0
ENGR 103	Solidworks Beginning Solid Modeling	3
ENGR 104	Solidworks Intermediate Solid Modeling	3
ENGR 105	Solidworks Advanced Solid Modeling	3
MNFG 106	Solidworks Drawings	3
Civil Option		**Units:** 0
ENGR 012	Civil/Architectural Blueprint Reading	2
ENGR 184	AutoCAD II	4
ENGR 185	Civil 3D	4
ENGR 154	Revit and Civil Drafting	4

Total: 21-24

Engineering Civil Drafting and Design: Certificate of Achievement (Transcripted)

Program Code: SAC.ENRCE.CA
Program Control Number: 21775

This program prepares students for employment as a DRAFTER or DESIGNER in the CIVIL ENGINEERING, architecture, or construction fields. Civil drafters create detailed technical drawings of buildings, structures, and various construction projects designed by architects and civil engineers. Civil drafters must be proficient in industry-standard CAD software (AutoCAD, Civil 3D, REVIT) and have knowledge of industry-standard drafting practices. Employment is available in private industry and at local and county government agencies.

This program also develops essential job skills for ENGINEERS. Many university engineering programs may not include these job skill courses as part of their curriculum. Other courses in this program may transfer to the university.

Learning Outcome(s):

1. select and develop engineering careers
2. read and produce industry-standard civil engineering drawings
3. use a variety of CAD software standard for the civil engineering field

Required core courses: **Units:** 23-24

ENGR 100A	Introduction to Engineering	3
OR		
ENGR 100B	Introduction to Civil Engineering	2
ENGR 012	Civil/Architectural Blueprint Reading	2
ENGR 122	Engineering Drawing	3
OR		
ENGR 125	Engineering Graphics	3
ENGR 183	AutoCAD I	4
ENGR 184	AutoCAD II	4
ENGR 185	Civil 3D	4
ENGR 154	Revit and Civil Drafting	4

Total: 23-24

Engineering Civil Technology: Certificate of Achievement (Transcripted)

Program Code: SAC.ENRCT.CA
Program Control Number: 21766

This program prepares students for employment as a CIVIL ENGINEERING TECHNICIAN. Civil engineering technicians assist civil engineers and surveyors to plan, design, and build various infrastructure projects (e.g., highways, bridges, utilities, etc.) as well as commercial, industrial, and residential projects.

This program also develops essential job skills for ENGINEERS. Many university engineering programs may not include these job skill courses as part of their curriculum. Other courses in this program may transfer to the university.

Learning Outcome(s):

1. select and develop engineering careers
2. use CAD software to produce industry-standard models and technical drawings.
3. use common land surveying instruments

Required core courses: **Units:** 31-32

ENGR 100A	Introduction to Engineering	3
OR		
ENGR 100B	Introduction to Civil Engineering	2
ENGR 122	Engineering Drawing	3
OR		
ENGR 125	Engineering Graphics	3
ENGR 183	AutoCAD I	4
ENGR 184	AutoCAD II	4
ENGR 185	Civil 3D	4
ENGR 118	Surveying	3
ENGR 119	Advanced Plane Surveying	3
GEOL 101	Introduction to Geology	3
GEOL 101L	Introduction to Geology Laboratory	1
MATH 162	Trigonometry	4

Total: 31-32

Engineering Mechanical Drafting and Design: Certificate of Achievement (Transcripted)

Program Code: sac.enrdd.ca
Program Control Number: 21774

This program prepares students for employment as a MECHANICAL ENGINEERING DRAFTER or DESIGNER. Mechanical drafters use MCAD (mechanical computer-aided drafting/design) software to create solid models and then detailed technical drawings of machinery or mechanical devices produced by engineers. Mechanical drafters must be proficient in parametric MCAD software and have knowledge of current industry drafting practices. Designers are typically drafters with additional industry experience and training. Designers take generic designs from engineers and add detail to them (e.g., material and fastener selection) using MCAD. Employment is primarily in the private industries such as aerospace, biomedical, industrial, and other manufacturing industries.

This program also develops essential job skills for ENGINEERS. Many university engineering programs may not include these job skill courses as part of their curriculum. Other courses in this program may transfer to the university.

Learning Outcome(s):

1. apply the rules of orthographic projection to create multi-view drawings
2. produce industry-standard models and engineering drawings.
3. effectively use CAD software to produce models and drawings

Required Core Courses: **Units:** 28

ENGR 100A	Introduction to Engineering	3
ENGR 122	Engineering Drawing	3
OR		
ENGR 125	Engineering Graphics	3
ENGR 183	AutoCAD I	4
ENGR 103	Solidworks Beginning Solid Modeling	3
ENGR 104	Solidworks Intermediate Solid Modeling	3
ENGR 105	Solidworks Advanced Solid Modeling	3
MNFG 106	Solidworks Drawings	3
ENGR 114	Geometric Dimensioning and Tolerancing	3
ENGR 158	Basic Machining Concepts and Operations	3

Total: 28

Engineering Mechatronics: Certificate of Achievement (Transcripted)

Program Code: sac.enmt.ca
Program Control Number: 21776

This program prepares students for employment as a MECHANICAL ENGINEERING TECHNICIAN or as an engineering technician in the related areas of electro-mechanical, aerospace, biomedical, industrial, or manufacturing. The program focuses on mechatronics – mechanical systems controlled with electronics or computer technology. The program emphasizes hands-on learning and covers: robotics, automation, PLC (programmable logic control), rapid prototyping, micro-controllers like Arduino, sensors, actuators, control systems, testing, measurement, programming, and basic circuits.

Employment is mainly in private manufacturing industries such as the mechanical, aerospace, biomedical, or industrial areas.

This program also develops essential job skills for ENGINEERS. Many university engineering programs may not include these job skill courses as part of their curriculum. Other courses in this program may transfer to the university.

Learning Outcome(s):

1. design, fabricate, program, and operate mechatronics systems

2. program and operate micro-controllers obtain sensor data and to control various actuators
3. use various rapid prototyping and/or automation equipment

Required core courses: **Units:** 20

ENGR 100A	Introduction to Engineering	3
ENGR 122	Engineering Drawing	3
OR		
ENGR 125	Engineering Graphics	3
ENGR 103	Solidworks Beginning Solid Modeling	3
OR		
MNFG 103	Solidworks Beginning Solid Modeling	3
ENGR 132	Introduction to Robotics	2
ENGR 133	Mechatronics I	3
ENGR 134	Mechatronics II	3
ENGR 158	Basic Machining Concepts and Operations	3
OR		
MNFG 158	Basic Machining Concepts and Operations	3

Total: 20

Engineering STEM Core: Certificate of Achievement (Transcripted)

Program Code: SAC.ENRSC.CA
Program Control Number: 41540

This program provides a basic program of engineering coursework for students planning to transfer to a university engineering program. For the elective block, students should select based on major:

Mechanical and aerospace engineering majors: ENGR 235, 240, 103
Civil and environmental engineering majors: ENGR 235, 240, 183
Electrical and computer engineering majors: ENGR 250, CMPR 120, CMPR 121

Learning Outcome(s):

1. apply math and science concepts and techniques to engineering problems
2. solve problems of common lower division engineering courses

Science and math courses **Units:** 15-16

MATH 180	Single Variable Calculus I	4
MATH 185	Single Variable Calculus II	4
PHYS 217	Engineering Physics I	4
CHEM 209	Introductory Chemistry	4
OR		
CMPR 120	Introduction to Programming	3

Elective courses (engineering and related) (select 1) **Units:** 3-5

ENGR 235	Statics	3
ENGR 240	Dynamics	3
ENGR 250	Electric Circuits	3
ENGR 183	AutoCAD I	4
ENGR 103	Solidworks Beginning Solid Modeling	3
CHEM 219	General Chemistry	5
CMPR 121	Programming Concepts	3

Total: 18-21

Engineering AutoCAD 2D Basics: Certificate of Proficiency (Untranscripted)

Program Code: SAC.CAD2D.CERT

This program prepares students for entry level DRAFTER positions that require knowledge of AutoCAD, typically in the architectural, civil, construction, and industrial fields. Students will learn to create and edit technical drawings and annotate designs. The program may be completed in less than one year, and it provides a good first step to more advanced drafting technology coursework and programs.

Learning Outcome(s):

1. Effectively use AutoCAD software

Required core courses: **Units:** 10-11

ENGR 100A	Introduction to Engineering	3
OR		
ENGR 100B	Introduction to Civil Engineering	2
ENGR 183	AutoCAD I	4
ENGR 184	AutoCAD II	4

Total: 10-11

Engineering Mechanical 3D Solid Modeling CAD: Certificate of Proficiency (Untranscripted)

Program Code: SAC.ENGR3D.CERT

This program prepares students for employment as a MECHANICAL ENGINEERING DRAFTER or DESIGNER. Mechanical drafters use MCAD (mechanical computer-aided drafting/design) software to create solid models and then detailed technical drawings of machinery or mechanical devices designed by engineers. The program focuses on training students on industry-standard MCAD software that is used heavily in the mechanical, aerospace, automotive, industrial, & biomedical engineering fields. Students learn to use the parametric nature of MCAD software to produce changeable models incorporating "design intent" and to produce drawings that conform to industry standards. The skills learned are applicable to drafters, designers, engineering technicians, and engineers in these fields.

Employment is primarily in the private manufacturing industries such as aerospace, biomedical, industrial, and many other manufacturing industries.

This program also develops essential job skills for ENGINEERS. Many university engineering programs may not include these job skill courses as part of their curriculum. Other courses in this program may transfer to the university.

Learning Outcome(s):

1. apply rules of orthographic projection to create multi-view drawings
2. produce industry-standard models and technical drawings
3. effectively use 3D solid modeling CAD software

Required Core Courses: **Units:** 15

ENGR 103	Solidworks Beginning Solid Modeling	3
ENGR 104	Solidworks Intermediate Solid Modeling	3
ENGR 105	Solidworks Advanced Solid Modeling	3
MNFG 106	Solidworks Drawings	3
ENGR 122	Engineering Drawing	3
OR		
ENGR 125	Engineering Graphics	3

Total: 15