



Engineering Certificate (ENGR)

Program Outline

PROGRAM IMPLEMENTATION DATE: September 2012
OUTLINE EFFECTIVE DATE: September 2017
PROGRAM OUTLINE REVIEW DATE: April 2022

GENERAL PROGRAM DESCRIPTION:

Career paths in engineering include civil engineering (structures), mechanical engineering (machines), electrical and computer engineering (circuits and software), chemical and biological engineering (chemical and biochemical processes) and engineering physics (applied physics in the design of new devices). In general, engineering is for students who are interested in the physical structures and systems in our modern world. Their work involves the analysis, design, planning, construction and maintenance of these structures and systems for reliable and safe use.

Program Information:

The COTR Engineering Certificate is designed to satisfy the Year 1 requirements of undergraduate engineering programs at UVIC and UBC; it may also help students transfer into the engineering programs at other institutions. This Engineering Certificate prepares students to apply for competitive admission to Year 2 programs. It also provides a dual admission option for UVic Engineering. Students should always check with the receiving institution for details on course requirements and course transfer.

Delivery: Face-to-face and online

COTR Credits: 34-37

Hours for this program: 780-825 hours

Typical Structure of Instructional Hours:

Instructional Activity	Duration
Lecture Hours - minimum	450-495
Seminars / Tutorials	
Laboratory / Studio Hours – min.	315
Practicum / Field Experience Hours	
Other Contact Hours	15
Total	780-825

Practicum Hours if applicable:

Type of Practicum	Duration
On-the-job Experience	N/A
Formal Work Experience	N/A
Other	N/A
Total	N/A

Program Outline Author or Contact:

Trevor Beugeling, MASC, BEng, BSc

Signature

APPROVAL SIGNATURES:

Department Head
Erin Aasland Hall
E-mail: aaslandhall@cotr.bc.ca

Dean of Business and University Studies
Darrell Bethune
E-mail: bethune@cotr.bc.ca

Department Head Signature

Dean Signature

EDCO

Valid from: September 2017 to April 2022

Education Council Approval Date

PROGRAM PREREQUISITES AND TRANSFER CREDIT:

Admission Requirements: Minimum grade of 65% in English 12 or ENGL 090 or 091, Pre-Calculus or Principles of Math 12 or MATH 090, Physics 12 or PHYS 090 and Chemistry 12 or CHEM 090.

Flexible Assessment FA:

Credit can be awarded for this program through FA Yes No

Learners may request formal recognition for flexible assessment at the College of the Rockies through one or more of the following processes: External Evaluation, Worksite Assessment, Demonstration, Standardized Test, Self-assessment, Interview, Products/Portfolio, Challenge Exam. Contact an Education Advisor for more information.

Transfer Credit: For transfer information within British Columbia, Alberta and other institutions, please visit <http://www.cotr.bc.ca/Transfer>

Students should also contact an academic advisor at the institution where they want transfer credit.

ENGINEERING CERTIFICATE: Sample schedule; courses may run in different semesters

Course Acronym	UVIC Required Courses	CR	Hours		Course Acronym	UBC Required Courses	CR	Hours
Fall Semester								
APSC 122	Introduction to Engineering	1	15 hours		APSC 122	Introduction to Engineering	1	15 hours
APSC 151	Engineering Graphics	3	30 lecture, 60 lab		APSC 151	Engineering Graphics	3	30 lecture, 60 lab
CHEM 115*	Chemistry for Engineering	3	45 lecture, 45 lab		CHEM 115*	Chemistry for Engineering	3	45 lecture, 45 lab
COMP 105	Introduction to Prog. in the C and C++ Language	3	45 lecture, 45 lab		COMP 105	Introduction to Prog. in the C and C++ Language	3	45 lecture, 45 lab
MATH 103	Differential Calculus	3	45 lecture, 15 lab		MATH 103	Differential Calculus	3	45 lecture, 15 lab
PHYS 103	Introduction to Physics 1	3	45 lecture, 45 lab		PHYS 103	Introduction to Physics 1	3	45 lecture, 45 lab
Winter Semester								
ENGL 100**	English Composition	3	45 lecture		ENGL 100**	English Composition	3	45 lecture
MATH 104	Integral Calculus	3	45 lecture, 15 lab		MATH 104	Integral Calculus	3	45 lecture, 15 lab
MATH 221	Elementary Linear Algebra	3	45 lecture		MATH 221	Elementary Linear Algebra	3	45 lecture
PHYS 104	Introduction to Physics 2	3	45 lecture, 45 lab		PHYS 104	Introduction to Physics 2	3	45 lecture, 45 lab
PHYS 141	Engineering Statics	3	45 lecture					
					PHYS 170	Engineering Statics and Dynamics	3	45 lecture
Spring Semester								
APSC 123	Engineering Design	3	15 lecture, 45 lab		APSC 123	Engineering Design	3	15 lecture, 45 lab
COMC 102***	Advanced Professional Communications	3	45 lecture					

*CHEM 101 and CHEM 102 may be taken together as an alternative to CHEM 115.

**ENGL 100 can be taken in the Fall or Winter semester

***COMC 102 can be taken in the Winter or Spring Semester

Total Credits for one year certificate: 34-37

COURSE GRADE:

Course grades are assigned as follows:

Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Mark Percent	≥ 90	89-85	84-80	79-76	75-72	71-68	67-64	63-60	59-55	54-50	< 50

Students must achieve an overall average of C+ with no course grade lower than a C to earn the Engineering Certificate and receive guaranteed admission to a second year UVic Bachelor of Engineering program.

COURSE DESCRIPTIONS:

APSC 122 Introduction to Engineering

This course is designed to introduce students to Engineering. Information is provided on engineering professions and the particular skills and type of work done by practicing engineers with different specialties. Students learn about the practice of Engineering through a series of presentations conducted by working engineers. Presentations focus on particular industries and/or specific disciplines and projects.

Prerequisites: None

APSC 123 Engineering Design

APSC 123 is a three credit course in which instruction and activities in engineering design are presented in an integrated manner. You will be introduced to fundamental principles and practical aspects of electrical, mechanical, software and computer engineering and will apply this knowledge in developing and implementing your own designs.

Prerequisites: None

Corequisites: COMP 105

APSC 151 Engineering Graphics

Engineering graphics explores the language of communication used to solve practical engineering problems and challenges. This course will teach orthographic projection, pictorial drawing, and visualization in three dimensions. Students will have the opportunity to exercise and develop skills in the creation and use of a variety of types of engineering graphics. This will be achieved through free hand sketching. AutoCAD 2013 program instruction, and “hands-on” lab activities. This course is intended for students pursuing a career in the field of Engineering.

Prerequisites: Minimum 65% in MATH: Pre-Calculus 11, Principles 11, MATH 080 or equivalent

CHEM 101 Fundamentals of Chemistry 1

This course presents the fundamental principles of chemistry with particular reference to acid-base and redox chemistry, electronic structure of atoms and molecules, properties of liquids, gases, solids and their solutions, phase changes, and thermochemistry. The associated laboratory exercises emphasize proper experimental techniques, data collection and analysis, safety and technical writing skills.

Prerequisites: One of CHEM 090 or CHEM 100 or Chemistry 12 or equivalent; and one of MATH 090 or Pre-Calculus 12 or Principles 12 or equivalent

CHEM 102 Fundamentals of Chemistry 2

Together with CHEM 101, CHEM 102 provides a solid foundation in fundamental chemical principles. Topics include equilibrium, thermodynamics, kinetics, electrochemistry, chemistry of the main group elements and the chemistry of organic and biomolecules. The associated laboratory exercises emphasize proper experimental technique, data collection and analysis, safety and technical writing skills.

Prerequisites: CHEM 101 or equivalent

CHEM 115 Chemistry for Engineering

This course provides a solid background in chemical principles required for engineering students. Topics include acid-base and redox chemistry, electronic structure of atoms and molecules, properties of liquids, gases, solids and their solutions, phase changes, thermochemistry, thermodynamics, equilibrium, kinetics and electrochemistry. The laboratory exercises emphasize proper experimental techniques, data collection and analysis, safety and technical writing skills.

Prerequisites: One of (CHEM 090, Chemistry 12 or equivalent) and one of (Math 090, Pre-Calculus 12, Principles 12 or equivalent)

COMC 102 Advanced Professional Communications

This course expands on the writing skills learned in COMC 101 or ENGL 100 and introduces the art of oral communication. The course presents functional communicative strategies that can be used in any workplace environment. Students gain practical experience through engaging and relevant activities and assignments that centre on gathering and summarizing information to produce successful proposals and reports, designing clear visuals with graphic illustrations, and developing speaking skills appropriate to informal and formal presentations and interviews.

Prerequisites: ENGL 100 or COMC101/150

COMP 105 Introduction to Programming in the C and C++ Language

Covers the basic programming techniques of C and C++ languages with an introduction to structured programming and abstract types.

Prerequisites: Minimum grade of 65% in the following Math courses: MATH 090, Foundations 12 or Pre-Calculus 12, Applications 12 or Principles 12 or equivalent. It is recommended that students have programmed in some programming language before.

Co-requisites: It is recommended that the student be enrolled in MATH 103/104, or MATH 101/102, or MATH 113.

ENGL 100 English Composition

English 100 focuses on composition for academic purposes and develops a student's ability to write clearly and effectively. Students also learn the fundamentals of critical thinking, persuasive writing techniques (including rhetorical appeals and devices), scholarly research, and academic reading.

Prerequisites: Minimum 65% in English 12 or equivalent (refer to [Course Equivalency Information](#) on the College website)

MATH 103 Differential Calculus

This course is intended for students who are pursuing a Bachelor of Science degree. Topics include: functions; limits; continuity; derivatives; their interpretation, differentiation rules, techniques of differentiation, implicit differentiation; inverse functions; exponential functions, logarithms; applications of differentiation such as linear approximations, Newton's method, related rates, analysis of graphs, and optimization; the Mean Value Theorem; definite and indefinite integrals; integration by substitution; Riemann sums; applications on integration.

Prerequisites: Minimum grade of 65% in the following Math courses: MATH 090, MATH 100, Pre-Calculus 12, Principles 12, or equivalent

MATH 104 Integral Calculus

Topics include: Logarithmic, exponential and hyperbolic functions, complex numbers, integration techniques substitution, parts, partial fractions, trigonometric substitution, numerical methods, l'Hopital's rule, improper integrals, sequences, series, convergence tests divergence, integral, comparison, limit comparison, ratio, root, and alternating series tests, Taylor Maclaurin and Fourier series, vectors dot products, vector valued functions, and polar curves.

Prerequisites: MATH 103, MATH 109, MATH 113 or a score of 4 or 5 on the AP Calculus.

MATH 221 Elementary Linear Algebra

This course is intended for students who are pursuing a Bachelor of Science with major in Computing, Mathematics or Physics or Applied Science Engineering degree. Topics include: systems of linear equations and matrices, matrix arithmetic, determinants, vectors, products of vectors, lines and planes in 2- and 3-space. Euclidean vector spaces, real vector spaces, inner product spaces, eigenvalues and eigenvectors, diagonalization, linear transformations, kernel, range, similarity, approximation, quadratic forms.

Prerequisites: MATH 104 except students enrolled in first year Engineering. MATH 103 for first year Engineering students (may be taken concurrently).

PHYS 103 Introduction to Physics 1

This course introduces the student to how calculus is used to build physical theory and to solve problems in kinematics, dynamics, momentum, and centre of mass calculations. In addition, the student is introduced to several conservation laws, in particular conservation of mechanical energy and linear and angular momentum.

Prerequisites: PHYS 090, Physics 12 or equivalent. MATH 103 is a required course, either taken prior or concurrently.

PHYS 104 Introduction to Physics 2

This course builds on PHYS 103. Electric and magnetic fields are used as examples of vector fields and the concept of flux and Gauss's theorem used to calculate the electric field in simple cases. Line integrals and the gradient are introduced as a means of going between electric field and potentials. Students are taught the uses of resistors, capacitors, and inductors and how to do calculations for circuits which use them. Ideas from Relativity and Quantum Mechanics are introduced.

Prerequisites: PHYS 103 **Co-requisites:** MATH 104 is a required course, either taken prior or concurrently.

PHYS 141 Engineering Statics

This course includes the topics vector operations, dot and scalar products; conditions for equilibrium in two- and three-dimensions; free body diagrams; moments about an axis; couples; friction, wedges; trusses, methods of joints, method of sections; shear and moment equations and diagrams; relations between distributed load, shear, and moment; centre of gravity, centre of mass; moment of inertia; parallel axis theorem; radius of gyration; deformation, bending.

Prerequisites: Both MATH 103 and PHYS 103 may be taken previously or concurrently.

PHYS 170 Engineering Statics and Dynamics

This course includes the topics vector operations, dot and scalar products; conditions for equilibrium in two- and three-dimensions; free body diagrams; moments about an axis; couples; friction, wedges; kinematics; rectilinear and curvilinear motion in rectangular, normal and tangential, and cylindrical components; dynamics, Newton's second law; equations, of motion in various coordinates; work and energy; power and efficiency; linear and angular impulse and momentum; conservation of momentum.

Prerequisites: Both MATH 103 and PHYS 103 may be taken previously or concurrently.