

# 2016 / 2017 CURRICULUM - SOFTWARE ENGINEERING

EIGHT SEMESTER PROGRAM Total credits: 136 (presently 136 cr.)

First Semester (Fall 2016)		14 credits	Second Semester (Winter 2017)		18 credits
XXXX xxx	Humanities & Social Sciences 1*	(3 cr)	CHEM 120	General Chemistry 2	(4 cr)
MATH 140	Calculus 1	(3 cr)	MATH 141	Calculus 2	(4 cr, P - MATH 140)
PHYS 131	Mechanics & Waves	(4 cr, C - MATH 140)	PHYS 142	Electromagnetism & Optics	(4 cr, P - PHYS 131; C - MATH 141)
MATH 133	Linear Algebra and Geometry	(3 cr)	ECSE 202	Intro. to Software Development	(3 cr)
FACC 100	Intro. to Engineering Profession	(1 cr)	XXXX xxx	Impact of Technology on Society **	(3 cr)
Third Semester (Fall 2017)		15 credits	Fourth Semester (Winter 2018)		18 credits
XXXX xxx	Humanities & Social Sciences 2*	(3 cr)	COMP 206	Introduction to Software Systems	(3 cr, P - COMP/ECSE 202 or COMP 250)
ECSE 205	Probability & Statistics for Eng.	(3 cr)	COMP 250	Introduction to Computer Science	(3 cr)
MATH 262	Intermediate Calculus	(3 cr, P-MATH 141 & MATH 133 or equiv)	ECSE 200	Electric Circuits 1	(3 cr, P - PHYS 142 or CEGEP Equivalent: C - MATH 263)
MATH 263	ODEs for Engineers	(3 cr, C - MATH 262)	ECSE 223	Model-based Programming	(3 cr, P - ECSE 202)
CCOM 206	Communication in Engineering	(3 cr)	ECSE 222	Digital Logic	(3 cr, P - ECSE 202)
			MATH 240	Discrete Structures 1	(3 cr, C - MATH 133)
Fifth Semester (Fall 2018)		17 credits	Sixth Semester (Winter 2019)		18 credits
COMP 251	Algorithms and Data Structures	(3 cr, P - COMP 250, C - MATH-240)	XXXX xxx t1	Technical Complementary 1	(3cr)
ECSE 321	Intro. to Software Engineering	(3 cr, P - ECSE/COMP 202 or COMP 208)	ECSE 316	Intro. Signals and Networks	(3 cr, P - MATH 263 & ECSE 200 & COMP 251 )
ECSE 324	Computer Organization	(4 cr, P - ECSE 200 & ECSE 222)	ECSE 427	Operating Systems	(3 cr, P - ECSE 324 or COMP 273)
ECSE 326	Software Requirements Eng.	(3 cr, P - ECSE 223)	COMP 302	Prog. Languages & Paradigms	(3 cr, P - COMP 250)
FACC 300	Engineering Economy	(3 cr)	ECSE 310	Thermodynamics of Computing	(3 cr, P - ECSE 200, ECSE 205 & ECSE 222)
FACC 400	Engineering Professional Practice	(1 cr, P - FACC100, 60 program credits)	ECSE 211	Design Principles and Methods	(3 cr, P - ECSE 200 & ECSE/COMP 202)
Seventh Semester (Fall 2019)		18 credits	Eighth Semester (Winter 2020)		18 credits
ECSE 456	ECSE Design Project 1	(3 cr, P - CCOM 206 & ECSE 211 & ECSE 326)	ECSE 457	ECSE Design Project 2	(3 cr, P-ECSE 456)
XXXX xxx	Technical Complementary 2	(3 cr)	XXXX xxx	Technical Complementary 4	(3 cr)
XXXX xxx	Technical Complementary 3	(3 cr)	XXXX xxx	Technical Complementary 5	(3 cr)
ECSE 420	Parallel Computing	(3 cr, P - ECSE 427)	COMP 421	Database Systems	(3 cr, P - COMP 206, COMP 251 & COMP 302)
ECSE 429	Software Validation	(3 cr, P-ECSE 321 or COMP 303)	ECSE 428	Software Engineering Practice	(3 cr, P - ECSE 321 or COMP 335)
COMP 360	Algorithm Design	(3 cr, P - COMP 251, MATH 363)	XXXX xxx	Natural Science Complementary ***	(3 cr)

Courses shown in boldface above must be passed with a grade "C" or better. A "D" is *only* acceptable in the courses *not* in boldface. Also, a grade of "C" is required in all prerequisites in order to proceed with the follow-on courses. (Exception: A student who fails a course with a grade of D may take an ECSE course that has it as a prerequisite, provided that the failed course is retaken at the same time. Students thinking of doing this should meet with a Departmental advisor).

Technical Complementary courses are selected from the list given on the next page.

\* For instructions on selecting valid "Humanities and Social Sciences" courses, see [www.mcgill.ca/ece](http://www.mcgill.ca/ece), then: Programs and Courses > Undergraduate > Complementary Studies.

\*\* For instructions on selecting valid "Impact of Technology on Society" courses, see [www.mcgill.ca/ece](http://www.mcgill.ca/ece), then: Programs and Courses > Undergraduate > Complementary Studies.

\*\*\* Natural Science Complementary courses must be chosen from an approved list.

This sample curriculum is for students who wish to complete their degree requirements in 8 semesters. Students may, at any time, deviate from this structure. However, it is the student's responsibility to devise a study plan that has no course conflicts or prerequisite/corequisite violations. Academic advisors are available for help with course selection.

# SOFTWARE ENGINEERING

## Technical Complementaries (5 courses) 15 credits (minimum)

Five technical complementary courses must be chosen from the following list.

ECSE 500 level technical complementaries are restricted to students with a minimum CGPA of 3.0 and B+ or better in the prerequisites.

COMP 330	Theory of Computation	(3 cr, P - COMP 251)
COMP 350	Numerical Computing	(3 cr, P - MATH 222, MATH 223 & one of COMP/ECSE 202, COMP 208 or COMP 250 or equiv)
COMP 409	Concurrent Programming	(3 cr, P - COMP 251, COMP 302 & COMP 310 or ECSE 427)
COMP 417	Intro. Robotics and Intelligent Systems	(3 cr, P - COMP 424 & MATH 223)
COMP 424	Artificial Intelligence	(3 cr, P - COMP 206 or ECSE 321, COMP 251)
COMP 512	Distributed Systems	(4 cr, P - COMP 310, COMP 251 or equivalent)
COMP 520	Compiler Design	(4 cr, P - COMP 273 & COMP 302)
COMP 521	Modern Computer Games	(4 cr, P - COMP 303 or COMP 361; C - COMP 557)
COMP 525	Formal Verification	(3 cr, P - COMP 251 and COMP 330)
<b>COMP 529</b>	<b>Software Architecture</b>	<b>(4cr, P - COMP 303)</b>
COMP 533	Model-Driven Software Development	(3 cr, P - ECSE 321)
COMP 557	Fundamentals of Computer Graphics	(3 cr, P - MATH 223, COMP 206 & COMP 251)
COMP 566	Discrete Optimization 1	(3 cr, P - COMP 360 & MATH 223)
COMP 575	Fundamentals of Distributed Algorithms	(3 cr, P - COMP 310)
ECSE 325	Digital Systems	(3 cr, P - ECSE 324)
ECSE 415	Introduction to Computer Vision	(3 cr, P - ECSE 304 or ECSE 306)
ECSE 416	Telecom. Networks	(4 cr, P - COMP-250, ECSE 205 & ECSE 308 or ECSE 316)
ECSE 421	Embedded Systems	(3 cr, P - ECSE 322 & ECSE 323)
ECSE 422	Fault Tolerant Computing	(3 cr, P - ECSE 322)
ECSE 424	Human-Computer Interaction	(3 cr, P - ECSE 322)
ECSE 425	Computer Architecture	(3 cr, P - ECSE 324)
ECSE 444	Microprocessors	(4 cr, P - ECSE 324)
ECSE 539	Software Language Engineering	(3 cr, P - COMP 303 or ECSE 321)

## NATURAL SCIENCE COMPLEMENTARY COURSES

The following is the list of approved natural science complementary courses.

### ATOC 214, Introduction: Physics of the Atmosphere

(3) (Fall) (3 hours lectures) (Prerequisite: CEGEP Physics) An introduction to physical meteorology designed for students in the physical sciences. Topics include: composition of the atmosphere; heat transfer; the upper atmosphere; atmospheric optics; formation of clouds and precipitation; instability; adiabatic charts.

### ATOC 215 Oceans, Weather and Climate

(3) (Winter) (3 hours lectures) (Prerequisite: CEGEP Physics or permission of the instructor) Laws of motion, geostrophic wind, gradient wind. General circulation of the atmosphere and oceans, local circulation features. Air-sea interaction, including hurricanes and sea-ice formation, extra-tropical weather systems and fronts, role of the atmosphere and oceans in climate.

### ATOC 219 Introduction to Atmospheric Chemistry

(3) (Winter) (3 hours lectures) (Prerequisite: CHEM 110 and CHEM 120, and one of MATH 139 or MATH 140 or MATH 150, or a CEGEP DEC in Science, or permission of instructor. An introduction to the basic topics in atmospheric chemistry. The fundamentals of the chemical composition of the atmosphere and its chemical reactions. Selected topics such as smog chamber, acid rain, and ozone hole will be examined.

### BIOL 200 Molecular Biology

(3) (Fall) (3 hours lecture, 1 hour optional tutorial) (Prerequisite: BIOL 112 or equivalent.) (Corequisite: CHEM 212 or equivalent) The physical and chemical properties of the cell and its components in relation to their structure and function. Topics include: protein structure, enzymes and enzyme kinetics; nucleic acid replication, transcription and translation; the genetic code, mutation, recombination, and regulation of gene expression.

### BIOL 215 Introduction to Ecology and Evolution

(3) (Fall) (3 hours lecture) (Prerequisite: BIOL 111) (Restrictions: Not open to students who have taken BIOL 208, BIOL 304 or BIOL 305. Not open to students who have taken ENVR 200 and/or ENVR 202.) An introduction to the fundamental processes of ecology and evolution that bear on the nature and diversity of organisms and the processes that govern their assembly into ecological communities and their roles in ecosystem function.

### CHEM 203 Survey of Physical Chemistry

(3) (Fall) (3 lectures) (Prerequisites: CHEM 110 and CHEM 120 or equivalent.) (Restriction: Intended for students in biological science programs requiring only one course in physical chemistry) (Restriction: Not open to students who have taken or are taking CHEM 204 or CHEM 213) A survey of the principles and methods of physical chemistry with emphasis on the use of biological examples. Topics will include thermodynamics, transport properties, kinetics, molecular structure and interactions, and spectroscopy.

### ENVR 200 The Global Environment

(3) (Fall) (Section 001: Downtown Campus) (Section 051: MacDonald Campus). A systems approach to study the different components of the environment involved in global climate change: the atmosphere, biosphere, hydrosphere, and lithosphere. The interactions among these components. Their role in global climate change. The human dimension to global change.

### EPSC 201 Understanding Planet Earth

(3) (Fall or Winter) (3 hours lecture) Earth & Planetary Sciences : Learn about Earth's origin, its place in the solar system, its internal structure, rocks and minerals, the formation of metal and fossil fuel deposits, and the extinction of dinosaurs. Discover the impact of the volcanic eruptions, earthquakes and mountain chains on Earth's past, present and future. Explore 125 million-year-old Mount Royal.

### EPSC 203 Structural Geology

(3) (Winter) (2 hours lectures, 3 hours laboratory) Primary igneous and sedimentary structures, attitudes of planes and lines, stress and strain, fracturing of rocks, faulting, homogeneous strain, description and classification of folds, foliation and lineation, orthographic and stereographic projections.

### EPSC 210 Introductory Mineralogy

(3) (Fall) (2 hours lectures, 3 hours laboratory) Crystal chemistry and identification of the principal rock-forming and ore minerals. Elementary crystallography. Optional 2-day field trip.

### ESYS 200 Earth System Processes

(3) (Winter) (3 hours lecture) Complex interactions among the atmosphere, biosphere, geosphere and hydrosphere. Biological, chemical and physical processes within and between each "sphere" that extend over spatial scales ranging from microns to the size of planetary orbits and that span time scales from fractions of a second to billions of years.

### MIMM 211 Introductory Microbiology

(3) (Fall) (3 hours lecture) (Corequisite: BIOL 200) A general treatment of microbiology bearing specifically on the biological properties of microorganisms. Emphasis will be on prokaryotic cells. Basic principles of microbial genetics are also introduced.

### PHYS 214 Introductory Astrophysics

(3) (Fall) (Prerequisite: Cegep physics or PHYS 102 or PHYS 142.) (Restriction: Not open to students who have taken or are taking PHYS 205 or PHYS 206.) An introduction to astrophysics with emphasis placed on methods of observation and current models. Stellar radiation and detectors, quasars, black holes. Galaxies, large scale structure of the universe, cosmology.

### PHYS 224 Physics of Music

(3) (Fall) (3 hours lectures) Restriction: Not open to students who have taken PHYS 225. An introduction to the physics of music. Properties of sound and their perception as pitch, loudness, and timbre. Dissonance, consonance, and musical intervals and tuning. Physics of sound propagation and reflection. Resonance. Acoustic properties of pipes, strings, bars, and membranes, and sound production in wind, string, and percussion instruments. The human voice. Room reverberation and acoustics. Directional characteristics of sound sources.

### PHYS 230 Dynamics of Simple Systems

(3) (Fall) (3 hours lecture) (Prerequisite: CEGEP physics.) (Corequisite: MATH 222) (Restriction: Not open to students taking or having passed PHYS 251) Translational motion under Newton's laws; forces, momentum, work/energy theorem. Special relativity; Lorentz transforms, relativistic mechanics, mass/energy equivalence. Topics in rotational dynamics. Noninertial frames.

### PHYS 260 Modern Physics and Relativity

(3) (Fall) (3 hours lectures) (Corequisite: MATH 222) History of special relativity; Lorentz transformations: kinematics and dynamics; transformation of electric and magnetic forces; introduction to topics in modern physics.