2020 / 2021 CURRICULUM - SOFTWARE ENGINEERING

EIGHT SEMESTER PROGRAM Total credits: 136

First Semester (Fall 2020)		14 credits
XXXX xxx	Humanities & Social Sciences 1*	(3 cr)
MATH 140	**Calculus 1**	(3 cr, P- High school calculus)
PHYS 131	**Mechanics & Waves**	(4 cr, C - Calculus course (MATH 140)
MATH 133	**Linear Algebra and Geometry**	(3 cr, P- A course in functions)
FACC 100	**Intro. to Engineering Profession**	(1 cr)

Second Semester (Winter 2021)		18 credits
CHEM 120	**General Chemistry 2**	(4 cr, P - College level mathematics and physics or permission of instructor)
MATH 141	**Calculus 2**	(4 cr, P - MATH 140)
PHYS 142	**Electromagnetism & Optics**	(4 cr, P - PHYS 131; C - MATH 141)
ECSE 202	**Intro. to Software Development**	(3 cr)
XXXX xxx	Natural Science Complementary ***	(3 cr)

Third Semester (Fall 2021)		15 credits
ECSE 205	**Probability & Statistics for Eng.**	(3 cr)
ECSE 223	**Model-based Programming**	(3 cr, P - ECSE 202)
MATH 262	**Intermediate Calculus**	(3 cr, P-MATH 141 or equiv, MATH 133)
MATH 263	**ODEs for Engineers**	(3 cr, C - MATH 262)
CCOM 206	**Communication in Engineering**	(3 cr)
FACC 250	**Resp. of the Prof. Engineer**	(0 cr, P - FACC 100 or BREE 250)

Fourth Semester (Winter 2022)		18 credits
COMP 206	**Introduction to Software Systems**	(3 cr, P - ECSE 202 or COMP 250)
COMP 250	**Introduction to Computer Science**	(3 cr) P- Familiarity with a high level programming language and CEGEP level MATH [MATH 133, MATH 140, MATH 141]
ECSE 200	**Electric Circuits 1**	(3 cr, P - PHYS 142 ; C - MATH 263)
ECSE 222	**Digital Logic**	(3 cr, P - ECSE 202)
MATH 240	**Discrete Structures**	(3 cr, C - MATH 133)
XXXX xxx	Humanities & Social Sciences 2*	(3 cr)

Fifth Semester (Fall 2022)		17 credits
COMP 251	**Algorithms and Data Structures**	(3 cr, P - COMP 250, C - MATH 240)
ECSE 321	**Intro. to Software Engineering**	(3 cr, P - ECSE 223 and COMP 202 or COMP 208 or ECSE 202)
ECSE 324	**Computer Organization**	(4 cr, P - ECSE 200, ECSE 222)
ECSE 326	**Software Requirements Eng.**	(3 cr, P - ECSE 223 or COMP 303)
FACC 300	**Engineering Economy**	(3 cr)
FACC 400	**Engineering Professional Practice**	(1 cr, P - FACC 100, FACC 250, and 60 program credits)

Sixth Semester (Winter 2023)		18 credits
XXXX xxx	**Technical Complementary 1**	(3 cr)
ECSE 316	**Signals and Networks**	(3 cr, P - MATH 263, ECSE 200, COMP 251)
ECSE 427	**Operating Systems**	(3 cr, P - ESCE 324 or COMP 273)
COMP 302	**Prog. Languages & Paradigms**	(3 cr, P - COMP 250)
ECSE 310	**Thermodynamics of Computing**	(3 cr, P - ECSE 200, ECSE 205, ECSE 222)
ECSE 211	**Design Principles and Methods**	(3 cr, P - ECSE 200, ECSE 202)

Seventh Semester (Fall 2023)		18 credits
ECSE 458 D1	**Capstone Design Project**	(3 cr, P - CCOM 206, ECSE 211, ECSE 324, COMP 302)
XXXX xxx	**Technical Complementary 2**	(3 cr)
XXXX xxx	**Technical Complementary 3**	(3 cr)
ECSE 420	**Parallel Computing**	(3 cr, P - ECSE 427)
ECSE 429	**Software Validation**	(3 cr, P - ECSE 321 or COMP 303)
COMP 360	**Algorithm Design**	(3 cr, P - COMP 251, MATH 240)

Eighth Semester (Winter 2024)		18 credits
ECSE 458 D2	**Capstone Design Project**	(3 cr, P- ESCE 458D1)
XXXX xxx	**Technical Complementary 4**	(3 cr)
XXXX xxx	**Elective Course ******	(3 cr)
COMP 421	**Database Systems**	(3 cr, P - COMP 206, COMP 251, COMP 302)
ECSE 428	**Software Engineering Practice**	(3 cr, P - ECSE 321 or COMP 335)
XXXX xxx	Impact of Technology on Society **	(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, then: Undergraduate Studies > Program Information > Complementary Studies.

** For instructions on selecting valid "Impact of Technology on Society" courses, see www.mcgill.ca/ece, then: Undergraduate Studies > Program Information > Complementary Studies.

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

One 3-credit course at the 200-level or higher from any department at McGill, approved by the Undergraduate Programs Office in the Department of Electrical and Computer Engineering. For approval, please contact undergrad.ece@mcgill.ca.

ECSE 458, Capstone Design Project course is a spanned course given in both the fall and winter terms. A course that spans across two semesters may be taken in Fall-Winter or Winter-Fall. Students wishing to take the Fall-Winter sequence will need to register for ECSE 458 D1/D2. For a Winter-Fall sequence, students need to register for ECSE 458 N1/N2.

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.

Revised May 2020

SOFTWARE ENGINEERING

A:Technical Complementaries (1 course) 3 credits (minimum)

One technical complementary course 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.

ECSE 325	Digital Systems	(3 cr, P - ECSE 324)
ECSE 343*	Numerical Methods in Engineering	(3 cr, P- ECSE 205, COMP 250, MATH 263)
ECSE 415	Intro. to Computer Vision	(3 cr, P - ECSE 205, ECSE 206 or ECSE 316)
ECSE 416	Telecom. Networks	(4 cr, P - ECSE 205, ECSE 308 or ECSE 316, COMP 250)
ECSE 422	Fault Tolerant Computing	(3 cr, P - ECSE 324, COMP 250)
ECSE 425	Computer Architecture	(3 cr, P - ECSE 324)
ECSE 437	Software Delivery	(3 cr, P - ECSE 321 or COMP 303)
ECSE 439	Software Language Engineering	(3 cr, P - ECSE 321 or COMP 303)
ECSE 444	Microprocessors	(4 cr, P - ECSE 324)
ECSE 446	Realistic Image Synthesis	(3 cr, P - ECSE 202, ECSE 205, COMP 250)
ECSE 544	Computational Photography	(4 cr, P - ECSE 205 and ECSE 206)
ECSE 551**	Machine Learning for Engineers	(4 cr - P - COMP 250 and ESCE 205 or MATH 323; C- ESCE 443 or ESCE 543 or MATH 247)

B:Technical Complementaries (3 courses) 9 credits (minimum)

Three other technical complementary courses must be chosen from list A or from list B:

COMP 330	Theory of Computation	(3 cr, P - COMP 251, MATH 240)
COMP 350*	Numerical Computing	(3 cr, P - MATH 222 or MATH 262, MATH 223 & (ECSE 202 or 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 251, MATH 223 & (ECSE 321 or COMP 206)
COMP 424***	Artificial Intelligence	(3 cr, P - COMP 206/ECSE 321, MATH 323 or equivalent, 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 251, MATH 223 & (COMP 303 or COMP 361)
COMP 525	Formal Verification	(3 cr, P - COMP 251, COMP 330)
COMP 529	Software Architecture	(4 cr, P - COMP 303)
COMP 533	Model-Driven Software Development	(3 cr, P - ECSE 321 or COMP 303 or COMP 361)
COMP 551**	Applied Machine Learning	(4 cr, MATH 323 or ECSE 205 or ESCE 305 or equivalent)
COMP 559	Fundamentals of Computer Animation	(4 cr - P MATH 222, MATH 223, COMP 206, COMP 250)
COMP 575	Fundamentals of Distributed Algorithms	(3 cr, P - COMP 310)
ECSE 421	Embedded Systems	(3 cr, P - ECSE 324)
ECSE 424	Human-Computer Interaction	(3 cr, P - ECSE 324, COMP 250 or COMPE 251, COMP 273)
ECSE 507	Optimization & Optimal Control	(3 cr, P - (ECSE 343 or ECSE 443) or ESCE 543 or ECSE 501 or COMP 540 or permission of instructor)
ECSE 509	Probability & Random Signals 2	(3 cr, P - (ECSE 206 or ESCE 316) and ECSE 205
ECSE 526***	Artificial Intelligence	(3 cr, P - ECSE 324)
ECSE 532	Computer Graphics	(4 cr, P - ECSE 324)
MATH 247	Honours Applied Linear Algebra	(3 cr, P - MATH 133 or equiv.)

*COMP 350 and ECSE 343 cannot both be taken.

** ECSE 551 and COMP 551 cannot both be taken.

*** COMP 424 and ECSE 526 cannot both be taken.

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 meteorologydesigned 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 Enviroment
(3) (Fall) (Section 001: Dowtown 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 procaryotic 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) (Restricion: 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.