# 2017 / 2018 CURRICULUM - COMPUTER ENGINEERING

**ENTRY FROM CEGEP** **Total credits:** **111**

| **First Semester (Fall 2017)** | | **15 credits** |
|---|---|---|
| **ECSE 202** | **Intro. to Software Development** | (3 cr) |
| **ECSE 205** | **Probability & Statistics for Eng.** | (3 cr) |
| **MATH 262** | **Intermediate Calculus** | (3 cr, P-MATH 141, MATH 133 or equiv) |
| **MATH 263** | **ODEs for Engineers** | (3 cr, C - MATH 262) |
| XXXX xxx | Humanities & Social Sciences * | (3 cr) |

| **Second Semester (Winter 2018)** | | **16 credits** |
|---|---|---|
| **COMP 250** | **Introduction to Computer Science** | (3 cr) |
| **ECSE 222** | **Digital Logic** | (3 cr, P - ECSE 202) |
| **ECSE 200** | **Electric Circuits 1** | (3 cr, P - PHYS 142 or CEGEP Equivalent; C - MATH 263) |
| **ECSE 223** | **Model-based Programming** | (3 cr, P - ECSE 202) |
| XXXX xxx | Impact of Technology on Society ** | (3 cr) |
| **FACC 100** | **Intro. to Engineering Profession** | (1 cr) |

| **Third Semester (Fall 2018)** | | **16 credits** |
|---|---|---|
| **ECSE 210** | **Electric Circuits 2** | (3 cr, P - ECSE 200) |
| **ECSE 211** | **Design Principles and Methods** | (3 cr, P - ECSE 200, ECSE 202) |
| **ECSE 206** | **Intro. to Signals & Systems** | (3 cr, P - ECSE 200) |
| **ECSE 324** | **Computer Organization** | (4 cr, P - ECSE 200, ECSE 222) |
| **CCOM 206** | **Communication in Engineering** | (3 cr) |

| **Fourth Semester (Winter 2019)** | | **15 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 202) |
| **ECSE 310** | **Thermodynamics of Computing** | (3 cr, P - ECSE 200, ECSE 205, ECSE 222) |
| **ECSE 325** | **Digital Systems** | (3 cr, P - ECSE 324) |
| **MATH 240** | **Discrete Structures 1** | (3 cr, C - MATH 133) |
| **FACC 250** | **Resp. of the Prof. Engineer** | (0 cr) |

| **Fifth Semester (Fall 2019)** | | **17 credits** |
|---|---|---|
| **ECSE 331** | **Electronics** | (4 cr, P - ECSE 210) |
| **ECSE 308** | **Intro. Comm. Sys. & Networks** | (4 cr, P - ECSE 205, ECSE 206) |
| **ECSE 353** | **Electromagnetic Fields & Waves** | (3 cr, P - MATH 262, MATH 263, ECSE 210) |
| **ECSE 427** | **Operating Systems** | (3 cr, P - ECSE 324) |
| XXXX xxx | Natural Science Complementary *** | (3 cr) |

| **Sixth Semester (Winter 2020)** | | **16 credits** |
|---|---|---|
| **ECSE 456** | **ECSE Design Project 1** | (3 cr, P - CCOM 206, ECSE 211, ECSE 324, ECSE 331) |
| **XXXX xxx** | **Technical Complementary 1** | (3 cr) |
| **XXXX xxx** | **Technical Complementary 2** | (3 cr) |
| **ECSE 425** | **Computer Architecture** | (3 cr, P - ECSE 324) |
| **ECSE 444** | **Microprocessors** | (4 cr, P - ECSE 324) |

| **Seventh Semester (Fall 2020)** | | **16 credits** |
|---|---|---|
| **ECSE 457** | **ECSE Design Project 2** | (3 cr, P- ECSE 456) |
| **XXXX xxx** | **Technical Complementary 3** | (3 cr) |
| **XXXX xxx** | **Technical Complementary 4** | (3 cr) |
| **XXXX xxx** | **Technical Complementary 5** | (3 cr) |
| **FACC 300** | **Engineering Economy** | (3 cr) |
| **FACC 400** | **Engineering Professional Practice** | (1 cr, P - FACC100, 60 program credits) |

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: Programs and Courses > Undergraduate > Complementary Studies.

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

******* "Natural Science Complementary" courses must be chosen from the list below.

**This sample curriculum is for students who wish to complete their degree requirements in 7 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 April 2017

# COMPUTER ENGINEERING

## A:Technical Complementaries (3 courses) 9 credits (minimum)

Three technical complementary courses must be chosen from this list:

| | | |
|---|---|---|
| COMP 424 | Artificial Intelligence | (3 cr, P - ECSE 205, COMP 251 & (COMP 206 or ECSE 321) |
| ECSE 335 | Microelectronics | (4 cr, P - ECSE 331) |
| ECSE 412 | Discrete-Time Signal Processing | (3 cr, P - ECSE 206 or ECSE 306) |
| ECSE 416 | Telecom. Networks | (4 cr, P - COMP 250, ECSE 205, ECSE 308 or ECSE 316) |
| ECSE 420 | Parallel Computing | (3 cr, P - ECSE 427) |
| ECSE 421 | Embedded Systems | (3 cr, P - ECSE 324) |
| ECSE 422 | Fault Tolerant Computing | (3 cr, P - ECSE 324, COMP 250) |
| ECSE 424 | Human-Computer Interaction | (3 cr, P - ECSE 324, COMP 250) |
| ECSE 428 | Software Engineering Practice | (3 cr, P - ECSE 321) |
| ECSE 429 | Software Validation | (3 cr, P - ECSE 321 or COMP 303) |
| ECSE 439 | Software Language Engineering | (3 cr, P - ECSE 321 or COMP 303) |

## B:Technical Complementaries (2 courses) 6 credits (minimum)

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

| | | |
|---|---|---|
| ECSE 307 | Linear Systems & Control | (4 cr, P - ECSE 206, ECSE 210) |
| ECSE 403 | Control Systems | (4 cr, P - ECSE 307) |
| ECSE 408 | Communication Systems | (4 cr, P - ECSE 205, ECSE 308) |
| ECSE 415 | Introduction to Computer Vision | (3 cr, P - ECSE 304 or ECSE 306) |
| ECSE 431 | Introduction to VLSI CAD. | (3 cr, P - ECSE 323, ECSE 330) |
| ECSE 435 | Mixed Signal Test Techniques | (3 cr, P - ECSE 206, ECSE 335) |
| ECSE 436 | Signal Processing Hardware | (3 cr, P - ECSE 322, ECSE 323, ECSE 304 or ECSE 306) |
| ECSE 450 | Electromagnetic Compatability | (3 cr, P - ECSE 222, ECSE 331, (ECSE 353 or ECSE 354) |
| COMP 551 | Applied Machine Learning | (4 cr, P - ECSE 323, ECSE 205 or ECSE 305 or equivalent) |
| COMP 557 | Fundamentals of Computer Graphics | (3 cr, P - MATH 222, MATH 223, COMP 206, COMP 250) |

# 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.