

ELECTRICAL ENGINEERING (B.ENG.) (134 CREDITS)

Offered by: Electrical & Computer Engr (Faculty of Engineering)

Degree: Bachelor of Engineering

Program credit weight: 134 credits

Program Description

Program credit weight: 134-137 credits

Program credit weight for Quebec CEGEP students: 109-112 credits

This program gives students a broad understanding of the key principles that are responsible for the extraordinary advances in the technology of computers, micro-electronics, automation and robotics, telecommunications, and power systems. These areas are critical to the development of our industries and, more generally, to our economy. A graduate of this program is exposed to all basic elements of electrical engineering and can function in any of our client industries. This breadth is what distinguishes an engineer from, for example, a computer scientist or physicist.

In addition to technical complementary courses, students in the Electrical Engineering program take general complementary courses in social sciences, administrative studies, and humanities. These courses allow students to develop specific interests in areas such as psychology, economics, management, or political science.

Note: For information about Fall 2025 and Winter 2026 course offerings, please check back on May 8, 2025. Until then, the "Terms offered" field will appear blank for most courses while the class schedule is being finalized.

Required Year 0 (Freshman) Courses (25 credits)

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credit for these Year 0 (Freshman) courses and enter a 109- to 112 credit program.

For information on transfer credit for French Baccalaureate, International Baccalaureate exams, Advanced Placement exams, Advanced Levels, and Science Placement Exams, see www.mcgill.ca/engineering/current-students/undergraduate/new-students and select your term of admission.

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Course	Title	Credits
CHEM 120	General Chemistry 2.	4
MATH 133	Linear Algebra and Geometry.	3
MATH 140	Calculus 1.	3
MATH 141	Calculus 2.	4
PHYS 131	Mechanics and Waves.	4
PHYS 142	Electromagnetism and Optics.	4

AND 3 credits selected from the approved list of courses in Humanities and Social Sciences, Management Studies, and Law, listed below under Complementary Studies (Group B)

Note: FACC 100 Introduction to the Engineering Profession. must be taken during the first year of study.

Required Non-Departmental Courses (26 credits)

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Course	Title	Credits
CIVE 281	Analytical Mechanics.	3
COMP 202	Foundations of Programming.	3
COMP 206	Introduction to Software Systems.	3
FACC 100	Introduction to the Engineering Profession. ¹	1
FACC 250	Responsibilities of the Professional Engineer.	0
FACC 300	Engineering Economy.	3
FACC 400	Engineering Professional Practice.	1
MATH 262	Intermediate Calculus.	3
MATH 263	Ordinary Differential Equations for Engineers.	3
MIME 262	Properties of Materials in Electrical Engineering.	3
WCOM 206	Communication in Engineering.	3

¹ Note: FACC 100 Introduction to the Engineering Profession. must be taken during the first year of study.

Required Electrical Engineering Courses (57 credits)

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Course	Title	Credits
ECSE 200	Electric Circuits 1.	3
ECSE 205	Probability and Statistics for Engineers	3
ECSE 206	Introduction to Signals and Systems.	3
ECSE 210	Electric Circuits 2.	3
ECSE 211	Design Principles and Methods.	3
ECSE 222	Digital Logic.	3
ECSE 250	Fundamentals of Software Development.	3
ECSE 251	Electric and Magnetic Fields.	3
ECSE 307	Linear Systems and Control.	4
ECSE 308	Introduction to Communication Systems and Networks.	4
ECSE 324	Computer Organization.	4
ECSE 331	Electronics.	4
ECSE 343	Numerical Methods in Engineering.	3
ECSE 354	Electromagnetic Wave Propagation.	4
ECSE 362	Fundamentals of Power Engineering.	4
ECSE 458D1	Capstone Design Project.	3
ECSE 458D2	Capstone Design Project.	3

Note: ECSE 458N1 Capstone Design Project. and ECSE 458N2 Capstone Design Project. can be taken instead of ECSE 458D1 Capstone Design Project. and ECSE 458D2 Capstone Design Project..

Complementary Courses (23-26 credits)

Technical Complementaries

17-20 credits (5 courses) must be taken, chosen as follows:

8 credits (2 courses) from List A

9-12 credits (3 courses) from List A or List B

List A: Technical Complementaries with Laboratory Experience (8-20 credits)

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Course	Title	Credits
ECSE 335	Microelectronics.	4
ECSE 403	Control.	4
ECSE 408	Communication Systems.	4
ECSE 416	Telecommunication Networks.	4
ECSE 433	Physical Basis of Transistor Devices.	4
ECSE 444	Microprocessors.	4
ECSE 470	Electromechanical and Static Conversion Systems.	4

List B: Technical Complementaries (0-12 credits)

Expand allContract all

Course	Title	Credits
COMP 370	Introduction to Data Science.	3
COMP 549	Brain-Inspired Artificial Intelligence. ¹	3
COMP 551	Applied Machine Learning.	4
COMP 559	Fundamentals of Computer Animation.	4
COMP 562	Theory of Machine Learning.	4
ECSE 310	Thermodynamics of Computing.	3
ECSE 325	Digital Systems.	3
ECSE 405	Antennas.	3
ECSE 412	Discrete Time Signal Processing.	3
ECSE 415	Introduction to Computer Vision.	3
ECSE 420	Parallel Computing.	3
ECSE 421	Embedded Systems.	3
ECSE 422	Fault Tolerant Computing.	3
ECSE 423	Fundamentals of Photonics.	3
ECSE 424	Human-Computer Interaction.	3
ECSE 425	Computer Architecture.	3
ECSE 427	Operating Systems.	3
ECSE 430	Photonic Devices and Systems.	3
ECSE 435	Mixed-Signal Test Techniques.	3
ECSE 446	Realistic Image Synthesis.	3
ECSE 451	EM Transmission and Radiation.	3

ECSE 460	Appareillage électrique (Electrical Power Equipment). ²	3
ECSE 463	Electric Power Generation. ³	3
ECSE 464	Power Systems Analysis. ⁴	3
ECSE 465	Power Electronic Systems. ²	3
ECSE 466	Réseaux de distribution. ²	3
ECSE 467	Comportement des réseaux électriques. ²	3
ECSE 468	Electricité industrielle (Industrial Power Systems). ²	3
ECSE 469	Protection des réseaux électriques. ²	3
ECSE 472	Fundamentals of Circuit Simulation and Modelling.	3
ECSE 500	Mathematical Foundations of Systems.	3
ECSE 501	Linear Systems.	3
ECSE 507	Optimization and Optimal Control.	3
ECSE 508	Multi-Agent Systems.	3
ECSE 509	Probability and Random Signals 2.	3
ECSE 516	Nonlinear and Hybrid Control Systems.	3
ECSE 519	Semiconductor Nanostructures and Nanophotonic Devices.	3
ECSE 521	Digital Communications 1.	3
ECSE 525	Satellite Navigation Systems .	4
ECSE 526	Artificial Intelligence.	3
ECSE 532	Computer Graphics.	4
ECSE 543	Numerical Methods in Electrical Engineering.	3
ECSE 544	Computational Photography.	4
ECSE 551	Machine Learning for Engineers. ¹	4
ECSE 552	Deep Learning.	4
ECSE 554	Applied Robotics .	4
ECSE 556	Machine Learning in Network Biology.	4
ECSE 557	Introduction to Ethics of Intelligent Systems. ³	3
ECSE 562	Low-Carbon Power Generation Engineering. ³	4
ECSE 563	Power Systems Operation and Planning. ⁴	3
ECSE 565	Introduction to Power Electronics. ⁴	3
ECSE 575	Heterogeneous Integration Systems.	3
PHYS 346	Majors Quantum Physics.	3
PHYS 434	Optics.	3

¹ ECSE 551 Machine Learning for Engineers. and COMP 551 Applied Machine Learning. cannot both be taken.

² Courses taught in French.

³ ECSE 463 Electric Power Generation. and ECSE 562 Low-Carbon

Power Generation Engineering. cannot both be taken.

⁴ ECSE 465 Power Electronic Systems. and ECSE 565 Introduction to Power Electronics. cannot both be taken.

Complementary Studies (6 credits)

Group A - Impact of Technology on Society

3 credits from the following:

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Course	Title	Credits
ANTH 212	Anthropology of Development.	3
BTEC 502	Biotechnology Ethics and Society.	3
ECON 225	Economics of the Environment.	3
ECON 347	Economics of Climate Change.	3
ENVR 201	Society, Environment and Sustainability.	3
GEOG 200	Geographical Perspectives: World Environmental Problems.	3
GEOG 203	Environmental Systems.	3
GEOG 205	Global Change: Past, Present and Future.	3
GEOG 302	Environmental Management 1.	3
MGPO 440	Strategies for Sustainability. ¹	3
PHIL 343	Biomedical Ethics.	3
RELG 270	Religious Ethics and the Environment.	3
SOCI 235	Technology and Society.	3
SOCI 312	Sociology of Work and Industry.	3
URBP 201	Planning the 21st Century City.	3

¹ Note: Management courses have limited enrolment and registration dates. See Important Dates at www.mcgill.ca/importantdates.

Group B - Humanities and Social Sciences, Management Studies, and Law

3 credits at the 200 level or higher from the following departments:

Anthropology (ANTH)

Economics (any 200- or 300-level course excluding ECON 227 Economic Statistics. and ECON 337 Introductory Econometrics 1.)

History (HIST)

Philosophy (excluding PHIL 210 Introduction to Deductive Logic 1. and PHIL 310 Intermediate Logic.)

Political Science (POLI)

Psychology (excluding PSYC 204 Introduction to Psychological Statistics. and PSYC 305 Statistics for Experimental Design., but including PSYC 100 Introduction to Psychology.)

Religious Studies (RELG) (excluding courses that principally impart language skills, such as Sanskrit, Tibetan, Tamil, New Testament Greek, and Biblical Hebrew)

School of Social Work (SWRK)

Sociology (excluding SOCI 350 Statistics in Social Research.)

OR 3 credits from the following:

Expand all Contract all

Course	Title	Credits
ARCH 528	History of Housing.	3
BUSA 465	Technological Entrepreneurship. ²	3
CLAS 203	Greek Mythology.	3
ENVR 203	Knowledge, Ethics and Environment.	3
ENVR 400	Environmental Thought.	3
FACC 220	Law for Architects and Engineers.	3
FACC 500	Technology Business Plan Design.	3
FACC 501	Technology Business Plan Project.	3
HISP 225	Hispanic Civilization 1.	3
HISP 226	Hispanic Civilization 2.	3
INDR 294	Introduction to Labour-Management Relations. ²	3
INTG 215	Entrepreneurship Essentials for Non-Management Students. ³	3
MATH 338	History and Philosophy of Mathematics.	3
MGCR 222	Introduction to Organizational Behaviour. ²	3
MGCR 352	Principles of Marketing. ²	3
ORGB 321	Leadership. ²	3
ORGB 423	Human Resources Management. ²	3

¹ If you are uncertain whether or not a course principally imparts language skills, please see an adviser in the McGill Engineering Student Centre (Frank Dawson Adams Building, Room 22) or email an adviser.

² Note: Management courses have limited enrolment and registration dates. See Important Dates at <http://www.mcgill.ca/importantdates>.

³ INTG 215 Entrepreneurship Essentials for Non-Management Students. is not open to students who have taken INTG 201 Integrated Management Essentials 1. and INTG 202 Integrated Management Essentials 2..

Note regarding language courses: Language courses are not accepted to satisfy the Complementary Studies Group B requirement, effective for students who entered the program as of Fall 2017.

Elective Course

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.

Enhanced Power Concentration

Students following this program must complete 16-17 credits of technical complementary courses.

The Institute for Electrical Power Engineering was recently established as a province-wide centre for electrical power engineering education. It is funded by industry, mostly Hydro-Québec, and provides a comprehensive program, state-of-the-art laboratory facilities, and a point of contact between industry and universities involved in power engineering.

Note: This program is open to students in the regular Electrical Engineering program only.

Here are some benefits of the concentration:

- A complete and up-to-date final-year program in electrical power engineering, with industry-sponsored and supported courses
- Access to industry-sponsored projects, internships, and new employment opportunities

Eligibility Criteria

Admission to the program is granted only in the Fall semester of every academic year. To be considered, the applicant must:

- be registered in the B.Eng. program (regular Electrical Engineering);
- have a cumulative GPA of at least 2.5;
- have completed or be registered in ECSE 362 Fundamentals of Power Engineering.;
- be able to complete the degree requirements within three semesters after initial registration in the concentration (excluding summer semesters);
- agree to follow the curriculum requirements set out below.

Selection Criteria

The number of students selected, expected to be between five and ten, will be subject to a specific agreement between the University and the Institute. Selection criteria for admission to the Institute will be based on the CGPA and on the curriculum vitae. The selection process for the scholarship may involve an interview with the committee presided by Hydro-Québec and the industrial partners. There is a possibility of an internship with Hydro-Québec.

Curriculum Requirements for Selected Students

Generally, unless the University has authorized specific substitutions, students must complete the degree requirements set out in this Course Catalogue with the following specifications:

Technical Complementaries and Laboratories (16 credits)

All students must take (or have taken) five courses from the following:

Required Courses (10 credits)

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Course	Title	Credits
ECSE 464	Power Systems Analysis.	3
ECSE 465	Power Electronic Systems.	3
ECSE 470	Electromechanical and Static Conversion Systems.	4

Students must also complete ECSE 458D1 Capstone Design Project. (Capstone Design Project) and ECSE 458D2 Capstone Design Project.E on a practical project in power engineering, preferably at the Institute or with a company sponsoring the Institute.

Complementary Courses

6-7 credits from the following:

Expand allContract all

Course	Title	Credits
ECSE 403	Control.	4
ECSE 460	Appareillage électrique (Electrical Power Equipment).	3
ECSE 463	Electric Power Generation. ¹	3
ECSE 466	Réseaux de distribution. ¹	3
ECSE 467	Comportement des réseaux électriques. ¹	3
ECSE 468	Electricité industrielle (Industrial Power Systems). ¹	3
ECSE 469	Protection des réseaux électriques. ¹	3

¹ Courses taught in French.

Note: ECSE 460 Appareillage électrique (Electrical Power Equipment)., ECSE 463 Electric Power Generation., ECSE 464 Power Systems Analysis., ECSE 465 Power Electronic Systems., ECSE 467 Comportement des réseaux électriques., ECSE 468 Electricité industrielle (Industrial Power Systems)., and ECSE 469 Protection des réseaux électriques. are courses sponsored by the Institute and taught at Polytechnique Montréal.