

BIOENGINEERING (B.ENG.) (142 CREDITS)

Offered by: Bioengineering (Faculty of Engineering)

Degree: Bachelor of Engineering

Program credit weight: 142

Program Description

Program credit weight: 142-152 credits

Program credit weight for Quebec CEGEP students: 122-123 credits

Program credit weight for out-of-province students: 142-143 credits

The B.Eng.; Major in Bioengineering will

1. provide students with the ability to apply systematic knowledge of biology, physical sciences and mathematics; and sound engineering foundations in order to solve problems of a biological nature; and
2. prepare students for the broad area of bioengineering, incorporating both biology-focused biological engineering and medicine-focused biomedical engineering.

Students will acquire fundamental knowledge in bioengineering-related natural sciences and mathematics, as well as in the foundations of general engineering and bioengineering. Students will also acquire knowledge in one area of specialization of bioengineering:

1. biological materials and biomechanics;
2. biomolecular and cellular engineering; or
3. biological information and computation

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 (29 credits)

Generally, students admitted to Engineering from Quebec CEGEPs are granted transfer credits for Year 0 (Freshman) courses, except BIOL 112 Cell and Molecular Biology., and enter a 122-123-credit program. Students from Quebec CEGEPs who have successfully completed a course at CEGEP that is equivalent to BIOL 112 Cell and Molecular Biology. may obtain transfer credits for this course by passing the McGill Science Placement Exam for BIOL 112. 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/student/sao/newstudents and select your term of admission.

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Course	Title	Credits
BIOL 112	Cell and Molecular Biology.	3
CHEM 110	General Chemistry 1.	4
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

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

Required Non-Departmental Courses (30 credits)

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Course	Title	Credits
CHEM 212	Introductory Organic Chemistry 1. ¹	4
COMP 208	Computer Programming for Physical Sciences and Engineering. ²	3
FACC 100	Introduction to the Engineering Profession. ²	1
FACC 250	Responsibilities of the Professional Engineer.	0
FACC 300	Engineering Economy.	3
FACC 400	Engineering Professional Practice.	1
MATH 203	Principles of Statistics 1.	3
MATH 262	Intermediate Calculus.	3
MATH 263	Ordinary Differential Equations for Engineers.	3
MATH 264	Advanced Calculus for Engineers.	3
PHYS 319	Introduction to Biophysics.	3
WCOM 206	Communication in Engineering.	3

¹ Students from a CEGEP background who have completed a CEGEP course equivalent to CHEM 212 Introductory Organic Chemistry 1. may obtain transfer credits for this course by passing the McGill Placement Exam before the start of their first term. For information on Science Placement Exams, see www.mcgill.ca/exams/dates/science. CEGEP students who do not successfully complete the CHEM 212 Introductory Organic Chemistry 1. Placement Exam must take CHEM 212 Introductory Organic Chemistry 1. at McGill, as outlined in the program requirements.

² Note FACC 100 Introduction to the Engineering Profession. FACC 100 Introduction to the Engineering Profession. must be taken during the first year of study.

Required Bioengineering Courses (50 credits)

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Course	Title	Credits
BIEN 200	Introduction to Bioengineering.	2
BIEN 210	Electrical and Optical Properties of Biological Systems.	3
BIEN 219	Introduction to Physical Molecular and Cell Biology.	4
BIEN 220	Introduction to Mechanics for Bioengineers.	2
BIEN 267	Bioanalytical Methods in Bioengineering.	3

BIEN 290	Bioengineering Measurement Laboratory.	3
BIEN 300	Thermodynamics in Bioengineering.	3
BIEN 314	Transport Phenomena in Biological Systems 1.	3
BIEN 340	Transport Phenomena in Biological Systems 2.	3
BIEN 350	Biosignals, Systems and Control.	4
BIEN 360	Physical Chemistry in Bioengineering.	3
BIEN 390	Bioengineering Laboratory.	3
BIEN 420	Biodevices Design for Diagnostics and Screening.	3
BIEN 470D1	Bioengineering Design Project.	3
BIEN 470D2	Bioengineering Design Project.	3
BIEN 471	Bioengineering Research Project.	2
BIEN 560	Design of Biosensors.	3

Complementary Courses (33-34 credits)

Bioengineering Complementary Courses (24-25 credits)

Starting in the third year (second year for CEGEP students) (Year 2), students will need to take 30-31 credits of courses to upgrade their general knowledge of Bioengineering. Students must register for the required Technical Complementary courses in one of the three streams of bioengineering knowledge and practice:

1. Biological Materials and Mechanics (25 credits);
2. Biomolecular and Cellular Engineering (24 credits); or
3. Biological Information and Computation (24 credits).

Stream 1: Biological Materials and Mechanics (25 credits)

13 credits from List A

12 credits from List B

List A

Expand allContract all

Course	Title	Credits
BIEN 320	Molecular, Cellular and Tissue Biomechanics.	3
BIEN 361	Materials for Bio-Applications.	3
BIEN 570	Active Mechanics in Biology.	3
CIVE 207	Solid Mechanics.	4

List B

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Course	Title	Credits
BIEN 330	Tissue Engineering and Regenerative Medicine.	3
BIEN 414		3
BIEN 450	Biological Structures and Assemblies.	3
BIEN 462	Engineering Principles in Physiological Systems.	3
BIEN 500	Special Topics in Bioengineering 1.	3
BIEN 505	Medical Technology Innovation and Development .	3

BIEN 510	Engineered Nanomaterials for Biomedical Applications.	3
BIEN 515	Special Topics in Bioengineering 2.	3
BIEN 525	Special Topics in Bioengineering 3.	3
BIEN 530	Imaging and Bioanalytical Instrumentation.	3
BIEN 535	Electron Microscopy and 3D Imaging for Biological Materials.	3
BIEN 545	Diagnostic Devices at the Point-of-Care.	3
BIEN 550	Biomolecular Devices.	3
BIEN 580	Synthetic Biology.	3
BIEN 585	Metabolic Engineering.	3
BMDE 503	Biomedical Instrumentation.	3
BMDE 504	Biomaterials and Bioperformance.	3
BMDE 505	Cell and Tissue Engineering.	3
BMDE 512	Finite-Element Modelling in Biomedical Engineering.	3
CHEE 563	Biofluids and Cardiovascular Mechanics. ¹	3
CIVE 281	Analytical Mechanics.	3
MECH 321	Mechanics of Deformable Solids.	3
MECH 547	Mechanics of Biological Materials.	3
MECH 561	Biomechanics of Musculoskeletal Systems.	3
MECH 563	Biofluids and Cardiovascular Mechanics. ¹	3
MECH 572	Mechanics and Control of Robotic Manipulators.	3
MIME 470	Engineering Biomaterials.	3
MIME 473	Introduction to Computational Materials Design.	3
SEAD 515	Climate Change Adaptation and Engineering Infrastructure .	3
SEAD 520	Life Cycle-Based Environmental Footprinting .	3
SEAD 540	Industrial Ecology and Systems.	3
SEAD 550	Decision-Making for Sustainability in Engineering and Design.	3

¹ Note: Students may choose only one of CHEE 563 Biofluids and Cardiovascular Mechanics. and MECH 563 Biofluids and Cardiovascular Mechanics.

NOTE: Maximum 6 credits of SEAD courses are allowed.

Stream 2: Biomolecular and Cellular Engineering (24-25 credits)

12 credits from List A

12-13 credits from List B

List A

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Course	Title	Credits
BIEN 310	Introduction to Biomolecular Engineering.	3
BIEN 320	Molecular, Cellular and Tissue Biomechanics.	3
BIEN 550	Biomolecular Devices.	3
BIEN 590	Cell Culture Engineering.	3

List B

Expand allContract all

Course	Title	Credits
BIEN 330	Tissue Engineering and Regenerative Medicine.	3
BIEN 410	Computational Methods in Biomolecular Engineering.	3
BIEN 414		3
BIEN 450	Biological Structures and Assemblies.	3
BIEN 462	Engineering Principles in Physiological Systems.	3
BIEN 500	Special Topics in Bioengineering 1.	3
BIEN 505	Medical Technology Innovation and Development .	3
BIEN 510	Engineered Nanomaterials for Biomedical Applications.	3
BIEN 515	Special Topics in Bioengineering 2.	3
BIEN 525	Special Topics in Bioengineering 3.	3
BIEN 530	Imaging and Bioanalytical Instrumentation.	3
BIEN 535	Electron Microscopy and 3D Imaging for Biological Materials.	3
BIEN 540	Information Storage and Processing in Biological Systems.	3
BIEN 545	Diagnostic Devices at the Point-of-Care.	3
BIEN 570	Active Mechanics in Biology.	3
BIEN 580	Synthetic Biology.	3
BIEN 585	Metabolic Engineering.	3
BIEN 595	Advanced Biomolecular Systems Modelling.	3
BMDE 503	Biomedical Instrumentation.	3
BMDE 508	Introduction to Micro and Nano-Bioengineering.	3
CIVE 281	Analytical Mechanics.	3
CIVE 557	Microbiology for Environmental Engineering.	3
PHYS 534	Nanoscience and Nanotechnology.	3
SEAD 510	Energy Analysis.	4
SEAD 515	Climate Change Adaptation and Engineering Infrastructure .	3
SEAD 520	Life Cycle-Based Environmental Footprinting .	3
SEAD 540	Industrial Ecology and Systems.	3
SEAD 550	Decision-Making for Sustainability in Engineering and Design.	3

NOTE: Maximum 6 credits of SEAD courses are allowed.

Stream 3: Biological Information and Computation (24-25 credits)

12 credits from List A

12-13 credits from List B

List A

Expand allContract all

Course	Title	Credits
BIEN 310	Introduction to Biomolecular Engineering.	3
BIEN 410	Computational Methods in Biomolecular Engineering.	3
BIEN 530	Imaging and Bioanalytical Instrumentation.	3
BIEN 540	Information Storage and Processing in Biological Systems.	3

List B

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Course	Title	Credits
BIEN 414		3
BIEN 450	Biological Structures and Assemblies.	3
BIEN 462	Engineering Principles in Physiological Systems.	3
BIEN 500	Special Topics in Bioengineering 1.	3
BIEN 505	Medical Technology Innovation and Development .	3
BIEN 515	Special Topics in Bioengineering 2.	3
BIEN 525	Special Topics in Bioengineering 3.	3
BIEN 535	Electron Microscopy and 3D Imaging for Biological Materials.	3
BIEN 545	Diagnostic Devices at the Point-of-Care.	3
BIEN 580	Synthetic Biology.	3
BIEN 585	Metabolic Engineering.	3
BIEN 595	Advanced Biomolecular Systems Modelling.	3
BMDE 502	BME Modelling and Identification.	3
BMDE 503	Biomedical Instrumentation.	3
BMDE 512	Finite-Element Modelling in Biomedical Engineering.	3
BMDE 519	Biomedical Signals and Systems.	3
CIVE 281	Analytical Mechanics.	3
COMP 250	Introduction to Computer Science.	3
COMP 251	Algorithms and Data Structures.	3
COMP 462	Computational Biology Methods.	3
COMP 551	Applied Machine Learning.	4
ECSE 415	Introduction to Computer Vision.	3
MECH 513	Control Systems.	3
MECH 572	Mechanics and Control of Robotic Manipulators.	3
SEAD 510	Energy Analysis.	4
SEAD 515	Climate Change Adaptation and Engineering Infrastructure .	3
SEAD 520	Life Cycle-Based Environmental Footprinting .	3
SEAD 540	Industrial Ecology and Systems.	3
SEAD 550	Decision-Making for Sustainability in Engineering and Design.	3

NOTE: Students in Stream 3 may only take one of the two 4 credit list B TCs (either COMP 551 Applied Machine Learning. or SEAD 510 Energy Analysis. or another 3 credit list B TC)

NOTE: Maximum 6 credits of SEAD courses are allowed.

Complementary Studies (9 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
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.	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 Science, Management Studies and Law

Generally, students admitted to Engineering from Quebec CEGEP's are granted transfer credits for 3 credits (one course) from the Complementary Studies Group B list.

6 credits of courses 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 from the following courses:

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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
MATH 338	History and Philosophy of Mathematics.	3
MGCR 222	Introduction to Organizational Behaviour. ³	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: 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 Courses (0-9 credits)

Students from Quebec CEGEPs must take 9 credits of elective courses. These can be chosen from any course at the 200-level or higher offered by the University, subject to permission of the offering department.