

# Bioengineering Curriculum - Stream 1 (Biological Materials & Mechanics)

2023 cohort

CEGEP Entry

<b>1st Semester (Fall)</b>		15 credits	Prerequisites/Co-requisites
BIEN 200	<a href="#">Introduction to Bioengineering</a>	2	P - Permission of Instructor
CHEM 212	<a href="#">Introductory Organic Chemistry 1</a>	4	P - CHEM 110 / C - CHEM 120
MATH 262	<a href="#">Intermediate Calculus</a>	3	P - MATH 141, MATH 133
MATH 263	<a href="#">Ordinary Differential Equations for Engineers</a>	3	C - MATH 262
BIEN 210	<a href="#">Electrical and Optical Properties of Biological Systems</a>	3	C - BIEN 200 or Permission of Instructor
<b>2nd Semester (Winter)</b>		15 credits	Prerequisites/Co-requisites
BIEN 220	Introduction to Mechanics for Bioengineers (*Course TBA on minerva)	2	P - BIEN 200, BIEN 210 or Permission of Instructor
BIEN 300	<a href="#">Thermodynamics in Bioengineering</a>	3	P - CHEM 120, MATH 262
BIEN 361	Materials for Bio-Applications (*Course TBA on minerva)	3	P - BIEN 200, BIEN 210
BIOL 112	<a href="#">Cell and Molecular Biology</a>	3	-
FACC 100	<a href="#">Introduction to the Engineering Profession</a>	1	-
MATH 203	<a href="#">Principles of Statistics 1</a>	3	-
<b>3rd Semester (Fall)</b>		17 credits	Prerequisites/Co-requisites
BIEN 219	<a href="#">Introduction to Physical Biology of the Cell</a>	4	P - BIOL 112 / C - CHEM212
BIEN 290	<a href="#">Bioengineering Measurement Laboratory</a>	3	P - BIEN 200, MATH 203, PHYS 142
BIEN 350	<a href="#">Biosignals, Systems and Control</a>	4	P - MATH 263 or Permission of Instructor
CS	Complementary Studies - Group B (HSSML)	3	-
COMP 208	<a href="#">Computers in Engineering</a>	3	P - MATH 140, MATH 141
<b>4th Semester (Winter)</b>		15 credits	Prerequisites/Co-requisites
BIEN 320	<a href="#">Molecular, Cellular, and Tissue Biomechanics (TC STREAM 1 List A)</a>	3	P - BIOL 112, BIEN 220
BIEN 360	<a href="#">Physical Chemistry in Bioengineering</a>	3	P - BIEN 300
BIEN 390	<a href="#">Bioengineering Laboratory</a>	3	P - BIEN 290
FACC 250	<a href="#">Responsibilities of the Professional Engineer</a>	0	P - FACC 100 or BREE 250
FACC 300	<a href="#">Engineering Economy</a>	3	-
MATH 264	<a href="#">Advanced Calculus for Engineers</a>	3	P - MATH 262 or MATH 151 or MATH 152 / C - MATH 263
<b>5th Semester (Fall)</b>		16 credits	Prerequisites/Co-requisites
BIEN 314	<a href="#">Transport Phenomena in Biological Systems 1</a>	3	P - BIEN 200, MATH 263, BIEN 300 or permission of instructor
WCOM 206	<a href="#">Communication in Engineering</a>	3	-
CIVE 207	<a href="#">Solid Mechanics (TC STREAM 1 List A)</a>	4	P - CIVE 205 or BIEN 220
BIEN 267	<a href="#">Bioanalytical Methods in Bioengineering</a>	3	P - BIEN 290
TC Stream 1 List B	Stream 1 Technical Complementary from List B	3	-
<b>6th Semester (Winter)</b>		15 credits	Prerequisites/Co-requisites
BIEN 340	<a href="#">Transport Phenomena in Biological Systems 2</a>	3	P - BIEN 314, BIEN 360 or permission of instructor
BIEN 420	<a href="#">Design of Diagnostic Biodevices</a>	3	P - BIEN 390
EC	Elective - 1	3	-
PHYS 319	<a href="#">Introduction to Biophysics</a>	3	P - BIOL 200; MATH 222/MATH 262; PHYS 230 and (PHYS 232 or PHYS 253), or Permission of Instructor.
TC Stream 1 List B	Stream 1 Technical Complementary from List B	3	-
<b>7th Semester (Fall)</b>		15 credits	Prerequisites/Co-requisites
BIEN 470 D1	<a href="#">Bioengineering Design Project</a>	3	P - Permission of Instructor, U4
BIEN 560	<a href="#">Design of Biosensors</a>	3	P - Permission of Instructor
BIEN 570	<a href="#">Active Mechanics in Biology (TC STREAM 1 List A)</a>	3	P - Permission of Instructor
EC	Elective - 2	3	-
TC Stream 1 List B	Stream 1 Technical Complementary from List B	3	-
<b>8th Semester (Winter)</b>		15 credits	Prerequisites/Co-requisites
BIEN 470 D2	<a href="#">Bioengineering Design Project</a>	3	P - Permission of Instructor, U4
BIEN 471	<a href="#">Bioengineering Research Project</a>	2	P - Permission of Instructor
CS	Complementary Studies - Group A (Impact)	3	-
EC	Elective - 3	3	-
FACC 400	<a href="#">Engineering Professional Practice</a>	1	P - FACC 100, FACC 250, and 60 program credits
TC Stream 1 List B	Stream 1 Technical Complementary from List B	3	-
<b>TOTAL:</b>		<b>123</b>	

\*The Complementary Studies (CS) courses are Impact of Technology courses (Group A) and Humanities & Social Sciences, Management Studies and Law courses (Group B). Students must take one course (3 credits) from Group A and two courses (6 credits) from Group B. The curriculum above includes suggested terms during which these courses can be taken. These must be chosen from an approved list of courses/departments, found in the program list under "Complementary Studies" in the Faculty of Engineering Undergraduate section of the Programs, Courses and University Regulations publication ([www.mcgill.ca/study](http://www.mcgill.ca/study)) (see your program listing in the "Browse Academic Units & Programs" section).

Elective courses (EC) can be chosen from any course at the 200-level or higher offered by the University, subject to permission of the offering department. Students are responsible for satisfying pre-/co-requisites and verifying with their department that they are meeting the requirements of their program.

## Engineering Science and Design Technical Complementaries

Starting in the third year (second year for CEGEP students) (Year 2/U2), students will need to take 24-25 credits of Technical Complementary 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 (24-25 credits).

### The courses listed below may be taken as List B Technical Complementaries in STREAM 1

Select 4 List B TCs (12 credits)			
Course number	Course name	Credits	Prerequisites/Co-requisites
BIEN 330	Tissue Engineering and Regenerative Medicine	3	P - BIEN 200, BIOL 112, BIOL 200, and CHEM 212, or instructor permission
BIEN 414	Fundamentals and Rheology of Biological Fluids	3	P - MATH 262 and BIEN 314, or permission of the instructor
BIEN 462	Engineering Principles in Physiological Systems	3	P - BIEN 350 or permission of instructor
BIEN 450	Biological Structures and Assemblies	3	P - BIEN 219 or permission of instructor
BIEN 500	Special Topics in Bioengineering	3	P - Permission of Instructor, Not open to students who took MECH 500 (W2020)
BIEN 510	Engineered Nanomaterials for Biomedical Applications	3	P - BIEN 200, CHEM 212, and BIOL 112, or instructor permission
BIEN 530	Imaging and Bioanalytical Instrumentation	3	P - Permission of instructor
BIEN 535	Electron microscopy and 3D imaging for biological materials	3	P - Permission of instructor
BIEN 545	Medical diagnostics at the point of care	3	P - Permission of instructor
BIEN 550	Biomolecular Devices	3	P - Permission of instructor
BIEN 580	Synthetic Biology	3	P - Permission of instructor
BIEN 585	Metabolic Engineering	3	P - Permission of instructor
BMDE 503	Biomedical Instrumentation	3	P - Experience with differential equations, in particular Laplace Transforms and complex numbers (e.g. MATH 263 or MATH 381 or equivalent) or permission of instructor
BMDE 504	Biomaterials and Bioperformance	3	P - U4 students only
BMDE 505	Cell and Tissue Engineering	3	P - U4 students only
BMDE 512	Finite Element Modelling	3	P - Differential equations (MATH 271 or equivalent) or permission of instructor
CHEE 563 or MECH 563	Biofluids and Cardiovascular Mechanics	3	P - CHEE 314 or MECH 331 or instructor permission
MECH 321	Mechanics of Deformable Solids.	3	P - CIVE 207
MECH 547	Mechanics of Biological Materials	3	P - MECH 210 and MIME 260 / 261, or instructor permission
MECH 561	Biomechanics of Musculoskeletal Systems	3	P - MECH 321 and permission of instructor
MECH 572	Mechanics and Control of Robotic Manipulators	3	P - BIEN 350 and permission of instructor
MIME 470	Engineering Biomaterials	3	P - MIME 261 or permission of instructor
MIME 473	Introduction to Computational Materials Design	3	P - MIME 209 and MIME 261, or permission of instructor.
SEAD 515	Climate Change Adaptation and Engineering Infrastructure	3	P - Permission of instructor
SEAD 520	Life Cycle-Based Environmental Footprinting	3	P - Permission of instructor
SEAD 530	Economics for Sustainability in Engineering and Design	3	P - Permission of instructor
SEAD 540	Industrial Ecology and Systems	3	P - Permission of instructor
SEAD 550	Decision-Making for Sustainability in Engineering and Design	3	P - Permission of instructor

**NOTE: Maximum 6 credits of SEAD courses are allowed.**