

# Bioengineering Curriculum - Fall 2019

## Stream 2 - Biomolecular and Cellular Engineering

CEGEP Entry

<b>1st Term (Fall)</b>		<b>14 credits</b>	<b>Prerequisites/Co-requisites</b>
BIEN 200	Introduction to Bioengineering	2	
CHEM 212	Introductory Organic Chemistry 1	4	P - CHEM 110 / C - CHEM 120
MATH 262	Intermediate Calculus	3	P - MATH 133, MATH 141
MATH 263	Ordinary Differential Equations for Engineers	3	C - MATH 262
MECH 210	Mechanics 1	2	P - PHYS 101 or PHYS 131 or equivalent
<b>2nd Term (Winter)</b>		<b>16 credits</b>	<b>Prerequisites/Co-requisites</b>
BIEN 210	Electrical and Optical Properties of Biological Systems	3	P - BIEN 200 / C - BIOL 112
BIEN 300	Thermodynamics in Bioengineering	3	P - CHEM 120, MATH 262
BIOL 112	Cell and Molecular Biology	3	-
COMP 208	Computers in Engineering	3	P - MATH 141 / C - MATH 133
FACC 100	Introduction to the Engineering Profession	1	-
MATH 203	Principles of Statistics 1	3	-
<b>3rd Term (Fall)</b>		<b>17 credits</b>	<b>Prerequisites/Co-requisites</b>
BIEN 219	Introduction to Physical Biology of the Cell	4	P - BIOL 112 / C - CHEM 212
BIEN 290	Bioengineering Measurement Laboratory	3	P - BIEN 200
BIEN 310	Introduction to Biomolecular Engineering (TC Stream 2)	3	P - BIEN 200 or permission of instructor
BIEN 350	Biosignals, Systems and Control	4	P - MATH 263 or permission of instructor
MATH 264	Advanced Calculus for Engineers	3	P - MATH 262 or MATH 151 or MATH 152 / C - MATH 263
<b>4th Term (Winter)</b>		<b>15 credits</b>	<b>Prerequisites/Co-requisites</b>
BIEN 320	Molecular, Cellular and Tissue Biomechanics (TC Stream 2)	3	P - BIOL 112, MECH 210
BIEN 360	Physical Chemistry in Bioengineering	3	P - BIEN 300
CS	Complimentary Studies - Group B (HSSML)	3	
CCOM 206	Communication in Engineering	3	-
FACC 250	Responsibilities of the Professional Engineer	0	P - FACC 100 or BREE 250
FACC 300	Engineering Economy	3	-
<b>5th Term (Fall)</b>		<b>18 credits</b>	<b>Prerequisites/Co-requisites</b>
BIEN 314	Transport Processes in Biological Systems 1	3	P - BIEN 200, MATH 263, BIEN 300 or permission of instructor
BIEN 390	Bioengineering Laboratory	3	P - BIEN 290
BIEN 410	Computational Methods in Biomolecular Engineering (TC Stream 2)	3	P - BIEN 310 and COMP 208, or permission of instructor
CIVE 281	Analytical Mechanics	3	C - MATH 262, MATH 263
EC	Elective - 1	3	-
CS	Complementary Studies Group A (Impact)	3	-
<b>6th Term (Winter)</b>		<b>15 credits</b>	<b>Prerequisites/Co-requisites</b>
BIEN 330	Tissue Engineering and Regenerative Medicine (TC Stream 2)	3	P - BIEN 200, BIOL 112, BIOL 200, and CHEM 212, or instructor permission
BIEN 340	Transport Phenomena in Biological Systems 2	3	P - BIEN 314, BIEN 360 or permission of instructor
BIEN 590	Cell Culture Engineering (TC Stream 2)	3	P - Permission of instructor
PHYS 319	Introduction to Biophysics	3	P - BIOL 200, MATH 222 / MATH 262, PHYS 230 and (PHYS 232 or PHYS 253), or permission of instructor
EC	Elective - 2	3	-
<b>7th Term (Fall)</b>		<b>15 credits</b>	<b>Prerequisites/Co-requisites</b>
BIEN 470D1	Bioengineering Design Project	3	P - BIEN 390
BIEN 510	Engineered Nanomaterials for Biomedical Applications (TC Stream 2)	3	P - BIEN 200, CHEM 212, and BIOL 112, or permission of instructor
BIEN 550	Biomolecular Devices (TC Stream 2)	3	P - Permission of instructor
BIEN 570	Active Mechanics in Biology (TC Stream 2)	3	P - Permission of instructor
BIEN 520	High Throughput Bioanalytical Devices (TC Stream 2)	3	P - Permission of instructor
<b>8th Term (Winter)</b>		<b>12 credits</b>	<b>Prerequisites/Co-requisites</b>
BIEN 470D2	Bioengineering Design Project	3	P - BIEN 390
BIEN 471	Bioengineering Research Project	2	P - Permission of instructor
BIEN 540	Information Storage and Processing in Biological Systems (TC STREAM 2)	3	Restricted to U3 Students, or permission of instructor
FACC 400	Engineering Professional Practice	1	P - FACC 100, FACC 250, and 60 program credits
EC	Elective - 3	3	-

\*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 one course (3 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).

\*\*FACC 250 is not yet indicated as a prerequisite in the eCalendar course information ([www.mcgill.ca/study](http://www.mcgill.ca/study)) but it will be before FACC 400 is taken.

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), students will need to take 36 credits of courses to upgrade their general knowledge of Bioengineering. While it is not mandatory, it is highly recommended that the students choose all courses in one of the three streams of bioengineering knowledge and practice: 1) Biological Materials and Mechanics (37 credits); 2) Biomolecular and Cellular Engineering (36 credits) [as indicated above]; or 3) Biomedical, Diagnostics and High Throughput Screening Engineering (36 credits). However, students may satisfy the Bioengineering Complementary Courses requirement by taking a minimum of 30 credits from the Engineering Science and Design Complementaries course list and 6 credits of any other courses in the Stream course lists.

## 30-37 credits from the following:

		Credits	Prerequisites/Co-requisites
BIEN 310	Introduction to Biomolecular Bioengineering	3	P - BIEN 200 or permission of instructor
BIEN 320	Molecular, Cellular, and Tissue Biomechanics	3	P - BIOL 112, MECH 210
BIEN 330	Tissue Engineering and Regenerative Medicine	3	P - BIEN 200, BIOL 112, BIOL 200, and CHEM 212, or instructor permission
BIEN 350	Biosystems and Control	3	P - MATH 263 or instructor permission
BIEN 410	Computational Methods in Biomolecular Engineering	3	P - BIEN 310 and COMP 208, or instructor permission
BIEN 510	Engineered Nanomaterials for Biomedical Applications	3	P - BIEN 200, CHEM 212, and BIOL 112, or instructor permission
BIEN 520	High Throughput Bioanalytical Devices	3	P - Permission of instructor
BIEN 530	Imaging and Bioanalytical Instrumentation	3	P - Permission of instructor
BIEN 550	Biomolecular Devices	3	P - Permission of instructor
BIEN 550	Biosensors	3	P - Permission of instructor
BIEN 570	Active Mechanics in Biology	3	P - Permission of instructor
BIEN 590	Cell Culture Engineering	3	P - Permission of instructor
CHEE 314	Fluid Mechanics	3	P - CHEE 204 or BIEN 200 / C - MATH 264
CHEE 370	Elements of Biotechnology	3	-
CHEE 563	Biofluids and Cardiovascular Mechanics	3	P - CHEE 314 or MECH 331 or instructor permission
or MECH 563	Biofluids and Cardiovascular Mechanics	3	
CIVE 207	Solid Mechanics	4	P - CIVE 205 or MECH 210
ECSE 415	Introduction to Computer Vision	3	P - ECSE 304 or ECSE 306 or ECSE 206
MECH 547	Mechanics of Biological Materials	3	P - MECH 210 and MIME 260 / 261, or instructor permission

## Last update: April 30, 2019

For the official program listing, see the *Programs, Courses and University Regulations* publication ([www.mcgill.ca/study](http://www.mcgill.ca/study)).