Bioengineering Curriculum - Fall 2018
Stream 3 - Biomedical, Diagnostics and High Throughput Screening Engineering
Non-CEGEP Entry

1st Term (Fall)  15 credits  Prerequisites/Co-requisites
CHEM 110  General Chemistry 1  4  P - College level mathematics and physics or permission of instructor
FACC 100  Introduction to the Engineering Profession  1  -
MATH 133  Linear Algebra and Geometry  3  P - A course in functions
MATH 140  Calculus 1  3  P - High school calculus
PHYS 131  Mechanics and Waves  4  C - Calculus course [MATH 140]

2nd Term (Winter)  15 credits  Prerequisites/Co-requisites
BIOL 112  Cell and Molecular Biology  3  -
CHEM 120  General Chemistry 2  4  P - College level mathematics and physics or permission of instructor
MATH 141  Calculus 2  4  P - MATH 140
PHYS 142  Electromagnetism and Optics  4  P - PHYS 131 / C - MATH 141

3rd Term (Fall)  17 credits  Prerequisites/Co-requisites
BIEN 200  Introduction to Bioengineering  2  -
BIOL 200  Molecular Biology  3  P - BIOL 112 / C - CHEM 212
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

4th Term (Winter)  12 credits  Prerequisites/Co-requisites
BIEN 210  Electrical and Optical Properties of Biological Systems  3  P - BIEN 200 / C - BIOL 112
BIOC 212  Molecular Mechanisms of Cell Function  3  P - BIOL 200
BREE 301  Biothermodynamics  3  -
COMP 208  Computers in Engineering  3  P - differential and integral calculus [MATH 140 and MATH 141] / C - linear algebra [MATH 133]
FACC 250  Responsibilities of the Professional Engineer  0  P - FACC 100 or BREE 250

5th Term (Fall)  14 credits  Prerequisites/Co-requisites
BIEN 290  Bioengineering Measurement Laboratory  4  P - BIEN 200, PHYS 142
BIEN 310  Introduction to Biomolecular Engineering (TC Stream 3)  3  P - BIEN 200 or permission of instructor
BIEN 350  Biosignals, Systems and Control  4  P - MATH 263 or instructor permission
CHEM 267  Introductory Chemical Analysis (TC Stream 3)  3  P - MATH 133, MATH 140, or equivalent

6th Term (Winter)  12 credits  Prerequisites/Co-requisites
CCEM 206  Communication in Engineering  3  -
CHEE 310  Physical Chemistry for Engineers  3  P - CHEE 220 or MIME 212 or BREE 301
MATH 264  Advanced Calculus for Engineers  3  P - MATH 262 / C - MATH 263

7th Term (Fall)  15 credits  Prerequisites/Co-requisites
BIEN 390  Bioengineering Laboratory  3  P - BIEN 290
CIVE 281  Analytical Mechanics  3  C - MATH 262, MATH 263
BIEN 410  Computational Methods in Biomolecular Engineering (TC Stream 3)  3  P - BIEN 310 and COMP 208, or instructor permission
CHEE 314  Fluid Mechanics (TC Stream 3)  3  P - CHEE 204 or BIEN 200 / C - MATH 264
CHEE 367  Instrumental Analysis 1 (TC Stream 3)  3  P - CHEM 287, CHEM 297

8th Term (Winter)  15 credits  Prerequisites/Co-requisites
BIEN 340  Transport Processes in Biological Systems  3  P - BIEN 200, MATH 263
FACC 300  Engineering Economy  3  -
PHYS 319  Introduction to Biophysics  3  P - BIOL 200, MATH 222 / 262, PHYS 230, and PHYS 232 / 253, or instructor permission
BIEN 482  Engineering Principles in Physiological Systems (TC Stream 3)  3  P - BIEN 350 or instructor permission
BIEN 530  Imaging and Bioanalytical Instrumentation  3  P - Permission of instructor

9th Term (Fall)  12 credits  Prerequisites/Co-requisites
BIEN 470D1  Bioengineering Design Project  3  P - BIEN 390
ECSE 529  Computer and Biological Vision (TC Stream 3)  3  P - ECSE 304 or ECSE 306
PHYS 534  Nanoscience and Nanotechnology (TC Stream 3)  3  P - Instructor permission

10th Term (Winter)  12 credits  Prerequisites/Co-requisites
BIEN 470D2  Bioengineering Design Project  3  P - BIEN 390
BIEN 471  Bioengineering Research Project  2  P - Instructor permission
FACC 400  Engineering Professional Practice  1  P - FACC 100, FACC 250**, and 60 program credits
BIEN 520  High Throughput Bioanalytical Devices (TC Stream 3)  3  P - Permission of instructor
BIEN 560  Biosensors (TC Stream 3)  3  P - Permission of instructor

*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) (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) 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.
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); or 3) Biomedical, Diagnostics and High Throughput Screening Engineering (36 credits) [as indicated above]. 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.

**Engineering Science and Design Technical Complementaries**

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

Last update: May 17, 2018

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisites/Co-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIEN 310</td>
<td>Introduction to Biomolecular Bioengineering</td>
<td>3</td>
<td>P - BIEN 200 or permission of instructor</td>
</tr>
<tr>
<td>BIEN 320</td>
<td>Molecular, Cellular and Tissue Biomechanics (TC Stream 1)</td>
<td>3</td>
<td>P - BIOL 112, MECH 210</td>
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<tr>
<td>BIEN 330</td>
<td>Tissue Engineering and Regenerative Medicine</td>
<td>3</td>
<td>P - BIEN 200, BIOL 112, BIOL 200, and CHEM 212, or instructor permission</td>
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<tr>
<td>BIEN 350</td>
<td>Biosystems and Control</td>
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<td>P - BIEN 310 and COMP 208, or instructor permission</td>
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<td>BIEN 510</td>
<td>Engineered Nanomaterials for Biomedical Applications</td>
<td>3</td>
<td>P - BIEN 200, CHEM 212, and BIOL 112, or instructor permission</td>
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<td>BIEN 520</td>
<td>High Throughput Bioanalytical Devices</td>
<td>3</td>
<td>P - Permission of instructor</td>
</tr>
<tr>
<td>BIEN 530</td>
<td>Imaging and Bioanalytical Instrumentation</td>
<td>3</td>
<td>P - Permission of instructor</td>
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<tr>
<td>BIEN 550</td>
<td>Biomolecular Devices</td>
<td>3</td>
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<tr>
<td>BIEN 550</td>
<td>Biosensors</td>
<td>3</td>
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<tr>
<td>BIEN 570</td>
<td>Active Mechanics in Biology</td>
<td>3</td>
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<tr>
<td>BIEN 590</td>
<td>Cell Culture Engineering</td>
<td>3</td>
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<tr>
<td>CHEE 314</td>
<td>Fluid Mechanics</td>
<td>3</td>
<td>P - CHEE 204 or BIEN 200 / C - MATH 264</td>
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<tr>
<td>CHEE 370</td>
<td>Elements of Biotechnology</td>
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<tr>
<td>CHEE 563</td>
<td>Biofluids and Cardiovascular Mechanics</td>
<td>3</td>
<td>P - CHEE 314 or MECH 331 or instructor permission</td>
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<tr>
<td>or MECH 563</td>
<td>Biofluids and Cardiovascular Mechanics</td>
<td>3</td>
<td>P - CHEE 314 or MECH 331 or instructor permission</td>
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<td>CIVE 207</td>
<td>Solid Mechanics</td>
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<td>ECSE 415</td>
<td>Introduction to Computer Vision</td>
<td>3</td>
<td>P - ECSE 304 or ECSE 306 or ECSE 206</td>
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<td>MECH 547</td>
<td>Mechanics of Biological Materials</td>
<td>3</td>
<td>P - MECH 210 and MIME 260 / 261, or instructor permission</td>
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30-37 credits from the following: