

BIOLOGICAL ENGINEERING PROGRAM CO-OP (BIOE:C)

School of Engineering, College of Engineering and Physical Sciences

Students interested in problems requiring the application of knowledge from both the biological sciences and engineering will find a challenge as a Biological Engineer. This field of engineering is the application of principles, methods and concepts of biology to systems and tools, ranging in scale from molecular to ecosystem level. This field combines engineering principles with life sciences to design creative solutions for biological systems, with applications ranging from pharmaceutical and food manufacturing, bioconversions to reduce waste, and production of sustainable, bio-based materials. For example, a Biological Engineer concentrating on biotechnology might design and manage bioreactors to improve their productivity. A Biological Engineering graduate can pursue a career in a number of exciting fields, including food safety, bio-instrumentation, diagnostics and sensorics in bio-systems, biomechanics and ergonomics.

Program Requirements

The Co-op program in Biological Engineering is a five year program, including five work terms. Students must follow the academic work schedule as outlined below (also found on the Co-operative Education website: <https://www.recruitguelph.ca/cecs/>).

Biological Engineering Academic and Co-op Work Term Schedule

Year	Fall	Winter	Summer
1	Academic Semester 1	Academic Semester 2	Off
2	Academic Semester 3 COOP*1100	Academic Semester 4	COOP*1000 Work Term I
3	Academic Semester 5	COOP*2000 Work Term II	COOP*3000 Work Term III
4	Academic Semester 6	Academic Semester 7	COOP*4000 Work Term IV
5	COOP*5000 Work Term V	Academic Semester 8	N/A

Please refer to the Co-operative Education program policy with respect to work term performance grading, work term report grading and program completion requirements.

For additional program information students should consult with their Co-op Co-ordinator and Co-op Faculty Advisor, listed on the Co-operative Education web site.

Credit Summary

(26.00 Total Credits)

Code	Title	Credits
	Required Core Courses	19.25
	BIOE-1 Biological Engineering Electives	1.75
	Complementary Studies Electives	2.00
	Free Electives	0.50

Co-op Work Terms	2.50
Total Credits	26

The recommended program sequence is outlined below.

Major (Honours Program)

Code	Title	Credits
Semester 1 - Fall		
CHEM*1040	General Chemistry I	0.50
ENGG*1100	Engineering and Design I	0.75
ENGG*1500	Engineering Analysis	0.50
MATH*1200	Calculus I	0.50
PHYS*1130	Physics with Applications	0.50
Semester 2 - Winter		
CHEM*1050	General Chemistry II	0.50
CIS*1500	Introduction to Programming	0.50
ENGG*1210	Engineering Mechanics I	0.50
MATH*1210	Calculus II	0.50
PHYS*1010	Introductory Electricity and Magnetism	0.50
Semester 3 - Fall		
BIOL*1070 or BIOL*1090	Discovering Biodiversity Introduction to Molecular and Cellular Biology	0.50
BIOL*1080	Biological Concepts of Health	0.50
COOP*1100	Introduction to Co-operative Education	0.00
ENGG*2230	Fluid Mechanics	0.50
ENGG*2400	Engineering Systems Analysis	0.50
MATH*2270	Applied Differential Equations	0.50
STAT*2120	Probability and Statistics for Engineers	0.50
Semester 4 - Winter		
BIOC*2580	Introduction to Biochemistry	0.50
ENGG*2100	Engineering and Design II	0.75
ENGG*2120	Material Science	0.50
ENGG*2450	Electric Circuits	0.50
ENGG*2660	Biological Engineering Systems I	0.50
MATH*2130	Numerical Methods	0.50
Summer Semester		
COOP*1000	Co-op Work Term I	0.50
Semester 5 - Fall		
ENGG*3160	Biological Engineering Systems II	0.50
ENGG*3260	Thermodynamics	0.50
ENGG*3450	Electronic Devices	0.50
ENGG*3830	Bio-Process Engineering	0.50
HIST*1250	Science and Technology in a Global Context	0.50
0.50 restricted electives		0.50
Winter Semester		
COOP*2000	Co-op Work Term II	0.50
Summer Semester		
COOP*3000	Co-op Work Term III	0.50
Semester 6 - Fall		
ENGG*3240	Engineering Economics	0.50
ENGG*4380	Bioreactor Design	0.75
ENGG*4390	Bio-instrumentation Design	0.75

1.00 restricted electives		1.00
Semester 7 - Winter		
ENGG*3100	Engineering and Design III	0.75
ENGG*3170	Biomaterials	0.50
ENGG*3430	Heat and Mass Transfer	0.50
ENGG*3440	Process Control	0.50
1.00 restricted electives		1.00
Summer Semester		
COOP*4000	Co-op Work Term IV	0.50
Fall Semester		
COOP*5000	Co-op Work Term V	0.50
ENGG*4000	Proposal for Engineering Design IV	0.00
Semester 8 - Winter		
ENGG*4110	Biological Engineering Design IV	1.00
1.75 restricted electives		1.75

Restricted Electives

(see Program Guide for more information)

The Engineering Program requires Biological Engineering students to complete the following combination of elective credits to complete their program:

- 1.75 credits from the BIOE-1 Biological Engineering electives
- 2.00 credits from Complementary Studies electives
- 0.50 credits in Free Electives

Consult the Program Guide for further information on the prerequisite requirements specific to each elective. Students can take a maximum of 1.50 credits at the 1000 level from the above list of electives.