

BIOLOGICAL AND MEDICAL PHYSICS CO-OP (BMPH:C)

Department of Physics, College of Engineering and Physical Sciences

The program emphasizes the application of physics to biology and medicine. It provides an excellent background for careers in the expanding interdisciplinary research laboratories of government and industry, as well as a starting point for a career in medical physics. Completion of the program at an appropriate level will qualify a student to pursue post-graduate studies in biophysics, medical physics and related areas of physics.

Program Requirements

The Co-op program in Biological and Medical Physics 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.recruituelph.ca/cecs/>).

Biological and Medical Physics 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

To be eligible to continue in the Co-op program, students must meet a minimum 70% cumulative average requirement after second semester, as well as meet all work term requirements. 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

(22.50 Total Credits)

Code	Title	Credits
	First year science credits	5.00
	Required science courses semesters 3 – 8	9.50
	Restricted electives (from List A or List B)	1.50
	Liberal Education electives	1.00
	Free electives - any approved elective for B.Sc. students.	3.00
	Co-op Work Terms	2.50
	Total Credits	22.5

Of the total credits required, students are required to complete 16.00 credits in science of which 2.00 credits must be at the 4000 level and an additional 4.00 credits must be at the 3000 or 4000 level.

The recommended program sequence is outlined below.

Major (Honours Program)

Students lacking Grade 12 or 4U Biology, Chemistry or Physics should follow the revised schedule of study for this major found at: https://www.uoguelph.ca/bsc/revised_SS (https://www.uoguelph.ca/bsc/revised_SS/)

Code	Title	Credits
Semester 1 - Fall		
BIOL*1090	Introduction to Molecular and Cellular Biology	0.50
CHEM*1040	General Chemistry I	0.50
CIS*1300	Programming	0.50
Select 1.00 credits from the following: ²		
IPS*1500	Integrated Mathematics and Physics I	1.00
MATH*1080 & PHYS*1080	Elements of Calculus I and Physics for Life Sciences	1.00
MATH*1200 & PHYS*1080	Calculus I and Physics for Life Sciences	1.00
Semester 2 - Winter		
BIOL*1080	Biological Concepts of Health	0.50
CHEM*1050	General Chemistry II	0.50
MATH*1160	Linear Algebra I	0.50
Select 1.00 credits from the following: ³		
IPS*1510	Integrated Mathematics and Physics II	1.00
MATH*1090 & PHYS*1070	Elements of Calculus II and Physics for Life Sciences II	1.00
MATH*1210 & PHYS*1010	Calculus II and Introductory Electricity and Magnetism	1.00
Semester 3 - Fall		
COOP*1100	Introduction to Co-operative Education	0.00
MATH*2200	Advanced Calculus I	0.50
MATH*2270	Applied Differential Equations	0.50
PHYS*2240	Thermal Physics	0.50
PHYS*2330	Electricity and Magnetism I	0.50
0.50 Liberal Education electives		0.50
Semester 4 - Winter		
BIOC*2580	Introduction to Biochemistry	0.50
PHYS*2030	Biophysics of Excitable Cells	0.50
PHYS*2180	Experimental Techniques in Physics	0.50
PHYS*2310	Mechanics	0.50
PHYS*2340	Electricity and Magnetism II	0.50
Summer Semester		
COOP*1000	Co-op Work Term I	0.50
Semester 5 - Fall		
PHYS*3130	Mathematical Physics	0.50
PHYS*3230	Quantum Mechanics I	0.50
1.50 electives ⁴		1.50
Winter Semester		
COOP*2000	Co-op Work Term II	0.50

Summer Semester			MICR*3230	Immunology	0.50
COOP*3000	Co-op Work Term III	0.50	PATH*3610	Principles of Disease	0.50
Semester 6 - Fall			PHYS*3000	Optics: Fundamentals and Applications	0.50
IPS*3000	Science Communication	0.50	PHYS*4130	Subatomic Physics	0.50
PHYS*3170	Radioactivity and Radiation Interactions	0.50	ZOO*2090	Vertebrate Structure and Function	0.50
ENGG*4040	Medical Imaging Modalities (or 0.50 electives) ⁵	0.50			
1.00 electives ⁴		1.00			
Semester 7 - Winter					
NANO*3600	Computational Methods in Materials Science	0.50			
PHYS*3510	Intermediate Laboratory	0.50			
PHYS*4040	Quantum Mechanics II	0.50			
PHYS*4540	Molecular Biophysics	0.50			
0.50 electives ⁴		0.50			
Summer Semester					
COOP*4000	Co-op Work Term IV	0.50			
Fall Semester					
COOP*5000	Co-op Work Term V	0.50			
Semester 8 - Winter					
PHYS*4500	Advanced Physics Laboratory	0.50			
PHYS*4070	Clinical Applications of Physics in Medicine (or 0.50 electives) ⁷	0.50			
1.50 electives ⁴		1.50			

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IPS*1500 Integrated Mathematics and Physics I is recommended

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IPS*1510 Integrated Mathematics and Physics II is recommended

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At least 1.00 credits of Liberal Education electives are required. In addition, students are required to complete 1.50 credits from either List A or List B below.

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Either ENGG*4040 Medical Imaging Modalities or PHYS*4070 Clinical Applications of Physics in Medicine must be completed.

List A: Biological Physics Stream

Code	Title	Credits
BIOC*3560	Structure and Function in Biochemistry	0.50
BIOC*4050	Protein and Nucleic Acid Structure	0.50
BIOC*4580	Membrane Biochemistry	0.50
MBG*2040	Foundations in Molecular Biology and Genetics	0.50
MCB*2050	Molecular Biology of the Cell	0.50
NANO*4100	Biological Nanomaterials	0.50
PHYS*3000	Optics: Fundamentals and Applications	0.50

List B: Medical Physics Stream

Code	Title	Credits
BIOM*2000	Concepts in Human Physiology	0.50
BIOM*3200	Biomedical Physiology	1.00
MBG*2040	Foundations in Molecular Biology and Genetics	0.50