

# BIOLOGICAL AND MEDICAL PHYSICS (BMPH)

## 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.

## Major (Honours Program)

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major may wish to consult the Faculty Advisor. This major requires the completion of 20.00 credits as follows:

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) ([https://www.uoguelph.ca/bsc/revised\\_SS/](https://www.uoguelph.ca/bsc/revised_SS/))

Code	Title	Credits
<b>Semester 1</b>		
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: <sup>1</sup>		
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
<b>Semester 2</b>		
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: <sup>2</sup>		
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
<b>Semester 3</b>		
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
<b>Semester 4</b>		
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
<b>Semester 5</b>		
IPS*3000	Science Communication	0.50
PHYS*3130	Mathematical Physics	0.50
PHYS*3230	Quantum Mechanics I	0.50
1.00 electives <sup>3</sup>		1.00
<b>Semester 6</b>		
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 <sup>3</sup>		0.50
<b>Semester 7</b>		
PHYS*3170	Radioactivity and Radiation Interactions	0.50
PHYS*4500	Advanced Physics Laboratory	0.50
PHYS*4001	Research in Physics (or 0.50 electives)	0.50
ENGG*4040	Medical Imaging Modalities (or 0.50 electives) <sup>3,4</sup>	0.50
0.50 electives		0.50
<b>Semester 8</b>		
PHYS*4002	Research in Physics (or 0.50 electives) <sup>3</sup>	0.50
PHYS*4070	Clinical Applications of Physics in Medicine (or 0.50 electives) <sup>3,4</sup>	0.50
1.50 electives <sup>3</sup>		1.50
1	IPS*1500 Integrated Mathematics and Physics I is recommended	
2	IPS*1510 Integrated Mathematics and Physics II is recommended	
3	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.	
4	Either ENGG*4040 Medical Imaging Modalities or PHYS*4070 Clinical Applications of Physics in Medicine must be completed.	
<b>Note:</b> PHYS*4001 Research in Physics and PHYS*4002 Research in Physics will be projects in biological or medical physics, some of which may be in areas outside the Department of Physics ( <a href="https://www.physics.uoguelph.ca/">https://www.physics.uoguelph.ca/</a> ).		
<b>List A: Biological Physics Stream</b>		
<b>Code</b>	<b>Title</b>	<b>Credits</b>
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**

<b>Code</b>	<b>Title</b>	<b>Credits</b>
BIOM*2000	Concepts in Human Physiology	0.50
BIOM*3200	Biomedical Physiology	1.00
MBG*2040	Foundations in Molecular Biology and Genetics	0.50
MICR*3230	Immunology	0.50
PATH*3610	Principles of Disease	0.50
PHYS*3000	Optics: Fundamentals and Applications	0.50
PHYS*4130	Subatomic Physics	0.50
ZOO*2090	Vertebrate Structure and Function	0.50

**Credit Summary**

(20.00 Total Credits)

<b>Code</b>	<b>Title</b>	<b>Credits</b>
	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
	<b>Total Credits</b>	<b>20</b>

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.