

Biological and Medical Physics (BMPH)

Department of Physics, College of Physical and Engineering Science

Major (Honours Program)

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.

Since some of the required courses are not offered every semester, students entering the Major in Biological and Medical Physics should plan their program in consultation with the Department of Physics Faculty Advisor.

Students may enter this major in Semester 1 or any semester thereafter. A student wishing to declare the major must consult the Faculty Advisor. This major requires the completion of 21.0 credits as indicated below.

Semester 1

BIOL*1090 [0.50] Introduction to Molecular and Cellular Biology

CHEM*1040 [0.50] General Chemistry I

CIS*1500 [0.50] Introduction to Programming

One of (MATH*1200 or IPS*1500 recommended):

MATH*1080 [0.50] Elements of Calculus I

MATH*1200 [0.50] Calculus I *

One of (PHYS*1000 or IPS*1500 recommended):

PHYS*1000 [0.50] An Introduction to Mechanics *

PHYS*1070 [0.50] Introductory Physics for Life Sciences

PHYS*1080 [0.50] Physics for Life Sciences

* IPS*1500 [1.00] is recommended instead of PHYS*1000 and MATH*1200

Students who are lacking one 4U /grade 12 course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The required first-year science courses in that subject should be completed according to the revised schedule of studies available at: <http://www.bsc.uoguelph.ca/revisedss>

Semester 2

BIOL*1080 [0.50] Biological Concepts of Health

CHEM*1050 [0.50] General Chemistry II

One of (PHYS*1010 or IPS*1510 recommended):

PHYS*1010 [0.50] Introductory Electricity and Magnetism *

PHYS*1080 [0.50] Physics for Life Sciences

PHYS*1130 [0.50] Physics with Applications

One of (MATH*1210 or IPS*1510 recommended):

MATH*1210 [0.50] Calculus II *

MATH*2080 [0.50] Elements of Calculus II

* IPS*1510 [1.00] is recommended instead of PHYS*1010 and MATH*1210

0.50 Arts or Social Science electives

Semester 3

MATH*2160 [0.50] Linear Algebra I

MATH*2200 [0.50] Advanced Calculus I

PHYS*2440 [0.75] Mechanics I

PHYS*2460 [0.75] Electricity and Magnetism I

0.50 electives*

Semester 4

MATH*2170 [0.50] Differential Equations I

PHYS*2030 [0.50] Biophysics of Excitable Cells
PHYS*2260 [0.50] Quantum Physics
PHYS*2470 [0.75] Electricity and Magnetism II
0.50 electives*

Semester 5

BIOC*2580 [0.50] Introduction to Biochemistry
MATH*3100 [0.50] Differential Equations II
PHYS*3100 [0.75] Electronics
PHYS*3230 [0.50] Quantum Mechanics I
PHYS*3240 [0.50] Statistical Physics I

Semester 6

PHYS*3510 [0.50] Intermediate Laboratory
PHYS*4040 [0.50] Quantum Mechanics II
PHYS*4540 [0.50] Molecular Biophysics
1.00 electives*

Semester 7

PHYS*3170 [0.50] Radioactivity and Radiation Interactions
PHYS*4500 [0.50] Advanced Physics Laboratory

One of:

PHYS*4001 [0.50] Research in Physics
0.50 electives*

1.00 electives*

Note: Either PHYS*4001/2 in semesters 7 and 8 or PHYS*4300 in semester 8 must be taken.

Semester 8

PHYS*4070 [0.50] Clinical Applications of Physics in Medicine

One of:

PHYS*4002 [0.50] Research in Physics
PHYS*4300 [0.50] Inquiry in Physics

1.50 electives*

Note: PHYS*4001/2 will be projects in biological or medical physics, some of which may be in areas outside the Department of Physics.

*A minimum of 1.0 credits in Arts/Social Science is required. In addition, students are required to complete 2.00 credits from either List A or List B courses given below:

LIST A: Biological Physics stream

BIOC*3560 [0.50] Structure & Function in Biochemistry
BIOC*4580 [0.50] Membrane Biochemistry
MBG*2040 [0.50] Foundations in Molecular Biology and Genetics
MCB*2050 [0.50] Molecular Biology of the Cell
MCB*4050 [0.50] Protein & Nucleic Acid Structure
PHYS*4240 [0.50] Statistical Physics II

LIST B: Medical Physics stream

BIOM*2000 [0.50] Concepts in Human Physiology
ENGG*4040 [0.50] Medical Imaging Modalities
MBG*2040 [0.50] Foundations in Molecular Biology and Genetics
PATH*3610 [0.50] Principles of Disease
PHYS*4130 [0.50] Subatomic Physics
PHYS*4150 [0.50] Solid State Physics

Biological and Medical Physics (Co-op) (BMPH:C)

Department of Physics, College of Physical and Engineering Science

Major (Honours Program)

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.

Since some of the required courses are not offered every semester, students entering the Major in Biological and Medical Physics (Co-op) should plan their program in consultation with the Department of Physics Faculty Advisor.

To graduate from the Co-op program a minimum of 4 successfully completed work terms is normally required.

This major requires the completion of 21.00 credits as indicated below:

Semester 1 - Fall

BIOL*1090 [0.50] Introduction to Molecular and Cellular Biology

CHEM*1040 [0.50] General Chemistry I

CIS*1500 [0.50] Introduction to Programming

One of (MATH*1200 or IPS*1500 recommended):

MATH*1080 [0.50] Elements of Calculus I

MATH*1200 [0.50] Calculus I *

One of (PHYS*1000 or IPS*1500 recommended):

PHYS*1000 [0.50] An Introduction to Mechanics *

PHYS*1070 [0.50] Introductory Physics for Life Sciences

PHYS*1080 [0.50] Physics for Life Sciences

* IPS*1500 [1.00] is recommended instead of PHYS*1000 and MATH*1200

Students who are lacking one 4U /grade 12 course in Biology, Chemistry or Physics must take the equivalent introductory course in first semester. The required first-year science courses in that subject should be completed according to the revised schedule of studies available at: <http://www.bsc.uoguelph.ca/revisedss>

Semester 2 - Winter

BIOL*1080 [0.50] Biological Concepts of Health

CHEM*1050 [0.50] General Chemistry II

One of (MATH*1210 or IPS*1510 recommended):

MATH*1210 [0.50] Calculus II *

MATH*2080 [0.50] Elements of Calculus II

One of (PHYS*1010 or IPS*1510 recommended):

PHYS*1010 [0.50] Introductory Electricity and Magnetism *

PHYS*1080 [0.50] Physics for Life Sciences

PHYS*1130 [0.50] Physics with Applications

* IPS*1510 [1.00] is recommended instead of PHYS*1010 and MATH*1210

0.50 Arts or Social Science electives

Semester 3 - Fall

BIOC*2580 [0.50] Introduction to Biochemistry

COOP*1100 [0.00] Introduction to Co-operative Education

MATH*2160 [0.50] Linear Algebra I

MATH*2200 [0.50] Advanced Calculus I

PHYS*2440 [0.75] Mechanics I

PHYS*2460 [0.75] Electricity and Magnetism I

Semester 4 - Winter

MATH*2170 [0.50] Differential Equations I
PHYS*2030 [0.50] Biophysics of Excitable Cells
PHYS*2260 [0.50] Quantum Physics
PHYS*2470 [0.75] Electricity and Magnetism II
0.50 electives*

Summer Semester

COOP*1000 [0.00] Co-op Work Term I ++

Semester 5 - Fall

MATH*3100 [0.50] Differential Equations II
PHYS*3100 [0.75] Electronics
PHYS*3240 [0.50] Statistical Physics I
1.00 electives*

Winter Semester

COOP*2000 [0.00] Co-op Work Term II ++

Summer Semester

COOP*3000 [0.00] Co-op Work Term III ++

Semester 6 - Fall

PHYS*3170 [0.50] Radioactivity and Radiation Interactions
PHYS*3230 [0.50] Quantum Mechanics I
1.50 electives*

Semester 7 - Winter

PHYS*3510 [0.50] Intermediate Laboratory
PHYS*4040 [0.50] Quantum Mechanics II
PHYS*4540 [0.50] Molecular Biophysics
1.00 electives*

Summer Semester

COOP*4000 [0.00] Co-op Work Term IV ++

Fall Semester

COOP*5000 [0.00] Co-op Work Term V ++

Semester 8 - Winter

PHYS*4070 [0.50] Clinical Applications of Physics in Medicine
PHYS*4500 [0.50] Advanced Physics Laboratory
One of:
 PHYS*4300 [0.50] Inquiry in Physics
 0.50 electives *
1.00 electives*

++Four work terms are required for the completion of the co-op degree. It is also necessary that there be at least one work term in each of Fall, Winter and Summer semesters. Therefore, one of the summer work terms could be missed and the student would still graduate successfully. Whether the student completes four or five work terms, a report is required for each work term completed. Contact the co-op faculty advisor for further details.

*A minimum of 1.00 credits of Arts/Social Sciences electives is required for completion of this program. In addition, students are required to complete 2.00 credits from either List A or List B courses given below:

LIST A: Biological Physics stream

BIOC*3560 [0.50] Structure & Function in Biochemistry
BIOC*4580 [0.50] Membrane Biochemistry
MBG*2040 [0.50] Foundations in Molecular Biology and Genetics
MCB*2050 [0.50] Molecular Biology of the Cell
MCB*4050 [0.50] Protein & Nucleic Acid Structure
PHYS*4240 [0.50] Statistical Physics II

LIST B: Medical Physics stream

BIOM*2000 [0.50] Concepts in Human Physiology
ENGG*4040 [0.50] Medical Imaging Modalities
MBG*2040 [0.50] Foundations in Molecular Biology and Genetics
PATH*3610 [0.50] Principles of Disease
PHYS*4130 [0.50] Subatomic Physics
PHYS*4150 [0.50] Solid State Physics