

PHY 469	Independent Studies I	3-0-0
Topics to be determined by the instructor based on student's needs.		
PHY 470	Independent Studies II	3-0-0
Topics to be determined by the instructor based on student's needs.		
PHY 471	Independent Studies III	3-0-0
Topics to be determined by the instructor based on student's needs.		
PHY 474	Cosmology	3-0-0
Topics to be studied include: cosmology, inflation, dark energy, compact objects, relativistic fluid dynamics, gravitational lensing, and gravitational waves.		
<i>Prerequisite: PHY 214 or PHY 208</i>		
<i>Note: See PHY 574. Students who take this course for credit may not receive credit for PHY 574.</i>		
PHY 475	Numerical Methods and Simulations	3-3-0
This course will cover selected topics in High Performance Computing including cellular automata, finite element methods, molecular dynamics, Monte Carlo methods, and multigrid methods. Applications of the algorithms to the study of classical fields, fluid dynamics, materials properties, nanostructures, and biomolecules will be addressed depending on the interests of the students.		
<i>Note: See PHY 575. Students may not take this course for credit if they have received credit for PHY 575.</i>		
PHY 476	Stellar Astrophysics	3-3-0
An introduction to the properties of stellar atmospheres and interiors. The equations of stellar evolution, nuclear energy generation, radiative transport and stellar model building will be studied. Further topics include the formation of stars, and the physics associated with supernovae, white dwarfs, neutron stars, pulsars and black holes.		
PHY 480	Honours Research Dissertation	6-1-6
Each student is required to carry out either an experimental or theoretical project under the supervision of a faculty member. A plan outlining the proposed research must be submitted for approval during the first four weeks of the course. Each student will present his/her results in the form of a seminar, an oral thesis defense, and a written dissertation.		
<i>Prerequisite: U3 Honours Physics registration or permission of the department.</i>		
PHY 487	Exoplanet Astrophysics	3-3-0
Exoplanets are planets in orbit around distant stars. This course is designed as an introduction to the discovery and characterization of exoplanets. The application of transits, velocimetry, imaging and lensing will be studied. Exoplanet atmospheres, interiors and orbital dynamics will be studied. Further topics include demographics, biosignatures and exploration of our Solar System to understand the origins of life.		
<i>Prerequisites: PHY 208, PHY 214</i>		
<i>Note: See PHY 587. Students who take this course for credit may not receive credit for PHY 587.</i>		
PHY 488	Statistics and Machine Learning for Physics	3-3-0
Theory and applications of modern techniques in statistics and machine learning for physics and astronomy. Topics covered include: frequentist statistics and Bayesian inference, dimensionality reduction, density estimation and clustering, regression and model selection, classification, Gaussian processes, and deep learning. Some frontier topics such as simulation-based inference and transformers will be covered.		
<i>Note: See PHY 588. Students who take this course for credit may not receive credit for PHY 588.</i>		
<i>Prerequisites: PHY 206, PHY 208, CS 211</i>		
<i>Co-requisite: PHY 325</i>		

Pre-Medicine Major (B.Sc.)

Faculty

Administered by the Program Coordinator

Program Overview (78 credits)

MAJMED

The Pre-Medicine Major allows students to complete the common pre-requisites necessary to apply to medical schools while at the same time pursuing a liberal arts education. The required and optional courses listed below correspond to the entrance requirements of many Canadian and American medical schools. They also address the requirements of most related professional schools (such as dentistry or physiotherapy).

It is important to note that every professional school has its own specific set of prerequisite courses, and these occasionally change. Up-to-date prerequisites are usually listed on the admissions site for an MD program. A student in the Pre-Medicine Major should consult the websites of any schools in which they are interested as they plan their optional courses.

The Pre-Medicine program is a double major program, students registering in the Pre-Medicine Major must be registered in a separate primary major. A student can select their primary major from any discipline offered at Bishop's, including Biology, Biochemistry, Chemistry, Business, Liberal Arts, or Psychology. Courses can be double counted towards both the primary major and the Pre-Medicine Major, but in order to graduate with the Pre-Medicine Major, a student must complete a minimum of 24 additional course credits that have not been counted towards the required courses (including required and concentration options) of the primary major. Some programs (e.g. Biology, Biochemistry and Computer Science) include "Free Options" or "Free Electives" in their programs. These courses can be used to fulfill the 24 course credits of the Pre-Medicine Major. Students with a large number of double-counted courses can complete additional "Pre-Medicine Option Courses" in order to obtain the 24 additional credits.

Entrance Requirements

The following criteria apply to entry into the B.Sc. Pre-medicine Major:

- a student must be registered in, and remain in, a primary major at Bishop's;
- a student must have completed 60 course credits (not including lab credits), including advanced credits, and have an overall average of 75% or greater;
- a student must maintain an overall average of 75% or greater at the end of each academic year to remain in the program.

Students with a completed D.E.C. will be granted advanced credit for first year science courses if they successfully completed collegial or equivalent courses in Chemistry (General Chemistry, Solutions Chemistry), Physics (Mechanics, Electricity and Magnetism), Mathematics (Differential Calculus, Integral Calculus) and Biology (General Biology, Cell and Molecular Biology). Students lacking any of these courses can take their equivalents at Bishop's.

Program Requirements

1. Pre-Medicine First Year Science Core Requirements:

(21 credits)

The following courses must be taken in order to meet the requirements of the major.

BIO 196 / BIL 196	Introduction to Cellular and Molecular Biology
CHM 191 / CHL 191	General Chemistry I
CHM 192 / CHL 192	General Chemistry II
MAT 191	Calculus I
MAT 192	Calculus II
PHY 193 / PHL 193	Physics for the Life Sciences I
PHY 194 / PHL 194	Physics for the Life Sciences II

Note: Some Quebec medical schools require PHY 206 Waves, Optics and Modern Physics in addition to PHY 193 and PHY 194. Students should research their preferred medical school to confirm whether they should take PHY 206.

2. Pre-Medicine Required Core Courses: (33 Credits)

The following courses must be taken in order to meet the requirements of the major.

BCH 210	General Biochemistry
BCH 313 / BCL 313	Metabolism
BIO 201	Cell and Molecular Biology
BIO 208 / BIL 208	Genetics
BIO 233	Human Anatomy
BIO 336	Animal Physiology I
CHM 111 / CHL 111	Organic Chemistry I
CHM 211 / CHL 211	Organic Chemistry II
PHY 101	Statistical Methods in Experimental Science
PSY 101	Introduction to Psychology
SOC 101	Introduction to Sociology

3. Pre-Medicine Required English Courses: (6 Credits)

Two Courses in English Literature.

4. Pre-Medicine Option Courses: (18 Credits)

Students must complete at least 6 courses (18 course credits) from the following list to meet the requirements of the major. Students with a large number of double-counted courses from categories 1, 2 and 3 above, can complete additional "Pre-Medicine Option Courses" in order to obtain the 24 additional course credits required to meet the requirements of the major.

BCH 381	Immunology
BCH 411	Molecular Biology
BIO 311	Quantitative Methods in Biology
BIO 320	Programmed Cell Death
BIO 337 / BIL 337	Animal Physiology II
BIO 352 / BIL 352	Microbiology
BIO 359	Human Genetics
BIO 411	Seminars in Health Sciences
BIO 433	Advanced Exercise Science
CHM 121	Inorganic Chemistry I
CHM 135 / CHL 135	Physical Chemistry - Thermal and Fluid Physics
CHM 141 / CHL 141	Analytical Chemistry
CHM 311	Organic Chemistry III
CHM 341 / CHL 341	Principles and Practices of Chemical Spectroscopy and Mass Spectrometry
CLA 170	Greek and Latin Terminology for Medicine and the Life Sciences
PBI 275	Health Psychology I
PBI 276	Health Psychology II
PBI 288	Brain and Behaviour I
PBI 380	Psychopharmacology
PHI 250	Ethics on the Cutting Edge*
PHY 206	Wave, Optics and Modern Physics
PSY 102	Introduction to Psychology II
PSY 337	Crisis Intervention *
SOC 307	Sociology of Health

**These courses are strongly recommended, since they will help students prepare for medical school interviews and the CASPer test.*