BS PREMED PHYSICS

The goal of the BS Premed Physics program is to prepare students for careers in medicine, medical physics and other doctoral health professions. As advances in knowledge and technology become increasingly multi-disciplinary in nature, the BS Premed Physics program offers its students a different perspective to preparation for medical school by concentrating on the applications of physics in medicine.

Students take physics, biology and chemistry courses that satisfy the requirements for a pre-med course, enabling them to proceed to medical school. The training gained from the interdisciplinary and collaborative electives, specialization courses, projects and theses provide students excellent preparation to the graduate-level medical physics program. Students are also encouraged to develop and/or work on materials and devices that will make medical practice easier and efficient for medical practitioners, effective for patients, and cheaper for the whole healthcare system.

Program Requirements

- 167.5 academic units and 9 non-academic units
- Completion of a practicum program
- Completion of a thesis

Summary of Units

General Education	53 units
Disciplinal Courses	83 units
Electives/ Specialization Courses	23 units
Thesis	5.5 units
Practicum	3 units
Lasallian Studies	3 units (non-academic)
NSTP/CWTS	6 units (non-academic)
Total number of units	167.5 (9)

Detailed Curriculum

			Units
Elective/ Specialization Courses	RADPY01	Radiation Physics 1	3
	LBYPH0P	Radiation Physics 1 Lab	1
	RDTHE01	Radiation Therapy	3
	RDBIO01	Radiation Biology	3
	NUCMD01	Nuclear Medicine	3
	IMAGM01	Medical Imaging	3
	LBYPH0T	Medical Imaging Lab	1
	HLTHP01	Health Physics	3

	PSYNTRO	Introduction to Psychology	3
Physics Courses	BASPHYS	Foundation Course in Physics	3
	PHYS102	Physics Fundamentals – Elasticity, Fluids, Heat & Thermodynamics	3
	PHYS103	Physics Fundamentals – Waves & Optics	3
	LBYPH02	Physics Fundamentals Lab - Elasticity, Fluids, Heat & Thermodynamics	1
	LBYPH03	Physics Fundamentals Lab – Waves & Optics	1
	LBYPH04	Physics Fundamentals Lab – Modern Physics	1
	PHYS104	Modern Physics	3
	PHYS001/B/C/D	Physics Problems 1/2/3/4 for Premed Physics	4
	ELECP01	Electronics 1	3
	LBYPH0K	Electronics Laboratory 1	1
	COMPY01	Computer for Physics 1	3
Biology Courses	BASBIOL	Foundation Course in Biology	3
	ANATOMY	Comparative Vertebrate Anatomy	3
	LBYBI11	Comparative Vertebrate Anatomy Lab	2
	EMBRYPH	Vertebrate Embryology	3
	LBYBI34	Vertebrate Embryology Lab	1
	PHYSIOPH	Fundamentals of Physiology	3
	LBYBI34	Fundamentals of Physiology Lab	1
	CELLBIO	Cell Biology	3
	LBYBI37	Cell Biology Lab	1
	MICROPH	Microbiology	3
	LBYBI35	Microbiology Lab	1
Chemistry Courses	BASCHEM	Foundation Course in Chemistry	3
	KMPHOR1	Organic Chemistry 1	3
	KMPHOR2	Organic Chemistry 2	3
	LBYORGP	Organic Chemistry Laboratory	1
	KMBIOKP	Biochemistry	3
	LBYBIOP	Biochemistry Laboratory	1
	KMANAP	Analytical Chemistry	3
	LBYANAP	Analytical Chemistry Lab	1

Mathematics & Statistics Courses	MTH101A	Foundation Course in Mathematics	5
	STT101A	Foundation Course in Statistics	3
	STT151A	Statistics for Research	3
	MATPY00	Calculus for Premed Physics	4
Thesis and Practicum	PYSEM01	Physics Seminar	1
	PRCPHYS	Practicum for Physics Students	3
	THSPY01	Physics Research 1	1
	THSPY02	Physics Research 2	1
	THSPY03	Physics Research 3	1
	RESAP01	Research Apprenticeship 1	0.5
	RESAP02	Research Apprenticeship 2	0.5
	RESAP03	Research Apprenticeship 3	0.5
General Education Courses			53
Lasallian Studies			(3)
NSTP/CWTS			(6)

Course Descriptions

Radiation Physics 1 (3 units lecture)

An introductory course on radiation physics aimed at providing a working background on the different types of radiation, their sources and detection and their general application in medicine and biology. Topics include different interactions of radiation with matter, various sources of radiation (man-made and natural), nuclear reactions and radioisotope production, neutron sources, nuclear reactors and particle accelerators in and their general application in medicine and biology.

Radiation Physics 2 (3 units)

This course focuses on the various methods of radiation detection and dosimetric principles. This includes radiation detection using ionization chambers, scintillation detectors, and semiconductor detectors among others.

Radiation Physics Laboratory (1 unit)

This laboratory course is designed for medical physics and pre-med physics majors taking up radiation physics courses. It supplements the topics discussed in the lecture class. Specifically, experiments involving different types, properties and clinical applications of radiation will be performed to provide the students with the tangible and practical aspects of radiation physics concepts learned in the lecture class.

Radiation Biology (3 units)

An introduction to the principles and concepts underlying the effects of ionizing radiation at the molecular, cellular and whole-tissue level. Topics include radiation damage to DNA, DNA damage repair mechanisms, cell-cycle kinetics (repopulation effects), Linear Energy Transfer (LET) effects, oxygen effects, the Four R's of radiation therapy, genomic instability, neoplastic transformation, apoptosis, and cancer. The course also covers examples and discussions related to radiation therapy treatment planning, including the biologically equivalent dose (BED) and equivalent uniform dose (EUD) concepts; and the human health effects relevant to radiation protection.

Radiation Therapy 1 (3 units)

The first of two courses in radiation therapy. This course covers topics on radiotherapy machines - their components and principles of operations, the various properties and mechanisms of x-ray and electron interaction with matter and the dosimetry of therapeutic x-rays.

Health Physics (3 units)

Topics include the physics of dose deposition, radiation dosimetry, elementary shielding and radiation protection devices, description and proper use (calibration and maintenance) of health physics instrumentation, and radiation regulatory issues. Legal, biological, and administrative aspects of radiation protection in nuclear medicine. Emphasis on practical means of minimizing radiation exposure to the patient, nuclear medicine staff, and the general public.

Nuclear Medicine (3 units)

An introductory course that will provide undergraduate physics majors with basic fundamentals in nuclear medicine, including radiation physics and radiation biology, in-vivo and in-vitro studies, and radionuclide therapy.

Medical Imaging Systems (3 units)

This course is a study of the basic concepts of medical imaging. Introductory course on medical imaging aims to provide knowledge on different types of medical imaging devices, their sources and their general applications in medicine and biology. It includes radioactivity, photon and charged particle interaction in matter, x-ray production and quality.

Laboratory for Medical Imaging Systems (1 unit)

This course is designed as a complimentary laboratory course for IMAGMED or IMAGSYS. It supplements the topics discussed in the lecture class. Specifically, experiments in X ray Film Analysis, ultrasound, and image processing will be performed to provide the students with the concrete applications of concepts learned in the lecture class.

Foundation Course in Physics (3 units)

This is a course on the conceptual foundations of Newtonian mechanics, electricity and magnetism using flipped classroom as instructional strategy. In examining the concepts

mentioned and its relevant consequences, vector methods, as well as the basic concepts of calculus will be used.

Fundamentals of Physics – Elasticity, Fluids, Heat & Thermodynamics (3 units)

This is a course on elasticity and the basics of fluid mechanics and thermodynamics. It will discuss stress and strain, elastic modulus, Pascal's Law, Archimedes Principle, Bernoulli's equation and the laws of thermodynamics.

Fundamentals of Physics Laboratory (1 unit)

This is a laboratory course that covers experiments in stress, strain, elasticity, fluids, heat, and basic circuits. The course puts emphasis on basic experimental techniques and data analysis, and written report of experimental results.

Fundamentals of Physics – Waves and Optics (3 units)

This is a course covering oscillations, the basic properties of mechanical and electromagnetic waves, optical phenomena, and optical instruments.

Fundamentals of Physics Laboratory - Waves and Optics (1 unit)

This is a laboratory course designed for students taking *Fundamentals of Physics: Waves & Optics* (lecture). The course supplements the topics discussed in the lecture class. Specifically, experiments in waves and optics are performed to provide the student concrete applications of concepts learned in the lecture class.

Modern Physics (3 units)

It is an introduction to the concepts and methods of modern physics: Einstein's special theory of relativity and quantum mechanics. Although the ideas to be encountered are barely 100years old, yet the students will realize their importance since these have dictated the scientific and technological development of the 20th century.

Fundamentals of Physics Laboratory – Modern Physics (1 unit)

Selected experiments will be performed to provide the students with hands-on experience with some of the experimental basis of modern physics. This course utilizes the student's imagination, intuition, and creativity in analyzing and discovering the various laws and principles that govern the physical world.

Computer for Physics 1 (3 units)

This is an introductory course in computer programming in FORTRAN/Python/MATLAB. The students will learn how to construct logical formulations or algorithms in arriving at finite numerical solution/s to various scientific problems. Rudiments of computer programming in FORTRAN/Python/MATLAB with hands-on training will be incorporated in the course.

Electronics for Physics 1 (3 units)

This course introduces the fundamental principles and applications of electrical and electronic devices, circuits, and systems in particular; resistors, capacitors, inductors, and semiconductor devices, e.g. diodes, transistors, and operational amplifiers. Digital logic and the design of combinational and sequential circuits are also discussed.

Electronics Laboratory for Physics 1 (1 unit)

Experiments involving analog circuits (resistive, inductive, and capacitive circuits), three-phase circuits, diodes, transistors, op-amp, and basic logic gates will be performed as well as introductory experiments in microcontrollers.