BACHELOR OF SCIENCE IN PHYSICS WITH SPECIALIZATION IN MEDICAL INSTRUMENTATION

Description and Aims of the Program

The Bachelor of Science in Physics with specialization in Medical Instrumentation program is an eleven-trimester (plus one trimester practicum) program that prepares students for possible careers as medical physicists. The main objective of the program is to produce graduates who by having a solid grounding in physical concepts and principles, and having a basic understanding of radiation therapy, medical imaging and medical instrumentation, will pursue graduate studies to enable them to become practicing medical physicists in the country. It is also the aim of the program to produce researchers who can contribute to the development of new medical instruments.

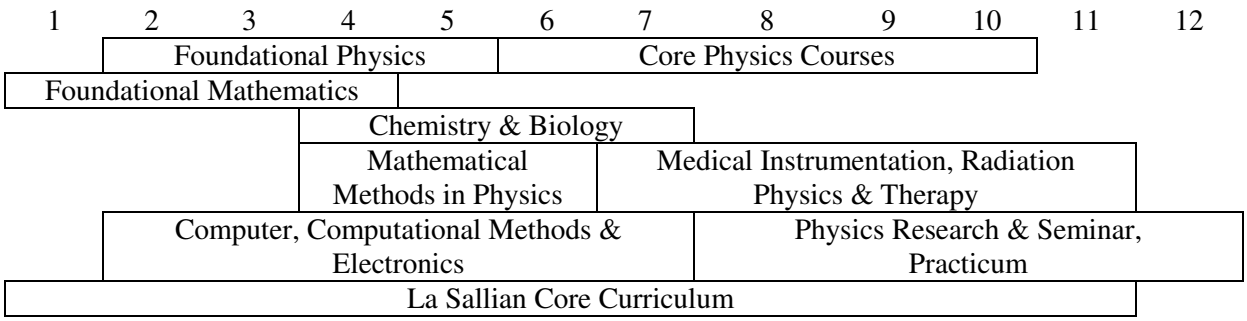
Graduates of the program can immediately work as associate medical physicists. At the same time, they can readily go to graduate programs in medical physics, preparing themselves for careers as full-fledged medical physicists. Being in a full physics program, graduates of this track are also open to other opportunities available to graduates of BS Physics programs. Since the program already includes a substantial number of Chemistry and Biology courses, it will take only a few more subjects to enable one to take the National Medical Admission Test (NMAT) and proceed to medical school.

Expected Learning Outcomes or Competencies

Critical and Creative Thinker	1. apply mathematical, computational and experimental methods in solving physical problems* 2. able to evaluate quality of information gathered from varied sources 3. capable of translating scientific knowledge and methods into innovations in materials science, medicine, economics and finance
Effective Communicator	1. synthesize and effectively communicate scientific information* 2. able to express thoughts in a logical, clear, concise, and precise manner
Reflective Lifelong Learner	1. apply scientific reasoning to arrive at decisions* 2. actively pursue new knowledge, be open to new ideas, and respect other people's view points 3. pursue personal and professional growth by constantly acquiring new skills and keeping abreast with technological advancement
Service-driven Citizen	1. employ scientific skills and knowledge for the improvement of human life and the preservation of the environment 2. uphold intellectual honesty and integrity in their conduct

*CHED competency standards for BS Physics, (CHED Memo No. 20, Series of 2007, Article IV)

Program Structure



The students spend their first year in preparatory studies, particularly on mathematics. Introductory-level physics and mathematical methods for physics courses are taken from the second to the sixth trimester of the program, preparing the students for the core physics courses (mechanics, electromagnetism, quantum mechanics and statistical physics), which are taken in the junior and senior years.

Aside from the core physics courses taken in a BS Physics program, the Medical Instrumentation track also has 20 units of Chemistry and Biology, 34 units of medical instrumentation and radiation physics, radiation therapy and nuclear medicine courses, including electronics, computer programming and computational methods.

REQUIRED COURSES WITH COURSE CREDITS

Part I. General Education, Basic and Major Courses

All BS Physics majors, regardless of specialization and minor, take the following courses (general education, basic, major, research, seminar and practicuum):

General Education/La Sallian Core Curriculum	Units
English	9
Humanities	6
Filipino	6
Science, Technology and Society	6
Mathematics	6
Natural Science (Physics Fundamentals)	6
History and Rizal	6
Philiosophy	3
Theology & Religious Education	12
Fitness & Wellness	6
Personal Effectiveness	(6)
Great Works	3
Civic Welfare Training Service	(6)
Lasallian Retreat	0
Total	**69(12)**

( ) Non-academic courses

Basics/ Foundational Courses	Units
Physics Fundamentals	6
Analysis	12
Mathematical Methods in Physics	9
Statistics	3
Total	**30**

Major/ Core Courses	Units
Classical Mechanics	6
Electrodynamics	6
Quantum Mechanics	6
Statistical Mechanics	3
Computational Methods in Physics	3
Solid State Physics	3
Total	**27**

Basic Skills Course	Units
Computer Programming	6
Basic Electronics (lecture and lab)	4
Physics Fundamentals (lab)	4
Total	**14**

Research and Seminar	4

On-the-Job-Training (Practicuum)	3

Part II. Specialization Courses

BS Physics majors have the option to choose from four tracks, namely Materials Science, Medical Instrumentation, minor in Economics, and minor in Finance. Students, depending on their chosen tracks, take 49 to 54 units of specialization courses. Below is a list of specialization courses for the Medical Instrumentation track.

Medical Instrumentation Specialization	Units
Radiation Physics (lecture & lab)	7
Biomedical Instrumentation	3
Radiation Therapy	6
Medical Imaging	3
Physiology	3
Radiation Biology	3
Nuclear Medicine	3
Health Physics	4
Chemistry and Biochemistry	11
Electronics (lecture and lab)	8
Bioethics	3
Total	**54**

PROGRAM COURSE CHECKLISTS

BS Physics with Specialization in Medical Instrumentation

First Trimester, AY 2011-2012

Course Code	Course Title	Units	Prerequisite
MATH111	College Algebra	3	
MATH112	Trigonometry	3	
LBYPHYX	Physics Laboratory 1for Physics Majors	2	
FILKOMU	Ku/omunikasyon sa Araling Filipino	3	
TREDONE	Humanity's Search for Life	3	
KASPIL1	Pag-aaral sa Buhay, Mga Akda at Nagawa ni Dr. Jose Rizal	3	
FWTEAMS	Physics Fitness & Wellness in Team Sports	2	
PERSEF1	Personal Effectiveness Foundation	(2)	
	Total Units	17+2(2)	

Second Trimester, AY 2011-2012

Course Code	Course Title	Units	Prerequisite
MATH113	Analysis 1	4	MATH111
PHYFUN1	Physics Fundamentals 1	3	MATH111,MATH112(soft)
COMPHY1	Computer for Physics 1	3	MATH111,MATH112(soft)
SOCTEC1	Integrated Social Science, Technoogy & Society 1	3	
ENGLCOM	Basic Communication & Study Skills	3	
FWSPORT	Physical Fitness & Wellness in Individual/Dual Sports	2	
NSTP-C1/R1	NSTP Program - Civic Welfare Training Service/ Military Science 1	(3)	
	Total Units	16+2(3)	

Third Trimester, AY 2011-2012

Course Code	Course Title	Units	Prerequisite
MATH114	Analysis 2	4	MATH113
PHYFUN2	Physics Fundamentals 2	3	PHYFUN1
LBYPHY2	Physics Fundamentals Lab 2	1	
COMPHY2	Computer for Physics 2	3	COMPHY1
ENGLRES	Basic Research Skills/English for Specific Purposes	3	ENGLCOM
INTFILO	Introductory Philosophy	3	
NSTP-C2/R2	NSTP Program - Civic Welfare Training Service/ Military Science 2	(3)	NSTP-C1/R1
FWDANCE	Physical Fitness & Wellness in Dance	2	
LASARE1	Lasallian Recollection 1	0	
	Total Units	17+2(3)	

First Trimester, AY 2012-2013

Course Code	Course Title	Units	Prerequisite
INOCHE1	Gen. Chemistry 1(lec)	3	
LBYCH14	Gen. Chemistry 1(lab)	1	
MATPHY1	Mathematical Methods in Physics 1	3	MATH114
MATH115	Analysis 3	4	MATH114
PHYFUN3	Physics Fundamentals 3	3	PHYFUN2
LBYPHY3	Physics Fundamentals lab 3	1	PHYFUN3,LBYPHYX
SPEECOM	Oral Communication/Advanced Speech Class	3	ENGLRES
PERSEF2	Personal Effectiveness 2	(2)	PERSEF1
LASARE2	Lasallian Recollection 2	0	LASARE1
	Total Units	18(2)	

Second Trimester, AY 2012-2013

Course Code	Course Title	Units	Prerequisite
INOCHE2	Gen. Chemistry 2 (lec)	3	INOCHE1
LBYCH15	Gen. Chemistry 2 (lab)	1	LBYCH14
MATPHY2	Mathematical Methods in Physics 2	3	MATPHY1
PHYFUN4	Physics Fundamentals 4	3	PHYFUN3
BAELEC1	Basic Electronics 1	3	PHYFUN2
LBYPHYK	Basic Electronics Lab 1	1	LBYPHY2
COMETPY	Computational Methods in Physics	3	COMPHY2
	Total Units	17	

Third Trimester, AY 2012-2013

Course Code	Course Title	Units	Prerequisite
CHEMBIO	Biochemistry	3	INOCHE2
STATSCI	Statistics for Science	3	MATH111
CLASME1	Classical mechanics 1	3	PHYFUN1,MATHPHY1
RADPHY1	Radiation Physics 1(lec)	3	PHYFUN3
LBYPHYP	Radiation Physics 1(lab)	1	LBYPHY3
BAELEC2	Basic Electronics 2 (lec)	3	BAELEC1
LBYPHYL	Basic Electronics 2 (lab)	1	LBYPHYK
TREDTWO	The Filipino Christian in a Changing World	3	TREDONE
	Total Units	20	

First Trimester, AY 2013-2014

Course Code	Course Title	Units	Prerequisite
PHYSIO1	Introduction to Physiology	3	CHEMBIO
MATPHY3	Mathematical Methods in Physics 3	3	MATPHY2,MATH115
QUMEONE	Quantum Mechanics 1	3	PHYFUN3, MATPHY2
CLASME2	Classical Mechanics 2	3	CLASME1
RADBIO	Radiation Biology	3	RADPHY1
BAELEC3	Basic Electronics 3	3	BAELEC2
LBYPHYM	Basic Electronics 3 (lab)	1	LBYPHYL
	Total Units	19	

Second Trimester, AY 2013-2014

Course Code	Course Title	Units	Prerequisite
QUMETWO	Quantum Mechanics 2	3	QUMEONE
PHYSEMI	Physics Seminar	1	SPEECOM
RADTHE1	Radiation Therapy 1	3	RADPHY1,RADIBIO
IMAGMED	Medical Imaging (lec)	2	COMPHY1,PHYSIO1
LBYPHYT	Medical Imaging (lab)	1	
SENSORI	Sensors, Measurements & Biomedical Instrumentation (lab)	2	
LBYMEE	Sensors, Measurements & Biomedical Instrumentation (lec)	1	
TREDTRI	The Christian and the Word	3	TREDTWO
	Total Units	16	

Third Trimester, AY 2013-2014

Course Code	Course Title	Units	Prerequisite
STATMEC	Statistical Mechanics	3	PHYFUN2,MATPHY2
ELECMA1	Electricity & Magnetism 1	3	MATPHY1,PHYFUN2
THYSPHY1	Physics Research 1	1	PHYSEMI
RADPHY2	Radiation Physics 2	3	RAPHY1
NUCLMED	Nuclear Medicine	3	RAPHY1
GRTWORK	Great Works	3	
SOCTEC2	Integrated Social Science, Technology & Society 2	3	
	Total Units	19	

First Trimester, AY 2014-2015

Course Code	Course Title	Units	Prerequisite
ELECMA2	Electricity & Magnetism 2	3	ELECMA1
SOLSTAT	Solid State Physics	3	STATMEC,QUMEONE
THYSPHY2	Physics Research 2	1	THYSPHY1
HEALTHP	Health Physics	4	RADPHY2
TREDFOR	The Christian Vocation of Life	3	TREDTRI
HUMALIT	Introduction to Literature	3	
PERSEF3	Personal Effectiveness 3	(2)	PERSEF2
LASARE3	Lasallian Retreat	0	LASARE2
	Total Units	17(2)	

Second Trimester, AY 2014-2015

Course Code	Course Title	Units	Prerequisite
RADTHE2	Radiation Therapy 2	3	RADTHE1
THYSPHY3	Physics Research 3	1	THYSPHY2
FILDLAR	Pagbabasa at Pagsulat sa Iba't Ibang	3	FILKOMU
BIOTICS	Bioethics	3	
HUMAART	Art Appreciation	3	
KASPIL2	Kasaysayan ng Pilipinas	3	KASPIL2
	Total Units	16	

Third Trimester, AY 2014-2015

Course Code	Course Title	Units	Prerequisite
MEDPRAC	Medical Practicum	3	
	Total Units	3	

***TO THE STUDENT**: Please take note that subjects should not be enrolled without passing their respective pre-requisite. Be reminded that subjects taken without having passed the pre-requisite will be INVALIDATED. Subjects without pre-requisite can be taken in any term. Please be guided accordingly. Thank you.*

Academic Units	**201**
Non-Academic Units	**12**
Total Units	**213**

COURSE DESCRIPTIONS

Basic/Foundational Courses

PHYFUN1 **Physics Fundamentals 1** (3 units)
Vectors; kinematics; Newton's Laws; energy; momentum
Pre-requisite: College Algebra, Trigonometry

PHYFUN2 **Physics Fundamentals 2** (3 units)
Coulomb's Law; electric field and potential; Gauss's Law; electric circuits; Ohm's Law; Kirchhoff's rules; magnetostatics; magnetic induction
Pre-requisite: Physics Fundamentals 1

PHYFUN3 **Physics Fundamentals 3** (3 units)
Oscillations; mechanical waves; vibrating bodies; acoustics; electromagnetic waves; geometrical and physical optics
Pre-requisite: Physics Fundamentals 1

PHYFUN4 **Physics Fundamentals 4** (3 units)
Special Theory of Relativity; modern physics
Pre-requisite: Physics Fundamentals 1

MATH111 **College Algebra** (3 units)
A course covering the number systems, algebraic functions, relations and graphs, equations, systems of equations, inequalities, and inverse functions.

MATH112 **Trigonometry** (3 units)
A course including polynomial functions, exponential and logarithmic functions, circular functions, trigonometric identities and equations, complex numbers, law of sines, law of cosines and solution of triangles.

MATH113 **Mathematical Analysis 1** (4 units)
A first course in Analysis covering plane analytic geometry, limits and continuity, derivatives of algebraic functions, and their applications.
Pre-requisite: College algebra, trigonometry

MATH114 **Mathematical Analysis 2** (4 units)
A continuation of Analysis 1. It covers differentials, indefinite and definite integrals and their applications, derivatives and integrals of logarithmic and exponential functions, trigonometric functions, and techniques of integration.
Pre-requisite: Mathematical analysis 1

MATH115 **Mathematical Analysis 3** (4 units)
A continuation of Analysis 2. It covers polar coordinates, indeterminate forms and improper integrals, infinite sequences and series, 3-dimensional space, quadric surfaces, functions of several variables and evaluation of multiple integrals in Cartesian coordinates.
Pre-requisite: Mathematical Analysis 2

STATSCI **Introduction to Statistics 1** (3 units)
A course covering descriptive statistics, basic rules of probability, discrete probability distributions, normal distribution, sampling distributions, confidence intervals and tests of hypotheses for means, difference of means and variance, t and chi-square distribution and proportion.
Pre-requisite: College Algebra

MATPHY1 **Mathematical Methods in Physics 1** (3 units)
Vector analysis covering algebra, differentiation and integration; integral theorems; curvilinear coordinates.
Pre-requisite: Mathematical Analysis 2

MATPHY2 **Mathematical Methods in Physics 2** (3 units)
A course on ordinary and partial differential equations with emphasis on second-order differential equations.
Pre-requisite: Mathematical Methods in Physics 1

MATPHY3 **Mathematical Methods in Physics 3** (3 units)
A course on complex analysis and integral equations. It includes contour integration, calculus of residues and Fourier transform.
Pre-requisite: Mathematical Methods in Physics 2

Major/Core Courses

CLASME1 **Classical Mechanics 1** (3 units)
Newtonian, Lagrangian and Hamiltonian formulations of classical mechanics, applications to central forces and harmonic oscillators
Pre-requisite: Physics Fundamentals 1, Mathematical Methods for Physics 1

CLASME2 **Classical Mechanics 2** (3 units)
Non-inertial frames, rigid bodies, systems of particles, relativistic kinematics and dynamics
Pre-requisite: Classical Mechanics 2

ELECMA1 **Electricity and Magnetism 1** (3 units)
Electrostatics and magnetostatics in vacuum, boundary value problems, electrodynamics
Pre-requisite: Physics Fundamentals 2, Mathematical Methods for Physics 1

ELECMA2 **Electricity and Magnetism 2** (3 units)
Electrostatics and magnetostatics in material media, electromagnetic waves and electromagnetic radiation
Pre-requisite: Electricity and Magnetism 1

QUMEONE **Quantum Mechanics 1** (3 units)
Postulates of quantum mechanics, the Schrödinger equation and its applications to harmonic oscillators and central forces, operator methods and matrix mechanics
Pre-requisite: Physics Fundamentals 3, Mathematical Methods 2

QUMETWO **Quantum Mechanics 2** (3 units)
Spin, angular momenta, hydrogen atom, perturbation theory and identical particles
Pre-requisite: Quantum Mechanics 1

STATMEC **Statistical Mechanics** (3 units)
Probability theory; equilibrium statistical mechanics and thermodynamics; kinetic theory; diffusion; phase transformations
Pre-requisite: Physics Fundamentals 2, Mathematical Methods 2

SOLSTAT **Solid-State Physics** (3 units)
Crystal structures and crystallography; free electron theory of metals; electron states in periodic potentials; band theory of solids; lattice oscillations; fundamentals of electrical, thermal, magnetic and optical properties of metals, dielectrics and semiconductors and polymers; superconductivity
Pre-requisite: Statistical Mechanics, Quantum Mechanics

Basic Skills Courses

BAELEC1 **Basic Electronics 1** (3 units) + 1 unit laboratory
Introduction to electronics covering basic DC and AC circuit analysis, diode and transistor circuits, logic gates and basic logic operations.
Pre-requisite: Physics Fundamentals 2, Physics Fundamentals Laboratory 2

COMPHY1 **Computer for Physics 1** (3 units)
This course is designed for students in the B.S. Physics program. It provides all programming essentials for constructing simple scientific applications.
Pre-requisite: College Algebra

LBYPHYX **Physics fundamentals Laboratory 1** (2 units)
This is a first course in physics for physics majors, covering the basic concepts and laws in mechanics in a laboratory setting and activities to develop basic laboratory skills.

LBYPHY2 **Physics Fundamentals Laboratory 2** (1 unit)
This course complements the lecture courses on PHYSICS 2 for engineering, science and computer studies students. It covers activities to further develop basic laboratory skills initially practiced in PHYSICS LABORATORY 1. Selected experiments in thermodynamics, electricity and magnetism will be performed.
Pre-requisite: Physics Fundamentals Laboratory 1
Co-requisite: Physics Fundamentals 2

LBYPHY3 **Physics Fundamentals Laboratory 3** (1 unit)
This laboratory course is designed for College of Science students taking up Fundamentals of Physics 3 (lecture component). 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.
Pre-requisite: Physics Fundamentals Laboratory 2
Co-requisite: Physics Fundamentals 3

Research, Seminar and Practicum

PHYSEMI **Physics Seminar** (1 unit)
This course enables the students to prepare for their thesis proposal by the 12th week of the trimester. Students enrolled in this subject MUST also be working as apprentices in one of the research groups of the department. Also, this subject enables them to write their thesis proposal. In writing the thesis proposal, the students get a feel of the requirements of the study they will undertake along with its theoretical background. This course also aims to develop the following Lasallian characteristics: critical and logical thinking, resourcefulness and innovativeness, perseverance and self-discipline.
Pre-requisite: Oral Communication/ Advanced Speech Class

THSPHY1 **Physics Research 1** (1 unit)
The first thesis course for physics majors. The major requirement for the course is the presentation of a thesis proposal.
Pre-requisite: Physics Seminar

THSPHY2 **Physics Research 2** (1 unit)
The second thesis course for physics majors where students are expected to conduct the greater part of their thesis research.
Pre-requisite: Physics Research 1

THSPHY3 **Physics Research** (1 unit)
The third and last thesis course for physics majors. Students are expected to finalize their thesis research and present the work to a panel of examiners.
Pre-requisite: Physics Research

PRCPHYS **Practicum for Physics Students** (3 units)
A practicum course for Physics students.
Specialization Courses for Materials Science Track

Specialization Courses for Medical Instrumentation Track

CHEMBIO **Engineering Biochemistry** (3 units)
This course is designed to introduce the major aspects of biochemistry in relation to the field of biomedical engineering. The course gives emphasis on the structure and dynamics of cellular

components; enzymes mechanisms and kinetics; intermediary metabolism and its metabolic pathways. In addition, introduction to some aspects of molecular biology important to cellular components are also explored. Lastly, the engineering concepts discussed are linked to the human scale in order to better understand how cellular and molecular phenomena provide functionality within the broader organization of organs and body function.

HEALTHP **Health Physics** (4 units)
Pre-requisite: Radiation Physics 2

IMAGMED **Medical Imaging Systems** (2 units)
This course is a study of the basic concepts of medical imaging. Introductory course on medical imaging aims to provide the students 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.

LBYPHYT **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.
Co-requisite: Medical Imaging Systems

NUCLMED **Nuclear Medicine** (3 units)
Pre-requisite: Radiation Physics 1

PHYSIO1 **Introduction to Physiology** (3 units)
PHYSIO1 is an introductory course in human anatomy and physiology. It provides the students with information on the basic unit of life progressing to the different organ systems of the body. Parts of the human body are first discussed leading to the specific functions of each. This lays the foundation for engineering applications related to the medical field.
Soft Pre-requisite: Biochemistry

RADPHY1 **Radiation Physics 1** (3 units lecture + 1 unit lab)
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.
Pre-requisite: Physics Fundamentals 3

RADPHY2 **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.
Pre-requisite: Radiation Physics 1

SENSORI **Sensors, Measurements & Biomedical Instrumentation** (2 units + 1 unit lab)

RADIBIO **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.
Pre-requisite: Radiation Physics 1

RADTHE1 **Radiation Therapy 1** (3 units)
The first of two courses in radiation theraphy. This course covers topics on radiotheraphy 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.
Pre-requisite: Radiation Physics 1, Radiation Biology

RADTHE2 **Radiation Therapy 2** (3 units)
This is the second of two radiation therapy courses. Topics covered by this course include linear accelerator beam properties, shielding, quality assurance, treatment planning, mathematical modeling in radiotherapy and introductory concepts about brachytherapy and radiosurgery.
Pre-requisite: Radiation Therapy 2

INOCHE1 **General Chemistry 1 for Science Majors** (3 units)
INOCHE1 is the first course in general and inorganic chemistry. It develops in the student basic concepts of matter and its classifications; mass relationships in chemical reactions; the properties of gases, liquids, and solids; some concepts of thermochemistry; quantum theory and electronic behavior; periodic relationship of elements in the periodic table; chemical bonding; intramolecular forces; and solutions.

LBYCH14 **General Chemistry Laboratory 1 for Science Majors** (1 unit)
A course developing basic laboratory skills. It includes experiments and exercises illustrating the concept covered in General Chemistry 1.

INOCHE2 **General Chemistry 2 for Science Majors** (3 units)
This 3-unit course is a continuation of General Chemistry I. It provides the science major the foundation in chemical concepts and principles covering elementary chemical thermodynamics, chemical equilibrium, acid-base theories and applications, reduction-oxidation reactions, electrochemistry, and kinetics.
Pre-requisite: General Chemistry 1 for Science Majors

LBYCH15 **General Chemistry Laboratory 2 for Science Majors** (1 unit)
A course including experiments and exercises illustrating the concepts covered in General Chemistry 2. Qualitative analysis of selected groups of cations and anions is also studied.
Pre-requisite: General Chemistry Laboratory 1 for Science Majors
Co-requisite: General Chemistry 2 for Science Majors

BAELEC2 **Basic Electronics 2** (3 untis)
An integrated course in basic electronics, covering network theorems, amplifiers, op-amps, combinational logic, synchronous sequential logic.
Pre-requisite: Basic Electronics 1
LBYPHYL **Basic Electronics Laboratory 2** (1 unit)
A laboratory course to complement BAELEC2 covering amplifier and digital circuits.
Pre-requisite: Basic Electronics Laboratory 1
Co-requisite: Basic Electronics 2

BAELEC3 **Basic Elecronics 3** (3 units)
An integrated course in basic electronics, covering Fourier transforms, Laplace transforms, registers, counters, memory units, algorithmic state machines, asynchronous logic, and interfacing.
Pre-requisite: Basic Electronics 2

LBYPHYM **Basic Electronics Laboratory 3** (1 unit)
A laboratory course to complement BAELEC3 emphasizing microcontroller programming and computer interfacing.
Pre-requisite: Basic Electronics Laboratory 2
Co-requisite: Basic Electronics 3

BIOTICS **Bioethics** (3 units)
This course offers a broad and basic understanding of bioethics. It deals with the ethical issues that have resulted from modern biomedical technology, e.g., patients' rights, genetic engineering.

General Education Courses

ENGLCOM **Basic Communication and Study Skills** (3 units)
A course that primarily focuses on the development of communicative competence in reading and writing. ENGLONE will use various strategies in academic reading, and the process approach to academic writing. Evaluation will include traditional and nontraditional (portfolio assessment) methods.

ENGLRES **Basic Research Skills/ English for Specific Purpose** (3 units)
A course that advances the basic academic reading and writing skills learned in English One. It also enhances the critical thinking skills necessary in conducting research and develop skills

required in technical communication of a particular field (Business, Computer Science, Engineering, Liberal Arts, Education, Science.)
Pre-requisite: Basic Communication and Study Skills

SPEECOM **Oral Communication/ Advance Speech Class** (3 units)
An English for Specific Purposes (ESP) course that focuses on the production, delivery and assessment of the following, the impromptu, lecture and /or persuasive speech for individual presentation, and the group/panel discussion for group presentation. The presentation aim at providing first-hand experience in public speaking to develop their self-confidence and critical thinking.
Pre-requisite: Basic Communication and Study Skills

HUMALIT **Introduction to Literature** (3 units)
The study of literary forms or genres as exemplified by selected literary texts from various countries at different historical periods.
Pre-requisite: Basic Research Skills/ English for Specific Purpose

HUMAART **Introduction to Art** (3 units)
An introduction to the elements and principles of art (music, dance, architecture, sculpture, painting and film) through a critical examination of the major art works, movements and styles in the Philippines and the world. It is principally a study of arts as processes of the creative imagination in dynamic interaction with its multi-faceted worlds.
Pre-requisite: Basic Research Skills/ English for Specific Purpose

SOCTEC1 **Science, Technology and Society 1** (3 units)
The course focuses on the interface between science and technology on the one and human society and culture on the other. The course analyzes how science influences and is influenced by prevailing views and attitudes in society about the individual person, human culture and society, and human and social development and progress.

SOCTEC2 **Science, Technology and Society 2** (3 units)
The course is about the influence and consequences of science and technology on various aspects of society, such as the environment, the economy, modernization and globalization, social and power relations, and governance.
Pre-requisite: Science, Technology and Society 1

FILKOMU **Komunikasyon sa Filipinohiya** (Basic Communication in Filipino, 3 units)
Gamit ang Wika sa higit na mataas na makrokasanayan sa pagtalakay ng Araling Pilipinas (Philippines Studies) sa pagkilala at pag-unawa sa sarili at sa pambansang identidad, kultura at lipunan. Pangkalahatang saklaw ng kurso ang pagtatamo ng bawat lasalliang estudyante ng kompetens sa komunikasyon sa apat na diskors na may kontent ng Filipinolohiya sa larangang akademik.

FILDLAR **Pagbasa at Pagsulat sa Iba't-ibang Disiplina** (Filipino for Specific Purposes, 3units)
Fokus ng kurso ang paglinang ng mga kasanayan sa analitikal at kritikal na pagbasa at pagsulat para sa pangangailangang akademik at komunikasyon pamprofesyonal na nagsasaalang-alang sa

ibat ibang rejister ng wika. Pag-aralan ang mga teknik sa pagsasalin at estratehiya sa pagbasa na lampas sa komprehensyon gamit ang mga genre na nakasulat (maging naririnig, napapanood) na tekstong disiplinal o buhat sa ibat ibang larangan ng gamit ng wika-humanidades, agham panlipunan at komunikasyon, at agham at teknolohiya, at profesyon. Magsisilbing modelo ang mga babasahin sa pagsulat ng mga iskolarling sanaysay at riserts.
Pre-requisite: Komunikasyon sa Filipinohiya

KASPIL1 **Buhay, mga Sinulat at Nagawa ni Dr. Jose Rizal** (**Rizal Studies**, 3 units)
Isang kritikal na pagaaral at pagsusuri sa buhay, mga akda at nagawa ni Dr. Jose Rizal mula pagkabata hanggang sa siya ay itanghal na isang bayani. Tinatalakay din sa kurso ang panahong pre-kolonyal hanggang sa kolonyalismong Espanyol sa Pilipinas na may diin sa ika-19 na dataon na siyang panahong ginalawan ni Dr. Jose Rizal. Ang kurso ay alinsunod sa itanatadhana at diwa ng Batas Rizal (R.A.1425, 1956) na naglalayong matugunan ang pangangailangan ng pangkasalukuyang panahon na mapagtibay ang damdaming makabayan ng mga magaaral.

KASPIL2 **Kasaysayan mg Pilipinas (Philippine History,** 3 units)
Isang mapamunang pag-aaral ng kasaysayan ng Pilipinas at ang kanyang mga institusyong pulitikal, ekonomiko, sosyal at kultural mula sa pagkakatatag ng Unang Republika hanggang sa kasalukuyan ayon sa pananaw ng isang Pilipino. Tinatalakay nito ang pagkabuo, pagunlad at ang mga hinarap na suliranin ng bansang Pilipinas sa bawat yugto ng kasaysayan mula sa pananakop ng mga Amerikano. Sa kursong ito, maipapaalam sa mga mag-aaral ang prosesong historikal bilang isang disiplina ng agham panlipunan at sa napakahalagang papel nito sa pag-unawa at pagbibigay solusyon sa mga isyung kinakaharap ng bansa sa kasalukuyan.
Pre-requisite: Buhay, mga Sinulat at Nagawa ni Dr. Jose Rizal

INTFILO **Introduction to Philosophy** (3 units)
Philosophy, both as a way of life and an academic discipline, examines and understands the fundamental questions about the world and human life, seeks answers to these questions, and applies the answers to daily living. It also examines the basis upon which beliefs are held, and explodes possible interconnections among various fields of knowledge. This course shall introduce students to the ideas of some of the world's greatest philosophers, which have shaped the way in which human beings think and live.

TREDONE **Humanity's Search for Life** (3 units)
In the Asian context, religion is bound up with the people's stories about the search for life and salvation. It is at the core of the Asian way of life. As the course looks at the uniqueness of the different religious traditions, the students are led to a critical appreciation of and openness to the truth-claims as expressed in their beliefs, norms, and rituals. This discovery will lead students to a greater interest in interreligious and ecumenical dialogue and to a mature faith.

TREDTWO **The Filipino Christian in a Changing World** (3 units)
This course will help students to develop as persons in communties of moral discernment. The Filipino-Christian living in a rapidly changing world is confronted with challenges and alternative lifestyles which demand proper discernment, evaluation and decision.
Pre-requisite: Humanity's Search for Life

TREDTRI **The Christian and the Word** (3 units)
The project aims to develop a manual for the course, The Christian and the Word (TREDTRI), consisting of a student guide and an instructional guide for TREDTRI teachers. The student guide and the instructional guide will indicate the topics, learning objectives, methodology, activities, evaluation, and resournces pertinent to the course.
Pre-requisite: The Filipino Christian in a Changing World

TREDFOR **The Christian Vocation to Life** (3 units)
The search for meaning is inseparable from one's chosen sate of life. Taking into account insights from relevant disciplines, the course deepens the students' general understanding of the universal call to holiness of the Reign of God and various responses to it. Moreover, the course prepares then to live in accord with their chosen reponse to God's call in an authentic and Lasallian Christian manner.
Pre-requisite: The Christian and the Word

GREATWK **The Great Works** (3 units)
The course is designed to center on a theme built around three Great Works from various cultures/disciplines that have exerted influence on the way human beings think about themselves in relation to the world. The course will be taught by a team of three teacher-facilitators who will rotate every four weeks in three classes. Each teacher will facilitate the reading and discussion of one work. Towards the end of the term, the teachers will meet as a team with all the students of the three classes in sessions that will serve to integrate the discussions on the three Great Works. Through the course, students are given a venue to participate in multidisciplinary discourses on how a particular Great Work "reads" or "thinks through" the human problems with new perspectives and paradigms.

FWTEAMS **Fitness and Wellness in Team Sports** (2 units)
The course aims to provide an opportunity to introduce fundamentals skills of specific team sports and strategies of organized team sports, their history and development, international amateur rules, system of play plus the facts and concepts of cardiorespiratory endurance, body composition, muscolus-skeletal fitness like flexibility, muscular strength, endurance and common team sports injuries prevention and rehabilitation.

FWSPORT **Fitness and Wellness in Individual/Dual Sports** (2 units)
An introductory course designed to familiarize freshman students with basic concepts, principles and practices focusing on the integration of Health-related, Performance related Physical Fitness skills, sport specific Skills and Wellness in order to develop and maintain an active lifestyle.

FWDANCE **Fitness and Wellness in Dance** (2 units)
This course introduces the students to the fundamental step patterns of simple to intricate variations of selected classic dance sport dances, contemporary classic Filipino and Filipino rhythmic dances. It also encourages the students to choreograph variations of their own. Students express their feelings or emotions through movements disciplined by rhythm. Dance etiquette, health and safety in dancing, posture and body mechanics are also included together with other concepts of fitness other than performance and health related fitness.

PERSEF1 **Personal Effectiveness 1** (2 units, non-academic)
The Lasallian Core Curriculum of the DLSU-Manila aims at developing a whole person who embodies the Lasallian values and demonstrates professional skills as well as personal competencies. This individual is mature in all aspects of his/her person, with a nationalistic and humanistic outlook and carefully reasoned faith. PERSEF1 is a foundational course in the Lasallian Core curriculum, to be taken by all students in their first year. It provides the information and skills that they need in order to adjust to college life. The course covers basic topics in each of the 5 themes of total personal development, designed to complement their academic and spiritual growth. These themes will be further explored in the 2 Personal Effectiveness courses which the students will take in later years.

PERSEF2 **Personal Effectiveness 2** (2 units, non-academic)
PERSEF 2 is a formative course in the Lasallian Core Curriculum, taken by students in their 2nd or 3rd year, before they take their practicum courses. It focuses on their preparation for entry into the world of work. It is based on the theory that career is a developmental process that starts in childhood and goes on through life. One's career development is thus affected by, and affects, one's physical, socio-psychological, spiritual and cognitive development. The topics of the various sessions revolve around the same 5 themes of total personal development, which were covered in PERSEF1, but take on a different level with emphasis on career development.
Pre-requisite: Personal Effectiveness 1

PERSEF3 **Personal Effectiveness 3** (2 units, non-academic)
PERSEF 3 is an integrative course in the Lasallian Core Curriculum, taken by all students in their final year. It provides them the opportunity to assess their development as individuals and to plan the rest of their lives as Lasallians in the community. It covers topics in the 5 themes of total personal development, taking these to a level of introspection as well as application.
Pre-requisite: Personal Effectiveness 2