

COLLEGE OF SCIENCE

May 26, 2013

ACADEMIC DEPARTMENTS

The College of Science has five Academic Departments as given hereafter.

Academic Department	Degrees
Mathematical Sciences	Bachelor of Science Degree in Mathematics
Physics	Bachelor of Science Degree in Physics
Chemistry	Bachelor of Science Degree in Chemistry Bachelor of Science Degree in Biochemistry
Biology	Bachelor of Science Degree in Biology (General Biology Concentration) Bachelor of Science Degree in Biology (Environmental Biology Concentration) Bachelor of Science Degree in Biology (Cellular and Molecular Biology Concentration)
Geology	Bachelor of Science Degree in Geology (Applied Geology Concentration) Bachelor of Science Degree in Geology (Petroleum Geology Concentration)

GRADUATION REQUIREMENTS

A student must obtain 120 **Credit Hours** to graduate according to the following:

1. Common Requirements 30 - 36 Credit Hours depending on the major chosen.

The following common requirements apply to all students in the College:

1.1 University General Requirements **21 - 27 Credit Hours**

1.2 College Compulsory Requirements **9 Credit Hours**

Course No.	Course Title	Semester	Prerequisite	Credit Hours
ITBP 103	Principles of Information Technology	1&2	INTU 1420	3
MATH 105	Calculus 1	1&2	MATU 1435	3
PHYS 105	General Physics 1	1&2	MATU 1435	3

1.3 Free Elective Requirements **0-3 Credit Hours**

The student may select any course offered by the any of the Colleges to fulfill this requirement

2. Major specialization and supporting courses requirement: 75 to 87 Credit Hours, selected to fit the chosen major as set out in the specifications of each individual department.

Department Of Physics

The department offers the degree of Bachelor of Science (B.Sc.) in Physics-General Physics Concentration and Bachelor of Science (B.Sc.) in Physics/Medical Physics concentration. The admission in the Medical Physics track is currently frozen. The department also offers a minor in Physics for students of other departments and colleges. The department is committed to high quality teaching in its programs and is actively engaged in enhancing the learning environment for its students. Several educational and experimental facilities are available in the department including, laboratories, multimedia facilities and specialized software packages for different courses.

Graduation Requirements

(1) Common Requirements:

33 Credit Hours

(1.1) General Education Requirements

24 Credit Hours

(1.2) College Requirements

9 Credit Hours

The Details about the above common requirements are provided under the section entitled college of science.

(2) Major Specialization and Supporting Courses Requirements:

78 Credit Hours

(2.1) Major Compulsory Requirements

36 Credit Hours

(2.2) Major Elective Requirements:

6 Credit Hours

(2.3) Supporting Compulsory Requirements:

18 Credit Hours

(2.4) Supporting Elective Requirements:

18 Credit Hours

(3) Internship

6 Credit Hours

(4) Free Electives

3 Credit Hours

TOTAL:

120 Credit Hours

Major Specialization Requirements

42 Credit Hours

A. Compulsory Courses

36 Credit Hours

Course No.	Course Title	Semester	Prerequisite	CH
PHYS 110	General Physics II	1 & 2	PHYS 105	3
PHYS 135	General Physics Lab I	1 & 2	PHYS 105*	1
PHYS 140	General Physics Lab II	1 & 2	PHYS 110*	1
PHYS 205	Intermediate Physics Lab I	1 & 2	PHYS 235*	1
PHYS 210	Intermediate Physics Lab II	1 & 2	PHYS 140 + PHYS 220* + PHYS 250*	1
PHYS 220	Thermal Physics	1 & 2	PHYS 105	3
PHYS 230	Electronics	1 & 2	PHYS 110	2
PHYS 235	Waves and Optics	1 & 2	PHYS 105	3
PHYS 250	Modern Physics	1 & 2	PHYS 105 + MATH 105	3
PHYS 255	Mathematical Physics	1 & 2	PHYS 105 + MATH 110	3
PHYS 262	Classical Mechanics	2	PHYS 255 or MATH 275	3
PHYS 312	Statistical Physics	2	PHYS 220	2
PHYS 315	Intermediate Physics Lab III	1 & 2	PHYS 140 + PHYS 230* + PHYS 250*	1
PHYS 335	Electromagnetic Theory I	1 & 2	a minimum 108 CH + PHYS 490* + PHYS 500*	3
PHYS 355	Quantum Mechanics I	1 & 2	PHYS 250 + (PHYS 255 or MATH 275)	3
PHYS 490	Modeling of Physical Systems	1 & 2	a minimum 108 CH + PHYS335*+PHYS 500*	3

* Concurrent

B. Elective Courses

6 Credit hours

Course No.	Course Title	Semester	Prerequisite	CH
PHYS 390	Introduction to Astrophysics	1 & 2	PHYS 105 + MATH 110	3
PHYS 330	Computational Physics	1 & 2	MATH 140 + PHYS 110	3
PHYS 345	Laser Physics	1 & 2	PHYS 250	3
PHYS 470	Solid State Physics	1 & 2	PHYS 250 + PHYS 312	3
PHYS 495	Selected Topics	1 & 2	**	3

* Concurrent

** Department Consent

Supporting Requirements**36 Credit hours****A. Compulsory Courses****18 Credit hours**

Course No.	Course Title	Semester	Prerequisite	CH
CHEM 111	General Chemistry I	1 & 2	-	3
MATH 110	Calculus II	1 & 2	MATH 105	3
MATH 140	Linear Algebra I	1 & 2		3
MATH 275	Ordinary Differential Equations	1 & 2	MATH 110 & MATH140	3
PSY 313	Educational Psychology	1	---	3
STAT 210	Probability & Statistics	1 & 2	MATH110	3

B. Elective Courses**18 Credit hours**

Upon the approval of the Department, a student may select to study a sequence of courses of a total of 18 Credit Hours constituting a specific minor

Professional Internship Program**6 Credit hours**

Course No.	Course Title	Semester	Prerequisite	CH
PHYS 500	Internship	1&2	108 + GPA ≥ 2.00 Department approval	6

4. Free Elective Requirements:**3 Credit Hours**

The student may select any course offered by the any of the Colleges to fulfill this requirement

Minor in Physics

The department offers a minor in Physics for the students of other departments and colleges.

Course No.	Course Title	Semester	Prerequisite	CH
PHYS 220	Thermal Physics	1 & 2	PHYS 105	3
PHYS 230	Electronics	1 & 2	PHYS 110	2
PHYS 235	Waves & Optics	1 & 2	PHYS 105	3
PHYS 250	Modern Physics	1 & 2	PHYS 105 + Math 105	3
PHYS 255	Mathematical Physics	1 & 2	PHYS 105+Math 110	3
PHYS 262	Classical Mechanics	2	MATH 275 or PHYS 255	3
PHYS 390	Introduction to Astrophysics	1 & 2	PHYS 105+Math 110	3
PHYS 312	Statistical Physics	2	PHYS 220	2
PHYS 330	Computational Physics	1 & 2	MATH 140 + PHYS 110	3
PHYS 345	Laser Physics	1 & 2	PHYS 250	3
PHYS 355	Quantum Mechanics I	1 & 2	PHYS 250+(PHYS 255 or MATH 275)	3
PHYS 470	Solid-State Physics	1 & 2	PHYS 250 + PHYS 312	3

Courses Descriptions

PHYS105 – General Physics I

3 Credit Hours (3+0)

This course aims at developing a clear understanding of the basic concepts in Mechanics. The course includes: physics and measurements, vectors, motion in one and two dimensions, Newton's laws of motion and their applications, work and energy, rotational dynamics, rolling motion, conservation of angular momentum. **(Prerequisite: None)**

PHYS110 – General Physics II

3 Credit Hours (3+0)

This course aims at developing a clear understanding of the basic concepts in electricity and magnetism. The course includes: Coulomb's law, electric fields, Gauss's Law, electric potential, capacitance and dielectrics, resistance, direct current circuits, magnetic fields, electromagnetic induction. **(Prerequisite: PHYS105)**

PHYS135 – General Physics Lab I

1 Credit Hour (0+3)

The course objectives are: developing a clear understanding of the basic concepts in physics, consolidating manual skills in dealing with laboratory equipment, and developing skills for using computers in the analysis of computer interfaced experiments. The course includes: fine measurements, force tables, motion on an inclined plane, verification of Newton's second law, the simple pendulum, circular motion, viscosity, Young's modulus, electrical equivalent of heat, and thermal conductivity. **(Prerequisite: PHYS105 or concurrent)**

PHYS140 – General Physics Lab II

1 Credit Hour (0+3)

The course objective is to develop a clear understanding of the basic concepts in electricity. It includes: Coulomb's law, equipotential surfaces and electric field lines, capacitors, Ohm's law, Kirchhoff's rules, Wheatstone bridge, the RC time constant, magnetic flux density, cathode ray oscilloscope, self-inductance, R-L-C series and parallel resonance. **(Prerequisite: PHYS110 or concurrent)**

PHYS205 – Intermediate Physics Lab I

1 Credit Hour (0+3)

The course objectives are: Developing a clear understanding of the basic concepts in waves, vibrations, and lasers. It includes: free damped oscillations, forced oscillations, standing waves, interference of sound waves, spherical mirror and thin lenses, the optical spectrometer, interference of light waves, diffraction of light waves, polarization of light, and Polari meter. **(Prerequisite: PHYS235 or concurrent)**

PHYS210 – Intermediate Physics Lab II

1 Credit Hour (0+3)

This course aims at developing an understanding of the basic experiments in thermal and modern physics. It includes: thermometer, Stefan-Boltzmann's law, thermal radiation, photoelectric effect, electron diffraction, magnetic hysteresis, Faraday effect, Frank-Hertz experiment, Zeeman effect, β -particle detection, and x-ray diffraction. **(Prerequisite: PHYS140 & PHYS220 or concurrent & PHYS250 or concurrent)**

PHYS220 – Thermal Physics

3 Credit Hours (3+0)

This course aims at developing an understanding of the main concepts, fundamental laws, and applications of classical thermodynamics. It includes the definitions of the most important thermodynamic properties like temperature, pressure, equation of state, internal energy, work, thermodynamic potentials, free energy functions and entropy. It also introduces the three fundamental laws of thermodynamics. In addition, this course develops a working knowledge of some practical applications of thermodynamics in daily life, like air conditioners, refrigerators, and car engines. **(Prerequisite: PHYS105)**

PHYS230 – Electronics

2 Credit Hours (2+0)

This course aims at developing a clear understanding of the basic concepts in electronics. It includes: semiconductor p-n junction, bipolar junction transistor, field-effects, transistor-transistor dc biasing, small-signal analysis in transistor circuits, operational amplifier, integrated circuits, feedback amplifiers, and oscillators. **(Prerequisite: PHYS110)**

PHYS235 – Waves & Optics

3 Credit Hours (3+0)

This course aims at developing a clear understanding of the basic concepts in vibrations, waves, light, and optics. It includes the following topics: oscillatory motion, wave motion, sound waves, superposition and standing waves, electromagnetic waves, the nature of light, laws of geometric optics, image formation by lenses and mirrors, some optical instruments, interference, diffraction and polarization of light. **(Prerequisite: PHYS105)**

PHYS250 – Modern Physics

3 Credit Hours (3+0)

This course aims at studying the basic concepts of modern. It includes the following topics: special relativity, in particular the mass-energy relation, photonic nature of radiation, wave properties of particles, hydrogen atom, an introduction to quantum mechanics, Schrodinger equation, and simple applications to solid-state and nuclear physics. **(Prerequisite: PHYS105 & MATH105)**

PHYS255 – Mathematical Physics**3 Credit Hours (3+0)**

This course aims at developing the mathematical techniques and skills needed for advanced physics courses. It includes the following topics: vector analysis, complex analysis, Fourier series and transforms with applications, series solutions to ODEs, and special functions. **(Prerequisite: PHYS105 & MATH110)**

PHYS262 – Classical Mechanics**3 Credit Hours (3+0)**

The course aims at studying the classical kinematics and dynamics of point-like objects and rigid bodies. It includes the following topics: particle kinematics in various coordinate systems, particle dynamics, central-force motion, rigid body mechanics, and introduction to lagrangian and hamiltonian methods. **(Prerequisite: PHYS255 or MATH110)**

PHYS312 – Statistical Physics**2 Credit Hours (2+0)**

This course aims at developing a clear understanding of the basic concepts in statistical physics as an integrated part of the student's overall curriculum. It includes the following topics: statistical equilibrium, statistical distributions: Maxwell-Boltzmann, Fermi-Dirac, Bose-Einstein, and various applications. **(Prerequisite: PHYS220)**

PHYS315 – Intermediate Physics Lab III**1 Credit Hour (0+3)**

This course aims at developing the experimental skills in the field of electronics and computer interfacing with electronic circuits. It includes the following topics: manually operated and computer-interfaced experiments on diodes, transistors, operational amplifier, and oscillators and their applications. **(Prerequisite: PHYS140 & PHYS230 or Concurrent & PHYS250 or Concurrent)**

PHYS335 – Electromagnetic Theory**3 Credit Hours (3+0)**

The course aims at establishing the basic knowledge of the electric and magnetic fields, both static and time-dependent. It includes the following topics: electrostatics (Gauss's law, electric fields in materials, polarization, boundary-value problems, Poisson and Laplace equations), magnetostatics (Biot-Savart's law, Ampere's law, scalar and vector potentials, magnetization of materials), Faraday's law, and Maxwell's equations. **(Prerequisite: a minimum 108 CH + PHYS 490* + PHYS500*)**

PHYS355 – Quantum Mechanics**3 Credit Hours (3+0)**

This course aims at developing a clear understanding of the basic concepts in quantum physics. It includes the following topics: concepts of quantum mechanics, Schrodinger's equation, stationary states, operators, one dimensional problems, angular momentum, 3D problem like hydrogen atom, methods of approximation, and helium atom. **(Prerequisite: PHYS250 & (PHYS255 or MATH275))**

PHYS490 – Modeling of Physical Systems**3 Credit Hours (3+0)**

This course is intended to integrate the physical concepts that have been learned by students in many other previously taken courses. The course provides the basic mathematical and numerical methods, as well as the conceptual elements, needed for using a computer-supported learning system. Numerical methods are used for solving linear and non-linear equations, ordinary and partial differential equations. These methods will be applied to simulate classical and quantum physical systems. Applications include classical motion such as: projectile, oscillatory, diffusion, and wave equation, and quantum systems such as: fields, atoms, molecules, crystals, and complex structures. **(Prerequisite: a minimum 108 CH + PHYS335*+PHYS500*)**

PHYS390 – Introduction to Astrophysics**3 Credit Hours (3+0)**

This course aims at introducing the essentials of celestial mechanics. It includes the following topics: basic radiation theory and spectra, observational determination of stellar properties and spectral classification, binary systems, H-R diagrams, stellar populations, stellar structure and evolution, white dwarfs, neutron stars, and black holes. It also discusses the properties of galaxies like structure, composition, and the interstellar medium. It discusses the topics of active galaxies and cosmology. **(Prerequisite: PHYS105 & MATH110)**

PHYS330 – Computational Physics**3 Credit Hours (3+0)**

This course aims at introducing the basic concepts and principles of numerical methods. It includes: principles of numerical analysis, some important numerical algorithms, mathematical modeling of physical systems, application of numerical techniques to mathematical models, computer simulations of physical systems, and the Monte-Carlo method with some applications. **(Prerequisite: PHYS110 & MATH140)**

PHYS345 – Laser Physics**3 Credit Hours (3+0)**

This course aims at developing a clear understanding of the basic principles of the laser action and applications of lasers. It includes the following topics: spontaneous and stimulated emission of radiation, Einstein's coefficients, population inversion, laser amplification and oscillation, laser frequencies, laser rate equation, different types of lasers, laser light characteristics, laser applications. **(Prerequisite: PHYS250)**

PHYS470 – Solid State Physics**3 Credit Hours (3+0)**

This course aims at developing a clear understanding of the basic concepts in the physics of the solid state. It includes the following topics: crystal structure, reciprocal lattice, X-ray diffraction, lattice vibrations, heat capacity, free electrons, electrical conduction in metals and semiconductors, band theory, and magnetic properties. **(Prerequisite: PHYS250 & PHYS312)**

PHYS495 – Selected Topics**3 Credit Hours (3+0)**

This course aims at studying a special topic that will serve the needs of the student. The topic varies according to needs and demand, and is set by the department. **(Prerequisite: Departmental Consent)**

PHYS500 – Internship**6 Credit Hours**

The internship program aims at presenting the students with opportunities to experience practical work in selected internship-providers sites. Students are expected to carry out tasks assigned to them under the supervision of a site supervisor and an academic supervisor. The period of such an internship is 8 consecutive weeks during the student's last semester before graduation. **(Prerequisite: a minimum of 108 CH & GPA $\geq$ 2.00)**

Courses Offered to the other colleges**PHYS100 – Astronomy****3 Credit Hours (3+0)**

This general education course aims at developing a clear understanding of the basics of astronomy. It discusses the following topics: getting to know the sky, figuring out how things work the family of the sun, the sun (our very own star), learning about stars, understanding stars, galaxies, and cosmology. **(Prerequisite: None)**

PHYS101 – Conceptual Physics**3 Credit Hours (3+0)**

This general education course aims at developing a basic understanding of the physical concepts needed in a modern life. It discusses the following topics: mechanics and motion, properties of matter, heat, sound, electricity and magnetism, light, atomic and nuclear Physics, and relativity. **(Prerequisite: None)**

PHYS110 – Physics and Engineering Applications I**4 Credit Hours (2+2)**

The course aims at developing a clear understanding of the basic physics concepts in mechanics for students from the Engineering College. It includes the following topics: units and dimensions of physical quantities, vectors, kinematics, Newton's laws of motion, work and energy, linear momentum and collision, angular momentum, rotational motion about an axis and its engineering applications. The course includes laboratory sessions with emphasis on engineering applications.

(Prerequisite: None)**PHYS1120 – Physics and Engineering Applications II****4 Credit Hours (2+2)**

The course aims at developing a clear understanding of the basic physics concepts in electricity and magnetism for students from the Engineering College. Topics covered include: Coulomb's Law, the electrostatic field, the electrostatic potential, capacitance and dielectrics, the electric current, the magnetic field and magnetic forces, electromagnetic induction, AC circuits, engineering applications in electricity and magnetism. The course includes laboratory sessions with emphasis on engineering applications.

(Prerequisite: PHYS110)**PHYS125 – Introductory Physics for IT****3 Credit Hours**

The course is offered solely to the information technology students (IT) to provide them with the necessary knowledge in physics. It includes: Motion in one dimension, Vectors and two-dimensional motion, Laws of motion, Energy, Vibrations and waves, Reflection and Refraction of light, Mirrors and Lenses, Wave optics, Electric Forces and electric fields, Electrical energy and capacitance, Current and resistance, Direct-current circuits, Magnetism. **(Prerequisite: None)**

NSCI260 – Natural Sciences I (Physics & Chemistry)**3 Credit Hours (2+3)**

This course aims at providing students from the College of Education with basic concepts in physics and chemistry. It is taught jointly by the Physics and Chemistry Departments. The Physics topics are as follows: physical quantities and units, rudiments of mechanics, mass density and pressure, heat and temperature, waves, and work and energy. The Chemistry topics are: atomic theory of matter, the constituents of the atom, periodic table, chemical bounds, and environmental chemistry.

(Prerequisite: None)

