University of Jordan

Faculty of Science / Physics Department

Study Plan for B.Sc. in Physics (2012/2013)

Offered Degree: B.Sc. in Physics

A. Plan Constituents:

The study plan for the B.Sc. in physics consists of (132) credit hours distributed among three categories as follows:

	Requirement Type	Credit Hours
First	University Requirements	27
Second	Faculty Requirements	21
Third	Specialty Requirements	84
	Total	132

B. Numbering System:

1. Department Codes

Department	Number
Mathematics	1
Physics	2
Chemistry	3
Biological Sciences	4
Geology	5

2- Course Codes:

Field Code	Specialized Field	Field Code	Specialized Field
0	General Physics	5	Mechanics
1	Practical Physics	6	Modern Physics
2	Waves and Optics	7	Solid State Physics
3	Electronics and Electricity and Magnetism	8	Mathematical and Computational Physics
4	Thermal and Statistical Physics	9	Special Topics and Research Methods

Study Plan for B.Sc. in Physics (2012/2013)

1) **University Requirements (27 credit hours):**
   i. **Obligatory University Requirements (12 credit hours)**
   ii. **Elective University Requirements (15 credit hours)**
2) **Faculty Requirements (21 obligatory credit hours): These include the following:**

Course No.	Course Title	Weekly hrs		credit hrs	Pre-requisite
		Theoretical	Experimental		
0301101	Calculus-1	3	-	3	-
0302101	General Physics-1	3	-	3	High school physics or Remedial Physics (0302099)
0303101	General Chemistry-1	3	-	3	High school chemistry or Remedial chemistry (0303099)
0304101	General Biology-1	3	-	3	-
0305101	General Geology-1	3	-	3	-
0301131	Principles of Statistics	3	-	3	-
1901102	Computer Skills-2 (C++)	3	-	3	Pass Remedial Computer Skills exam (1902099)

3) **Specialty Requirements: (84 credit hours)**
   i. **Obligatory Specialization Requirements (66 credit hours) these include the following:**

Course No.	Course Title	Weekly hrs		credit hrs	Pre-requisite
		Theoretical	Experimental		
0301102	Calculus-2	3	-	3	0301101
0301201	Calculus-3	3	-	3	0301102
0302102	General Physics-2	3	-	3	0302101
0302111	Practical Physics-1	-	3	1	0302101 or concurrent
0302112	Practical Physics-2	-	3	1	0302102 or concurrent
0302199	Mechanical Workshop	-	3	1	-
0302215	Practical Physics-3	1	3	2	0302221
0302221	Optics-1	3	-	3	0302112
0302231	Electronics	3	-	3	0302112
0302261	Modern Physics	3	-	3	0302102
0302280	Software Packages in Physics	1	3	2	0302261
0302281	Mathematical Physics-1	3	-	3	0301102
0332282	Mathematical Physics-2	3	-	3	0302281
0352311	Practical Physics-4	-	6	2	0302215 and 0302261
0302312	Practical Electronics	-	3	1	0302231 or concurrent
0302331	Electricity and Magnetism-1	3	-	3	0332282
0342332	Electricity and Magnetism-2	3	-	3	0302331
0332341	Thermal Physics	3	-	3	0302261
0302351	Classical Mechanics-1	3	-	3	0302281
0332352	Classical Mechanics-2	3	-	3	0302351
0302360	Special Theory of Relativity	2	-	2	0302351
0332361	Quantum Mechanics-1	3	-	3	0302281 and 0302261
0342411	Practical Physics-5	-	6	2	0352311 and 0342461
0342461	Quantum Mechanics-2	3	-	3	0332361
0302463	Nuclear Physics	3	-	3	0332361
0302471	Solid State Physics	3	-	3	0332361
0302490	Scientific Research Methodologies	1	-	1	Department approval

ii. Elective Specialization Requirements: (18 credit hours) from the following list:

Course No.	Course Title	Weekly hrs		credit hrs	Pre-requisite
		Theoretical	Experimental		
0301221	Ordinary Differential Equations-1	3	-	3	0301102
0331321	Partial Differential Equations-1	3	-	3	0301221
0302265	Radiation Physics	3	-	3	0302261
0332271	Polymer Physics	3	-	3	0302102
0302300	Environmental Physics	3	-	3	-
0302301	Alternative Energy Sources	3	-	3	0302101
0302321	Optics-2	3	-	3	0302221
0302330	Digital Electronics	3	-	3	0302231
0302366	Nondestructive Testing	3	-	3	0332361
0332371	Physics of Materials	3	-	3	0302261
0302447	Statistical Physics	3	-	3	0332341
0302462	Atomic and Molecular Physics	3	-	3	0332461
0302464	Astrophysics	3	-	3	0302351 and 0342332
0342466	Elementary Particles	3	-	3	0332361
0302472	Physics of Semiconductors	3	-	3	0302471
0302496	Special Topics	3	-	3	Department approval

Courses Offered by the Physics Department

Course No.	Course Title	Weekly hrs		credit hrs	Pre-requisite
		Theoretical	Experimental		
0302099	Remedial Physics	3	-	3	-
0342100	Science and Society	3	-	3	-
0302101	General Physics-1	3	-	3	High School Physics or 0302099
0302102	General Physics-2	3	-	3	0302101
0342103	General Physics for Biological Science Students	3	-	3	High School Physics or 0302099
0342105	Physics for Medical and Dentistry Students	3	-	3	High School Physics or 0302099
0302111	Practical Physics-1	-	3	1	0302101 or concurrent
0302112	Practical Physics-2	-	3	1	0302102 or concurrent
0332113	Practical Physics for Biological Science Students	-	3	1	0342103 or concurrent
0302115	Practical Physics for Dentistry Students	-	3	1	0342105 or concurrent
0302199	Mechanical Workshop	-	3	1	-
0302215	Practical Physics-3	1	3	2	0302221
0302221	Optics-1	3	-	3	0302112
0302231	Electronics	3	-	3	0302112
0302261	Modern Physics	3	-	3	0302102
0302265	Radiation Physics	3	-	3	0302261
0332271	Polymer Physics	3	-	3	0302102
0302280	Software Packages in Physics	1	3	2	0302261
0302281	Mathematical Physics-1	3	-	3	0301102
0332282	Mathematical Physics-2	3	-	3	0302281
0302300	Environmental Physics	3	-	3	-
0302301	Alternative Energy Sources	3	-	3	0302101
0352311	Practical Physics-4	-	6	2	0302215 and 0302261
0302312	Practical Electronics	-	3	1	0302231 or concurrent
0302321	Optics-2	3	-	3	0302221
0302330	Digital Electronics	3	-	3	0302231
0302331	Electricity and Magnetism-1	3	-	3	0332282
0342332	Electricity and Magnetism-2	3	-	3	0302331
0332341	Thermal Physics	3	-	3	0302261
0302351	Classical Mechanics-1	3	-	3	0302281
0332352	Classical Mechanics-2	3	-	3	0302351
0302360	Theory of Special Relativity	2	-	2	0302351
0332361	Quantum Mechanics-1	3	-	3	0302281 and 0302261
0302366	Nondestructive Testing	3	-	3	0332361
0332371	Physics of Materials	3	-	3	0302261
0342411	Practical Physics-5	-	6	2	0352311 and 0342461
0302447	Statistical Physics	3	-	3	0332341
0342461	Quantum Mechanics-2	3	-	3	0332361
0302462	Atomic and Molecular Physics	3	-	3	0342461
0302463	Nuclear Physics	3	-	3	0332361
0302464	Astrophysics	3	-	3	0302351 and 0342332
0342466	Elementary Particles	3	-	3	0332361
0302471	Solid State Physics	3	-	3	0332361
0302472	Physics of Semiconductors	3	-	3	0302471
0302490	Scientific Research Methodologies	1	-	1	Department approval
0302496	Special Topics	3	-	3	Department approval

Advisory Plan for B.Sc. in Physics (2012/2013)

First Year

First Semester		
Course No.	Course Title	Credit Hrs
0301101	Calculus-1	3
0302101	General Physics-1	3
0302111	Practical Physics-1	1
0305101	General Geology-1	3
	University Requirement	3
	University Requirement	3
	Total	16

Second Semester		
Course No.	Course Title	Credit Hrs
0301102	Calculus-2	3
0302102	General Physics-2	3
0302112	Practical Physics-2	1
0303101	General Chemistry-1	3
	University Requirement	3
	University Requirement	3
	Total	16

Second Year

First Semester		
Course No.	Course Title	Credit Hrs
0302221	Optics-1	3
0302281	Mathematical Physics-1	3
0302261	Modern Physics	3
1901102	Computer Skills-2	3
0302199	Mechanical Workshop	1
	University Requirement	3
	Total	16

Second Semester		
Course No.	Course Title	Credit Hrs
0302231	Electronics	3
0301201	Calculus-3	3
0332282	Mathematical Physics-2	3
0302215	Practical Physics-3	2
0302280	Software Packages in Physics	2
0301131	Principles of Statistics	3
	Total	16

Third Year

First Semester		
Course No.	Course Title	Credit Hrs
0352311	Practical Physics-4	2
0332341	Thermal Physics	3
0302331	Electricity and Magnetism-1	3
0302351	Classical Mechanics-1	3
0304101	General Biology-1	3
	Elective Specialization Requirement	3
	Total	17

Second Semester		
Course No.	Course Title	Credit Hrs
0302312	Practical Electronics	1
0332332	Electricity and Magnetism-2	3
0332361	Quantum Mechanics-1	3
0332352	Classical Mechanics-2	3
0302360	Theory of Special Relativity	2
	Elective Specialization Requirement	3
	University Requirement	3
	Total	18

Fourth Year

First Semester		
Course No.	Course Title	Credit Hrs
0342461	Quantum Mechanics-2	3
0302471	Solid State Physics	3
0302490	Scientific Research Methodologies	1
	Elective Specialization Requirement	3
	Elective Specialization Requirement	3
	University Requirement	3
	Total	16

Second Semester		
Course No.	Course Title	Credit Hrs
0342411	Practical Physics-5	2
0302463	Nuclear Physics	3
	Elective Specialization Requirement	3
	Elective Specialization Requirement	3
	University Requirement	3
	University Requirement	3
	Total	17

Course Descriptions (B.Sc. in Physics)

(0302099) Remedial Physics

3 credit hrs

Pre-requisite: None

Kinematics in one dimension; vectors; kinematics in two dimensions; Newton's laws of motion; circular motion; work and energy; electric field; electric potential; direct currents; direct current circuits; magnetic field; magnetic force; magnetic induction.

(0342100) Science and Society

3 credit hrs

Pre-requisite: None

Traditional energy sources: oil, coal and gas, world reserves; global warming: effect of industrial pollution on the environment; renewable energy sources: solar and wind, their advantages compared to the traditional energy sources; nuclear energy: advantages and disadvantages: effect on the environment, coast of energy production, nuclear safety and nuclear security issues.

(0302101) General Physics-1

3 credit hrs

Pre-requisite: High School Physics or 0302099

Motion in one dimension; vectors; motion in two dimensions; the laws of motion; circular motion; conservation of energy; linear momentum and collisions; rotation of a rigid object about a fixed axis; angular momentum; static equilibrium; universal gravitation; fluid mechanics; oscillatory motion.

(0302102) General Physics-2

3 credit hrs

Pre-requisite: 0302101

Electric field; Gauss's law; electric potential; capacitance and dielectrics; current and resistance; direct curent circuits; magnetic field; sources of the magnetic field; Faraday's law; inductance; alternating current circuits; the nature of light and the principles of ray optics; image formation

(0342103) General Physics for Biological Sciences Students

3 credit hrs

Pre-requisite: High School Physics or 0302099

Motion in one dimension; motion in two dimensions; Newton's laws of motion; statics; work; energy and power; linear momentum; temperature and the behavior of gases; thermodynamics; thermal properties of matter; electric forces; radioactivity; interaction of radiation with matter; radiation units; harmful effects of radiation; applications of radiation in medicine.

(0342105) General Physics for Medical and Dentistry Student

3 credit hrs

Pre-requisite: High School Physics or 0302099

Velocity and acceleration; Newton's laws of motion; static equilibrium; work and energy; temperature and behavior of gases; the first law of thermodynamics; thermal properties of matter; mechanics of non-viscous fluids; mirrors; lenses: the human eye; radioactivity; interaction of radiation with matter; radiation units; harmful effects of radiation; applications of radiation in medicine.

(0302111) Practical Physics-1

1 credit hr

Pre-requisite: 0302101 or concurrent

11 experiments each of 3 hrs/week duration: collection and analysis of data; measurements and uncertainties; vectors: force table; kinematics of rectilinear motion; force and motion; collision in two dimensions; rotational motion; simple harmonic motion: simple pendulum; gas's Laws; ballistic pendulum; specific heat capacity of metals.

(0302112) Practical Physics-2

1 credit hr

Pre-requisite: 0302102 or concurrent

12 experiments each of 3 hrs/week duration: electric field mapping; specific charge of copper ions; power transfer; potentiometer; capacitors: RC time constant; Kirchhoff's laws; magnetic field of a current; lenses; Young's double slit experiment; electromagnetic induction; Ohm's law; Wheatstone bridge.

(0332113) Practical Physics for Biological Sciences Students

1 credit hr

Pre-requisite: 0342103 or concurrent

11 experiments each of 3 hrs/week duration: collection and analysis of data; measurements and uncertainties; vectors: force table; Newton's second law of motion; simple harmonic motion: simple pendulum; the laws of gases; Ohm's law; Wheatstone bridge; The potentiometer; Joule's heat.

(0302115) Practical Physics for Dentistry Students

1 credit hr

Pre-requisite: 0342105 or concurrent

11 experiments each of 3 hrs/week duration: collection and analysis of data; measurements and uncertainties; vectors: force table; Newton's second law of motion; simple harmonic motion: simple pendulum; the laws of gases; Ohm's law; Wheatstone bridge; The potentiometer; Joule's heat.

(0302199) Mechanical Workshop

1 credit hr

Pre-requisite: None

Exercises involving: filing and shaping of metals, marking, drilling and tapping work pieces; using the lathe; simple electric circuits.

(0302215) Practical Physics-3

2 credit hrs

Pre-requisite: 0302221

Theoretical lectures (one hour/weak) that describe the tools and techniques which are used in analyzing experimental data and errors. The topics include: error analysis, data fitting, graphs; statistical distributions.

The experimental part consists of 12 experiments each of 3 hrs/week duration: single slit diffraction; RC circuit; RLC circuit; measurement of e/m; Michelson interferometer; Newton's rings; Blackbody radiation; thermal conductivity; polarization of light and polarimetery; prism spectrometer; speed of light; double slit interference; quantitative reflectivity measurements for dielectrics and metals.

(0302221) Optics-1

3 credit hrs

Pre-requisite: 0302112

Nature of light; Huygens's principle; Fermat's principle; wave equation; superposition of waves; interference of light; optical interferometry; production of polarized light; Fraunhofer diffraction; diffraction grating.

(0302231) Electronics

3 credit hrs

Pre-requisite: 0302112

Fundamental concepts: semiconductors; diodes and application; bipolar junction; transistor; small signal bipolar amplifier; field effect transistors; operational amplifier; operational amplifier applications; digital electronics.

(0302261) Modern Physics

3 credit hrs

Pre-requisite: 0302102

Quantum nature of radiation: Blackbody radiation, photoelectric effect, Compton effect; wavelike properties of particles: De Broglie waves, particle diffraction; atomic structure: spectral series of hydrogen, Bohr's model; nuclear structure: Rutherford scattering; Schrödinger's equation in one dimension: particle in a box.

(0302265) Radiation Physics

3 credit hrs

Pre-requisite: 0302261

Atomic and nuclear structure; radiation sources; radioactivity and radiation; interaction of radiation with matter; radiation units and limits; radiation detection and measurement; radiation protection; radiation hazard and dosimetry; biological effects of radiation; application of radiation in medicine and engineering.

(0332271) Polymer Physics

3 credit hrs

Pre-requisite: 0302102

Macromolecules; molecular weight; molecular conformation; tactility; molecular elasticity; crystalline and amorphous polymers; crystal orientation; drawing; structural studies; fiber and lamella structure; commercial polymers; mechanical properties and mechanical testing; annealing and heat treatments; melting and glass transition temperatures.

(0302280) Software Packages in Physics

2 credit hrs

Pre-requisite: 0302261

Mathematica software will be used as a computational and programming tool. Students will be trained to solve problems in real and complex algebra, trigonometry, linear algebra, differential equations, and special functions.

(0302281) Mathematical Physics-1

3 credit hrs

Pre-requisite: 0301102

Complex numbers; linear equations; vectors; matrices and determinants; partial differentiation; multiple integrals; vector analysis; Fourier series; ordinary differential Equations.

(0332282) Mathematical Physics-2

3 credit hrs

Pre-requisite: 0302281

Coordinate Transformations; tensor analysis; gamma; beta and error functions; asymptotic series; Stirling's formula; elliptic integrals and functions; integral transforms; series solution of differential equations; Legendre polynomials; Bessel functions; set of orthogonal functions; partial differential equations; functions of a complex variable.

(0302300) Environmental Physics

3 credit hrs

Pre-requisite: None

Elements of the environment; pollution (in water; soil; and air) and methods of handling pollution levels; transport processes (micro scale, local, regional and global); introduction to atmospheric aerosols: formation; deposition and removal; physical properties; population of aerosol particles and concentrations; dynamics of single aerosol particles (motion in the fluid; drag force; settling; etc.); transformation of atmospheric aerosols: condensation, coagulation, impacts of air pollution.

(0302301) Alternative Energy Sources

3 credit hrs

Pre-requisite: 0302101

Solar cells and solar energy convertors; water; wind; bio-fuel; nuclear energy: fission, fusion.

(0352311) Practical Physics-4

2 credit hrs

Pre-requisite: 0302215 and 0302261

At least ten experiments each of six hours per week from the following list: Frank-Hertz experiment; thermionic emission; the characteristics of Geiger-Mueller counter and the absorption of radiation; statistical nature of nuclear counting; Millikan's Oil- Drop experiment; mechanical oscillations; photoelectric effect; measurements of dielectric constants of liquids; hall effect in a conductor; diffraction grating and Balmer series; electron diffraction; magnetic susceptibility; black-body radiation from thermionic emission.

(0302312) Practical Electronics

1 credit hr

Pre-requisite: 0302231 or concurrent

12 experiments each of 3 hrs/week duration: measurements; diode and transistor characteristics; rectification and filtering; Zener diode and regulation; transistor biasing; transistor amplifiers; operational amplifiers; comparators; sine wave oscillators; relaxation oscillators; logic gates; A/D and D/A using operational amplifiers.

(0302321) Optics-2

3 credit hrs

Pre-requisite: 0302221

Matrix treatment of polarization; Fresnel diffraction; theory of multilayer films; Fresnel equations; laser basics; laser applications; nonlinear optics and the modulation of light; optical properties of materials.

(0302330) Digital Electronics

3 credit hrs

Pre-requisite: 0302231

Number systems and codes; digital electronic signals and switches; basic logic gates; Boolean algebra and reduction techniques; exclusive-OR and Exclusive-NOR gates; arithmetic operations and circuits; code converters; multiplexers and de-multiplexers; flip-flops and registers; practical considerations for digital design; counter circuits; shift registers; multi-vibrators and 555 timer; interfacing to the analog world; microprocessor fundamentals.

(0302331) Electricity and Magnetism-1

3 credit hrs

Pre-requisite: 0332282

Electrostatics: electrostatic field; electrostatic potential; work and energy in electrostatics; conductors; calculation of electrostatic potentials: Laplace's equation; the method of images; separation of variables; multipole expansion; electrostatic fields in matter; magnetostatics; magnetostatic fields in matter.

(0342332) Electricity and Magnetism-2

3 credit hrs

Pre-requisite: 0302331

Electrodynamics: electromotive force; Faraday's law; Maxwell's equations; potential formulations; energy and momentum; electromagnetic waves: The wave equation; electromagnetic waves in nonconductors and conductors; dispersion; electromagnetic radiation; electrodynamics and special relativity.

(0332341) Thermal Physics

3 credit hrs

Pre-requisite: 0302261

Binary model system; entropy; temperature; thermal equilibrium; laws of thermodynamics; Boltzmann distribution; thermal radiation; chemical potential; Gibbs distribution; ideal Gas; Fermi-Dirac and Bose-Einstein distributions; thermodynamic functions; heat and work; heat engines; phase transformations; Van der Waals' equation of state; kinetic theory.

(0302351) Classical Mechanics-1

3 credit hrs

Pre-requisite: 0302281

Newtonian mechanics; oscillations: simple harmonic oscillator, damped oscillations, forced oscillations; gravitation; central force motion; rotating frames.

(0332352) Classical Mechanics-2

3 credit hrs

Pre-requisite: 0302351

Lagrangian mechanics; Hamiltonian mechanics; dynamics of systems of particles; dynamics of rigid bodies; coupled oscillators.

(0302360)Theory of Special Relativity

2 credit hrs

Pre-requisite: 0302351

Unification of space and time (space-time), inertial frames of reference, Lorentz transformation, length contraction and time dilation, Relativity of simultaneity, time travel, causality, unification of momentum and energy, transformation of mass and energy, preliminary introduction to curved space: general relativity.

(0332361) Quantum Mechanics-1

3 credit hrs

Pre-requisite: 0302281 and 0302261

Wave function and statistical interpretation; time-Independent Schrödinger equation, one-dimensional problems: infinite square well, harmonic oscillator (operator method), free particle, Dirac delta-function and finite well; Formalism: Hilbert space, Hermitian operators, Dirac notation; Schrödinger equation in spherical coordinates; The Hydrogen atom, quantum theory of angular momentum; spin-1/2 particle.

(0302366) Nondestructive Testing

3 credit hrs

Pre-requisite: 0332361

Common nondestructive testing (NDT) methods include: ultrasonic; magnetic particle (MT), liquid penetrant, radiographic, remote visual inspection (RVI), eddy current testing, and low-coherence interferometry; the benefits of using NDT methods in life, especially in agriculture, engineering, and medicine.

(0332371) Physics of Materials

3 credit hrs

Pre-requisite: 0302261

Atomic structure and interatomic bonding; crystalline solids; imperfections in solids; diffusion; mechanical properties of metals; dislocations and strengthening mechanisms; phase diagrams; phase transformations in metals; structure and properties of ceramics; polymer structures; composites.

(0342411) Practical Physics-5

2 credit hrs

Pre-requisite: 0352311 and 0342461

Ten experiments at least each of six hours per week from the following list: α-Ray spectroscopy; β-Ray spectroscopy; γ-ray spectroscopy; Faraday effect; Kerr effect; Hall effect on semiconductors; Zeeman effect; electron spin resonance; nuclear magnetic resonance; X-rays ; Compton scattering; Rutherford scattering; measurement of (e/K_B) ; speed of sound; photon polarization (applying Jones matrices).

(0302447) Statistical Physics

3 credit hrs

Pre-requisite: 0332341

Macroscopic and microscopic descriptions of a system; classical postulate of statistical mechanics; microcanonical ensemble; ideal gases; bosons; fermions; canonical and grand canonical ensemble; partition functions; thermodynamic functions; applying Bose - Einstein (BE) distribution to a photon gas; derivation of Planck's law for Blackbody radiation; Bose-Einstein condensation.

(0342461) Quantum Mechanics-2

3 credit hrs

Pre-requisite: 0332361

Time-independent perturbation theory (nondegenerate and degenerate); fine structure of Hydrogen atom; Stark effect; Zeeman effect; time-dependent perturbation theory: emission and absorption of radiation; variational method; quantum theory of scattering: scattering amplitude and cross section, Born approximation; matrix quantum mechanics.

(0302462) Atomic and Molecular Physics

3 credit hrs

Pre-requisite: 0342461

Review of one-electron atoms; electron spin; addition of angular momenta; fine structure; Hyperfine structure; interaction of one-electron atoms with electromagnetic radiation; electric dipole transitions; interaction of one-electron atoms with external electric and magnetic fields; two-electron atoms; molecular structure and spectra of diatomic molecules.

(0302463) Nuclear Physics

3 credit hrs

Pre-requisite: 0332361

Basic nuclear properties; nuclear force between nucleons: the deuteron; nuclear models: liquid-drop model, shell model; radioactivity; units for measuring radiation; alpha, beta and gamma decays; energetics of nuclear reactions, isospin, conservation laws; reaction cross sections; nuclear fission and nuclear fusion; brief Introduction to particle physics: the standard model.

(0302464) Astrophysics

3 credit hrs

Pre-requisite: 0302351 and 0342332

Basic concepts of astrophysics; matter and radiation in stars; heat transfer in stars and nucleosynthesis; stellar structure; stellar evolution and the cosmology of the universe; astrophysics and general relativity; neutron stars; Black holes; galaxies and the universe.

(0342466) Elementary Particles

3 credit hrs

Pre-requisite: 0332361

Particle phenomenology; accelerators and detectors; scattering and Feynman rules; the quark model; introduction to the standard model; the Higgs mechanism; Linear Hadronic Collider (LHC) and the frontiers of scientific knowledge.

(0302471) Solid State Physics

3 credit hrs

Pre-requisite: 0332361

Crystal lattice and structure; reciprocal lattice; crystal binding; lattice vibrations; elastic scattering of waves; thermal properties of solids; free-electron gas, energy bands in solids.

(0302472) Physics of Semiconductors

3 credit hrs

Pre-requisite: 0302471

Semiconductor crystal structure; the energy band structure of crystals; transport of carriers in semiconductors; semiconductor diode devices and frequency speed behavior; and the bipolar junction transistor (BJT).

(0302490) Scientific Research Methodologies

1 credit hr

Pre-requisite: Department approval

Elements of scientific writing: introduction; methods and methodologies; results; analysis; discussion and conclusions. How to: write a scientific article, give a talk, give a power point presentation, and prepare a poster.

(0342496) Special Topics

3 credit hrs

Pre-requisite: Department Approval

This course covers topics of special interest in Physics that are not covered in the other courses. The syllabus to be taught should be approved by the Department council.