

REVISED CURRICULUM
DEPARTMENT OF PURE & APPLIED PHYSICS
(PHYSICS WITH ELECTRONICS OPTION)

3. B.Sc Physics with Electronics Programme

3.1 Philosophy, Aims and Objectives of the Programme

- (a). To provide students with a broad and balanced foundation of physics knowledge and practical skills.
- (b). To instill in students a sense of enthusiasm for physics, and appreciation of its applications in different contexts.
- (c). To involve the students in intellectually stimulating and satisfying experience of learning and studying.
- (d). To develop in students the ability to apply their knowledge and skills in Physics to the solution of theoretical and practical problems.
- (e). To develop in students through an education in Physics a range of transferable skills of value in physics and other areas.
- (f). To provide students with a knowledge and skills base for further studies in physics or multi-disciplinary areas involving physics.

3.2 Admission and Graduation Requirement

3.2.1 Unified Matriculation Examination (UME)

The entry requirements shall be at least credit level passes in five subjects including English Language, Mathematics, Physics and Chemistry to form the core subjects with credit in one other relevant science subject at the Senior Secondary School Certificate or its equivalent. In addition, an acceptable pass in the University Matriculation Examination (UME) into 100-level is required.

3.2.2 Direct Entry

Candidates with two A level passes (graded A-E) at the Advanced Level in one or more relevant subjects (Biology, Botany, Chemistry, Geography, Mathematics and Physics) may undertake the three – year degree programme into 200-level.

3.3 Learning Outcomes

All Bachelors Honours Degree students in Physics are expected to develop the following abilities and skills:

- (a). Regime of Subject Knowledge: Cognitive abilities and skills relating to solution of problems in Physics and Physics related disciplines.
- (b). Competencies and Skills: Practical skills relating to the conduct of laboratory and industrial work in
- (c). Behavioral Attitudes: General skills relating to non-subject specific competencies, communication, ICT knowledge, interpersonal, organization skills and ethical standards.

3.4 Attainment Levels

Graduates of Physics are expected to have the ability to apply knowledge and skills to solving theoretical and practical problems in Physics in relation to national and societal problems.

3.5 Resource Requirement for Teaching and Learning

- (a) Academic and non-academic staff. (See Self Study Form)
- (b) Academic and Non-Academic Spaces. (See Self Study Form)
- (c) Academic and Administrative Equipment. (See Self Study Form)
- (d) Library and Information Resources. (See Self Study Form)

3.6 Course Contents and Descriptions

(A). COURSE CONTENTS

100 LEVEL COURSES

1st Semester (Old)

Course Code	Course Title	Units
BIO 1111	General Biology I	3
CHM 1111	General Chemistry I	3
CHM 1121	General Chemistry Practical I	1
GES 1011	English and Communication Skill I	2
GES 1021	Science, Technology and Society	2
GES 1031	Nigerian Peoples and Culture	2
MTH 1111	Elementary Mathematics I	3
PHY 1111	General Physics I	3
PHY 1121	Experimental Physics I	1
PHY 1131	Heat and Geometrical Optics	2
PHY 1141	Technical/Engineering Drawing	2
	Total	24

1st Semester (Revised)

Course Code	Course Title	Units
BIO 1111	General Biology I	3
CHM 1111	General Chemistry I	2
CHM 1121	General Chemistry Practical I	1
CSC 1111	Introduction to Computer Science I	2
GES 1011	Communication in English I	2
GES 1021	History and Philosophy of Science	2
GES 1031	Nigerian Peoples and Culture	2
GES 1041	Use of library, Study Skills and ICT.	2
MTH 1111	General Mathematics I	3
PHY 1111	General Physics I	2
PHY 1121	Experimental Physics I	1
PHY 1131	Heat and Geometrical Optics	2
	Total	24

2nd Semester (Old)

Course Code	Course Title	Units
BIO 1112	General Biology II	3
CHM 1112	General Chemistry II	2
CHM 1122	General Chemistry Practical II	1
GES 1012	English and Communication Skill II	2
GES 1022	Logic and Philosophy	2
GES 1032	Political Economy	2
GES 1042	Community Service	1
GES 1052	Computer Appreciation	2
MTH 1212	Basic Statistics for Sciences	2
MTH 1112	Elementary Mathematics II	3
PHY 1112	General Physics II	3
PHY 1122	Experimental Physics II	1
	Total	24

2nd Semester (Revised)

Course Code	Course Title	Units
BIO 1112	General Biology II	3
CHM 1112	General Chemistry II	2
CHM 1122	General Chemistry Practical II	1
GES 1012	Communication in English II	2
GES 1022	Logic, Philosophy and Human Existence	2
GES 1032	Communication in French	2
GES 1042	Community Service	2
MTH 1112	General Mathematics II	3
PHY 1112	General Physics II	2
PHY 1122	Experimental Physics II	1
PHY 1311	Statistics for Physical Sciences	2
THG 1712	Introduction to Church History	2
	Total	24

200 LEVEL COURSES**1st Semester (Old)**

Course Code	Course Title	Units
EDC 2021	Entrepreneurship Studies I	2
GES 2011	Application of the Computer	2
MTH 2131	Mathematical Methods I	2
MTH 2151	Real Analysis I	2
PHY 2111	Classical Mechanics I	3
PHY 2121	Thermodynamics	2
PHY 2131	Vibrations and Waves	3
PHY 2141	Experimental Physics III	2
PHY 2211	Introduction to Electronics	2
THG 2711	Introduction to Ancient Church History	2
	Total	22

1st Semester (Revised)

Course Code	Course Title	Units
EDC 2021	Entrepreneurship and Innovation	2
GES 2011	Peace and Conflict Resolution	2
MTH 2131	Mathematical Methods I	3
MTH 2151	Real Analysis I	2
PHY 2131	Waves And Vibration	3
PHY 2141	Experimental Physics III	1
PHY 2221	Electronic Circuits and Introductory Electronics	3
PHY 2411	Modern Physics	3
PHY 2661	Introduction to Space Science	2
THG 2711	Spiritual Theology and Catechesis	2
	Total	23

2nd Semester (Old)

Course Code	Course Title	Units
GES 2012	Entrepreneurship Studies II	2
MTH 2142	Mathematical Methods II	3
PHY 2112	Fluid Mechanics I	3
PHY 2122	Geometrical and Physical Optics	3
PHY 2212	Electronics I	3
PHY 2712	Energy Physics	2
PHY 2132	Introduction to Modern Physics	2
PHY 2142	Advanced Laboratory Workshop	1
THG 2722	Introduction to Medieval and Contemporary Church History	2
	Total	21

2nd Semester (Revised)

Course Code	Course Title	Units
CSC 2122	Introduction to Computer Science II	2
CSC 2132	Computer Programming	3
EDC 2012	Business Creation and Growth	2
MTH 2152	Elementary Differential Equation	3
PHY 2142	Experimental Physics IV	1
PHY 2112	Fluid Mechanics	3
PHY 2312	Thermal Physics	3
PHY 2322	Analytical Mechanics	3
PHY 2632	Physics of Solid Earth	2
THG 2722	Social Teaching of the Church	2
	Total	24

300 LEVEL COURSES**1st Semester (Old)**

Course Code	Course Title	Units
MTH 3131	Complex Analysis II	3
PHY 3111	Fluid Mechanics II	3
PHY 3121	Electricity and Magnetism I	3
PHY 3141	Experimental Physics IV	2
PHY 3211	Electronic Circuit Analysis	2
PHY 3151	Classical Mechanics II	3
PHY 3411	Solid State Physics I	3
PHY 3221	Electronic Instrumentation I	2
THG 3341	Social teaching of the Church	2
	Total	23

1st Semester (Revised)

Course Code	Course Title	Units
MTH 3131	Complex Analysis	3
PHY 3131	Electromagnetism	3
PHY 3141	Experimental Physics V	1
PHY 3151	Material Science	3
PHY 3261	Workshop Practice	2
PHY 3271	Electronics I	2
PHY 3321	Analytical Mechanics II	3
PHY 3411	Solid State Physics I	3
PHY 3681	Energy and Environment	1
*	Technical Elective	2
	Total	23

***Technical Electives**

Course Code	Course Title	Units
PHY 3221	Engineering Drawing	2
PHY 3621	Geophysics I	2

2nd Semester

Course Code	Course Title	Units
PHY 3002	Students Industrial Work Experience Scheme	6
	Total	6

400 LEVEL COURSES**1st Semester (Old)**

Course Code	Course Title	Units
PHY 4111	Research Methods	2
PHY 4121	Electricity and Magnetism II	3
PHY 4141	Electronic Laboratory Practice	1
PHY 4211	Electronics Instrumentation II	2
PHY 4411	Quantum Mechanics I	3
PHY 4421	Mathematical Physics	3
PHY 4431	Statistical Physics	2
PHY 4511	Atomic and Nuclear Physics	3
*	Technical Elective	2
	Total	21

1st Semester (Revised)

Course Code	Course Title	Units
PHY 4261	Electronics Instrumentation	2
PHY 4241	Electronics II	2
PHY 4411	Quantum Mechanics I	3
PHY 4421	Mathematical Physics I	3
PHY 4431	Statistical Physics	3
PHY 4451	Nuclear Physics	3
PHY 4141	Laboratory Physics	1
*	Technical Elective	2
*	Technical Elective	2
	Total	21

***Technical Electives (Old)**

Course Code	Course Title	Units
PHY 4311	Power Metallurgy and Ceramics	2
PHY 4321	Introduction to Crystallography	2
PHY 4441	Electrical and Optical Properties of Solids	2
PHY 4611	Introduction to Plasma Physics	2
PHY 4711	Introduction to Environmental Physics	2

2nd Semester (Old)

Course Code	Course Title	Units
PHY 4122	Project	6
PHY 4212	Electronics II	2
PHY 4112	Seminar	1
PHY 4412	Quantum Mechanics II	3
PHY 4132	Thermal Physics	3
PHY 4422	Solid State Physics II	2
*	Technical Elective	2
THG 3532	Spiritual Theology	2
	Total	21

***Technical Electives (Old)**

Course Code	Course Title	Units
PHY 4332	Microwaves	2
PHY 4442	Network Analysis	2
PHY 4312	Mechanical Properties of Materials	2
PHY 4322	Material Science	2
PHY 4512	Atomic and Nuclear Spectroscopy	2

***Technical Electives (Revised)**

Course Code	Course Title	Units
PHY 4221	Digital Electronics	2
PHY 4231	Environmental Noise and Control	2
PHY 4241	Quality Control Techniques	2
PHY 4621	Geophysics II	2

2nd Semester (Revised)

Course Code	Course Title	Units
PHY 4122	Project	6
PHY 4112	Seminar	1
PHY 4342	Solid State Physics II	2
PHY 4372	Computational Physics	3
PHY 4412	Quantum Mechanics II	3
PHY 4422	Mathematical Physics II	3
PHY 4142	Laboratory Physics	1
*	Technical Elective	2
*	Technical Elective	2
	Total	22

***Technical Electives (Revised)**

Course Code	Course Title	Units
PHY 4332	Microwave Devices	2
PHY 4442	Network Analysis	2
PHY 4352	Semiconductor Physics	2
PHY4362	Introduction to Plasma Physics	2

(B). COURSE DESCRIPTIONS

(a). **PHY 1111 GENERAL PHYSICS I: (3 Credit Units) L 30: P0: T 15)**

(Mechanics, Thermal Physics and Waves)

Space and Time, Units and dimension, Kinematics; Fundamental Laws of Mechanics, statics and dynamics; work and energy; Conservation laws. Elasticity; Hooke's law, Young's shear and bulk moduli, Hydrostatics; Pressure; bouyance, Archimedes' Principles., Surface tension; adhesion, cohesion, capilarity, drops and bubbles. Temperature; heat; gas laws; laws of thermodynamics; kinetic theory of gases. Sound, Applications.

(b). **PHY 1112 GENERAL PHYSICS II: (3 Credit Units) L 30: P0: T 15)**

(Electricity, Magnetism and Modern Physics)

Electrostatics; conductors and currents; dielectrics; magnetic fields and induction; Maxwell's equations; electromagnetic oscillations and waves; Applications.

(c). **PHY 1121/1122 LABORATORY PHYSICS I & II: (2 Credit Units)**

This introductory course emphasizes quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques will be employed. The experiments include studies of meters,. the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc., covered in PHY 1111 and PHY 1112.

(d). **PHY 1131 HEAT AND GEOMETRICAL OPTICS: (2 Credit Units)**

(e). **PHY 1311 STATISTICS FOR PHYSICAL SCIENCES: (2 Credit Units)**

(f). **PHY 2112: FLUID MECHANICS I (3 Credit Units) (L30:T15:P0)**

Pre-requisite: PHY 1111

Rigid body dynamics, generated motions, and mechanics of continuum media. Fluid statics and dynamics. Hydrostatic pressure, Buoyancy, Archimedes's principle, hydro-dynamics. Steady flow. Bernoulli and continuity flow, Reynolds number. Laminar flow. Surface tensions. Capillary action.

(g). **PHY 2131 WAVES AND VIBRATION: (3 Credit Units)**

Pre-requisites -PHY 1111, PHY 1112, and MTH 1112

Wave phenomena; Acoustical waves; the harmonic oscillator; waves on a string; energy in wave motion; longitudinal waves; standing waves; group and phase velocity; Doppler effect; Physical Optics; Spherical waves; interference and diffraction, thin films; crystal diffraction, holography; dispersion and scattering. Geometrical Optics; Waves and rays; reflection at a spherical surface, thin lenses, optical lenses; mirrors and prisms.

(h). PHY 2141/2142 LABORATORY PHYSICS III & IV: (2 Credit Units)

Pre-requisite -PHY 1121/1122

The laboratory course consists of a group of experiments drawn from diverse areas of Physics (Optics, Electromagnetism, Mechanics, Modern Physics, etc.) It is accompanied by seminar studies of standard experimental technique and the analyses of famous and challenging experiments.

(i). PHY 2221 ELECTRIC CIRCUITS AND INTRODUCTORY ELECTRONICS; (3 Credit Units)

Pre-requisite -PHY 1112

D.C. Circuits; Kirchoff's Laws, sources of emf and current, network analysis and circuit theorems. A.C. Circuits. Inductance, capacitance, the transformer, sinusoidal wave-forms rms and peak values, power, impedance and admittance series RLC circuit, Q factor, resonance, Network analysis and circuit theorems, filters. Electronics; semiconductors, the pn-junction, field effect transistors, bipolar transistors, Characteristics and equivalent circuits, amplifiers, feedback, oscillators.

(j). PHY 2312 THERMAL PHYSICS: (3 Credit Units)

Pre-requisites - MTH 1112

The Foundations of classical thermodynamics including the zeroth and definition of temperature; the first law, work, heat and internal energy; Carnot cycles and the second law; entropy and irreversibility, thermodynamic potentials and the Maxwell relations. Application: Qualitative discussion of phase transitions: third law of thermodynamics; ideal and real gases. Elementary kinetic theory of gases including Boltzmann counting, Maxwell-Boltzmann Law of distribution of velocities, simple applications of the distribution law.

(k). PHY 2322 ANALYTICAL MECHANICS I: (3 Credit Units)

Pre-requisites -MTH 2131

Newtonian Mechanics; motion of a particle in one, two and three dimensions; systems of particles and collision theory; Newtonian gravitation; conservative forces and potentials, oscillations, central force problems; accelerated frames of reference; rigid body dynamics; generalized motion; mechanics of continuous media.

(l). PHY 2411 MODERN PHYSICS: (3 Credit Units)

Pre-requisite -PHY 1112

Special Relativity; Defects in Newtonian Mechanics; the speed of light; the Lorentz transformation; transformation of velocities. Experimental basis of quantum theory: Black body radiation; electrons and quanta; Bohr's theory of atomic structure; De Broglie hypothesis the uncertainty principle; Schrodinger's equation and simple applications.

(m). PHY 2632 PHYSICS OF SOLID EARTH: (2 Credit Units)

Origin, shape, structure and major divisions of the earth. The Earth's main magnetic field and its distribution. Electrical theory of the earth's core and origin of the magnetic field seafloor spreading, continental drift and plate tectonics.

(n). PHY 2661 INTRODUCTION TO SPACE SCIENCE: (2 Credit Units)

Introduction to Astronomy and Astrophysics, Satellite Communication, introduction to atmospheric Science, Space Environment, Space craft systems and Dynamics, Aero/Astrodynamic Engineering, Rocket Engineering, Cosmology, Origin of universe and life, Space Law and Business development.

(o). PHY 3131 ELECTROMAGNETISM: (3 Credit Units)

Pre-requisites -PHY 2411

Electrostatics and Magnetostatics. Laplace's equation and boundary value problems; Multiple expansions, dielectric and magnetic materials. Faraday's law. A.C. Circuits. Maxwell's equations. Lorentz covariance and special relativity.

(p). PHY 3141 LABORATORY PHYSICS V: (1 Credit Unit)

Pre-requisite-PHY 2141 & PHY 2142

A year long series of mini courses on important experimental techniques. Topics covered include electronics, optics, electricity, atomic, molecular nuclear and low temperature physics, statistics and data handling and scientific writing.

(q). PHY 3151 MATERIAL SCIENCE (3 Credit Units) (L30:T15:P0)

Pre-requisite: PHY

Introduction to material based on properties of solids, micro-structure forming and shaping. This should illustrate the importance of the range of currently available engineering materials and to show that technology development depends on (1) introducing new materials and new processes, (2) Awareness of limitations of existing materials and processes. Topics include: Atomic and atomic coordination, atomic order in solids and molecular disorder, single-phase materials and molecular phase, ceramic polymer materials, conducting materials, magnetic - and electrical materials, phase diagrams, processing and development of microstructure/composites. Performance materials and devices. Designing with different materials, performance criteria and standards. Selected case studies of materials selection.

(r). PHY 3261: WORKSHOP PRACTICE (2 Credit Units) (L20:T10:P15)

Introduction to workshop: safety at work, classification of materials; ferrous metals, non-ferrous metals, non-metallic materials. Layout of work; tools and applications, bench work instruments; filling, chipping, sawing, screw sheet, metals processing, principles of soldering, brazing and welding. The glass cutter and the cutting of soda and pure glass. Flame polishing. Joining two glass rods together. Construction of melting and boiling pints tubes as well as dropping pipettes. Design and construction of simple apparatus using wood, metal and glass. Fabrications of simple electronic circuits. Elements of engineering drawing.

(s). PHY 3271: ELECTRONICS I (2 Credit Units) (L20:T10:P0)

Pre-requisite: PHY 2131

Semi-conductor diodes, Amplification and bipolar transistor, the field effect transistor, Thermionic emission and the cathode vary table. Negative feedback, impedance matching Amplification at high frequencies, low frequency signals, differential amplifier, power supplies and control, Time constants, Integrated circuits, positive feedback circuits and signal generators, Logic counters and timers, operational amplifier.

(t). PHY 3321 ANALYTICAL MECHANICS II: (3 Credit Units) (L30:T15:P0)

Pre-requisite -PHY 2322

Degrees of freedom; Generalized coordinates Lagrange's formulation of mechanics, Applications. The Calculus of variations and the action principle. Hamilton's formulation of mechanics, Application. Invariance and conservation laws. Oscillatory systems, including damped, forced and coupled oscillations; Normal modes.

(u). PHY 3411 SOLID STATE PHYSICS I: (3 Credit Units) (L30:T15:P0)

Crystal lattice, planes and directions. crystal structure. Waves in periodic structures, crystal diffraction. Diffraction by a crystal lattice. Reciprocal lattice and Brillouin zones. Experimental diffraction methods. X-rays, electrons and neutrons. Atomic scattering factor. Geometric structure factor. Debye Waller factor. Crystal binding. Cohesive energy. Effect of periodic potential. Lattice vibrations. Thermal conduction. Debye approximation. Conductivity at low temperatures. Defects and dislocations in solids. The free electron model.

(v). PHY 3681 ENERGY AND ENVIRONMENT: (2 Credit Unit) (L20:T10:P0)

Conventional and non-conventional energy sources. Renewable and nonrenewable energy sources. Nigerian resources and reserves; prospects. Consumption and conservation. Costs, fossil fuel energy. Fossil fuel. Oil and gas. Cable drilling and rotary drilling. Mining of coal. Coal conversion technology. Environmental pollution. Health and safety problems. Nuclear fission as energy source: fission chain reactions. Fission chain reactions and nuclear criticality. Suitable fuels, nuclear power generation. Principles; costs, capacity and storage. Nuclear reactor safety. The nuclear fuel cycle. Fast

breeder reactors. Environmental impacts of nuclear power plants. Alternative energy sources: prospects of fusion reactors. Plasma. Solar energy. Geothermal energy. Hydroelectric power generation. Wind energy. Prospects and problems.

(w). PHY 3002 STUDENTS INDUSTRIAL WORK EXPERIENCE SCHEME: (6 Credit Units)

(x). PHY 4122 SUPERVISED INDIVIDUAL RESEARCH PROJECT: (6 Credit Units)

The course offers students the opportunity to do research in contemporary physics and under the supervision of staff. A detailed report on the research is presented by the student when the project is completed.

(y). PHY 4232 ENVIRONMENTAL PHYSICS: (2 Credit Units)

The Earth, the earth's history, the earth's interior, continental drift, weathering and erosion, ground water, ecology, the earth's atmosphere's structure of the earth's atmosphere. Weather and impact of weather on man, environmental pollution; the solar system, gravitation, the planets, the moons, comets and meteors, the universe.

(z). PHY 4261: INSTRUMENTATION AND EXPERIMENTAL TECHNIQUE (2 Credit Units) (L0:T0:P30)

Principles of experimental: systematic errors and their detection. Drift and noise. Data treatment, estimation of errors. Curve fitting. Examples of measuring methods in different fields. Elementary ideas of information theory. Electronics – feedback circuits including (Mathematically) complex feedback paths-miller integrator etc. Response of circuits to pulses and steps. Shaping circuits. Including (Mathematically) complex feedback paths-miller integrator etc. response of circuits to pulses and steps. Shaping circuits. Two state circuits-multivibrator and derived circuits. Transistor. Millimicrosecond methods. electrical measurements, galvanometer, D.C. amplifiers. Optical instruments; intensity and guidance. Photometry radiation detection and their limitations. Guidance in the design and construction of apparatus and measuring equipment

(aa). PHY 4322 COMPUTATIONAL PHYSICS: (3 Credit Units)

Use of numerical methods in Physics; various methods of numerical integration, differentiation, numerical solutions of some differential equations in physics, Statistical analysis of experimental data.

(bb). PHY 4341 SOLID STATE PHYSICS II: (3 Credit Units)

Pre-requisite -PHY 3411

Dielectric properties. Magnetism: Paramagnetism and diamagnetics; ferromagnetism and anti-ferromagnetism; Magnetic resonance. Imperfections in solids.

(cc). PHY 4411 QUANTUM MECHANICS I: (3 Credit Units)

Pre-requisites - MTH 2152

The formulation of quantum mechanics in terms of state vectors and linear operators. Three-dimensional spherically symmetric potentials. The theory of angular momentum and spin. Identical particles and the exclusion principle. Methods of approximation. Multielectron atoms.

(dd). PHY 4412 QUANTUM MECHANICS II: (3 Credit Units)

Pre-requisites -PHY 4411 and MTH 2152.

Time-independent and time-dependent perturbation theory. Scattering theory: elastic potential scattering; Green's function and partial wave methods. Selected phenomena from each of atomic physics, molecular physics, solid-state physics, and nuclear physics are described and then interpreted using quantum mechanical models.

(ee). PHY 4421/ 4422 MATHEMATICAL PHYSICS I & II: (6 Credit Units)

Pre-requisites -MTH 2152

Linear Algebra and Functional Analysis; Transformations in linear vector spaces and matrix theory. Hilbert space and complete sets of orthogonal functions. Special Functions of Mathematical Physics. The gamma function; hypergeometric functions; Legendre functions; Bessel functions. Hermite and Langerre function, The Dirac Delta function. Integral Transforms and Fourier Series: Fourier series and fourier transforms; Laplace transform. Applications of transform methods to the solution of elementary differential equations of interest in physics and engineering. Partial Differential Equations: Solution of boundary value problems of partial differential equations by various methods which include: Separation of variables, the method of integral transforms. Sturm-Liouville theory; Uniqueness of solutions. Calculus of residues and applications to evaluation of integrals and summation of series. Applications to various physical situations, which may include –electrogagnetic theory, quantum theory, diffusion phenomena.

(ff). PHY 4431 STATISTICAL PHYSICS: (3 Credit Units)

Pre-requisites -PHY 4411

Basic concept of statistical mechanics; microscopic basis of thermodynamics and applications to macroscopic systems, condensed states, phase transformations, quantum distributions; elementary kinetic theory of transport processes, fluctuation phenomena. Applications.

(gg). PHY 4451 NUCLEAR PHYSICS: (3 Credit Units)

Pre-requisite -PHY 4411

Nuclear structure: Nuclear properties, nuclear size, nuclear masses; Nuclear forces, nuclear -nucleon scattering; the deuteron. Nuclear models. Radio-active Decay: Alpha, beta, gamma decays. Nuclear reactions. Nuclear Instrumentations and radiation detection techniques; detectors. Fission and fusion. Nuclear reactor and nuclear energy.