ADEYEMI COLLEGE OF EDUCATION
ONDO, ONDO STATE

PHYSICS DEPARTMENT

COURSES OUTLINE

PHY 101: General Physics I (3-1-0) 4 Units

Fundamental principles of mechanics. Mechanical properties of matter including elasticity, surface tension and viscosity. Mechanical Waves. Thermal Physics: Thermal properties including elementary thermodynamics and kinetic theory.

REFERENCES

Advanced level Physics by M. Nelkon and P. Parker

Halliday & Resnick, Fundamentals of Physics, 3E, Wiley 1988

University Physics by Huge D.Young

Lamlard Physics by Olaniyi, H.B.

College Physics by Paul Peter Urone,Roger Hinrichs

PHY 102: General Physics II (3-1-0) 4 Units

Fundamental laws of electricity and magnetism and their applications. Electron Physics: Introduction to Physics of electronics and some applications. Optics: Principles and applications of geometrical and physical optics.

REFERENCES

Advanced level physics by M. Nelkon and P. Parker

Fundamentals of Electric Circuits by C.K Alexander and M.O Sadiku

Optics by Ajoy Ghatak

Halliday & Resnick, Fundamentals of Physics, 3E, Wiley 1988

University Physics by Huge D.Young

Lamlard Physics by Olaniyi, H.B.

College Physics by Paul Peter Urone,Roger Hinrichs

PHY 105: Physics For Biological Sciences I (3-1-0) 4 Units

Treatment of elementary principles of physics as in PHY 101, but with applications and examples chosen from the life sciences.

REFERENCES

Advanced level physics by M. Nelkon and P. Parker

Halliday & Resnick, Fundamentals of Physics, 3E, Wiley 1988

University Physics by Huge D.Young

Lamlard Physics by Olaniyi, H.B.

College Physics by Paul Peter Urone,Roger Hinrichs

PHY 106: Physics For Biological Sciences II (3-1-0) 4 Units

Treatment of elementary principles of physics as in PHY 102 but including elementary modem physics and with examples and applications chosen from the life sciences. PHY 107 Experiment Al Physics IA (0-0-3) I Unit Laboratory experiments which involve principles and experimental techniques in Mechanics, Thermodynamics and wave motion. PHY 108 Experimental Physics 18 (0-0-3) I Unit Laboratory experiments which involve principles and experimental techniques in electricity, magnetism, optics and modem physics.

REFERENCES

Advanced level physics by M. Nelkon and P. Parker

Fundamentals of Electric Circuits by C.K Alexander and M.O Sadiku

Optics by Ajoy Ghatak

Halliday & Resnick, Fundamentals of Physics, 3E, Wiley 1988

University Physics by Huge D.Young

Lamlard Physics by Olaniyi, H.B.

College Physics by Paul Peter Urone,Roger Hinrichs

PHY 201: Classical Mechanics (3-0-0) 3 Units

Vectors. Particle: Kinematics. Newtonian mechanics; statics and dynamics. Invariance of Newton's laws (Galilean F~elativity). Harmonic oscillation. Vibrations and waves. Work. Energy, momentum, angular momentum, conservation laws. Mechanics of systems of particles and rigid bodies; collisions of particles; central forces; theory of gravitation. Fluid mechanics. Special relativity; postulates; Michelson-Morley experiment; Lorentz transformation. Pre-requisite MTH 101, MTH 102 and PHY 101

REFERENCES

Classical Mechanics by H. Goldstein

Classical mechanics by N.C Rana and P.S Joag

Mechanics by L.D Landau and E.M Lifhitz

Classical Mechanics by Michael Cohen

Mathematical Methods of Classical Mechanics by V.I Arnold

PHY 202: Introduction To Environmental Physics (3-0-0) 3 Units

Introduction to solid earth physics including earth's history, ulterior structure, interior motions, weathering, erosions and ground water ecology. Elements of atmospheric physics The earth's atmosphere - structure types and heat transfer; weather and its impact on man Atmospheric electricity Introduction to solar physics: Solar atmosphere, solar activity and radiations. The solar system: planets, moons, comets and meteors The Universe, stars and galaxies.

PHY 203: Electric Circuits And Electronics (3-0-0) 3 Units

Elements of circuit theory: Linear circuit elements; network theorems; transient response of linear circuits. Alternating current circuit theory, electrical resonance; coupled circuits; transformers; A.C. bridges. Electrical instruments. Physics of active devices: Brief treatment of vacuum tubes. Semiconductors; energy bands~ electrons and holes. Junction and Zener diodes. Rectification, regulation. Transistors: bipolar, FET, MOSFET, static characteristics, small signal models and parameters. Basic voltage amplifiers. Pre-requisite: PHY 102.

REFERENCES

Fundamentals of Electric Circuits by C.K Alexander and M.O Sadiku

"Semiconductor Physics and Devices" by D.A Neamen

"Microelectronic Devices" by E S Yang

"Solid State Electronic Devices" by B G Streetman

"Microelectronic Circuits" by A S Sedra and K C Smith

PHY 205: Introductory Modern Physics (3-0-0) 3 Units

The origin of quantum theory - Blackbody radiation, Wien's law, the Rayleigh-Jeans theory, Planck's I theory. Electrons and quanta - Cathode rays; the specific charge of electrons, the charge and mass of electrons. Particle behaviour of electromagnetic radiation: photoelectric effect, x-rays, Compton effect, pair production and annihilation.

The atomic nucleus - Thomson's model; Rutherford's model; the size of the nucleus. Wave behaviour of matter - De Broglie hypothesis; electron diffraction, wave-particle duality. The uncertainty principle of Heisenberg. Bohr's theory of atomic structure - atomic spectra, Wilson-Sommerfeld quantization rules; Sommerfeld's relativistic theory; the correspondence principle. Problems of the old quantum theory. Schrodinger wave equation and simple applications. . Pre-requisite: PHY 101, PHY 102, MTH 101 and MTH 102.

REFERENCES

Physics for Scientists and Engineer with modern physics by R.A Serway and J.W Jewett.

Introduction to modern physics by R.B Singh

Modern Quantum Mechanics by J.J Sakurai

Richtmyer, F.K., Kennard, E.H., and Cooper, John N, Introduction to Modern Physics, 6th Ed, McGraw-Hill, 1969

Serway, Raymond A., Moses, C. J., and Moyer, C. A., Modern Physics, 2nd Ed., Saunders College , 1997.

1000 Solved Problems in Modern Physics by Ahmad A. Kamal

PHY 206: Modern Physics (3-0-0) 3 Units

The theory of relativity - the Galilean transformation and electromagnetic theory. The Michelson- i Morley experiment. Einstein's postulates. Simultaneity. The Lorentz transformation~ relativistic I kinematics and dynamics. Experimental verification. Magnetic moments and spin - effects of an external magnetic field. The Stern-Gerlach experiment and electron spin. The spin-orbit interaction; I total angular momentum. Relativistic corrections to one-electron atoms. Many-electron atoms - Pauli exclusion principle, the periodic table. The vector model; LS coupling scheme; Zeeman effect. X-rays: properties, spectra diffraction. Nuclear structure - the composition I of nuclei; nuclear sizes. Nuclear masses and abundances. Nuclear models. Radioactivity, alpha, beta and gamma decays. Nuclear reactions, nuclear fission and fusion, nuclear energy. Nuclear forces. I Accelerators and nuclear radiation. Elementary particles. Molecular and solid state physics - molecular binding; vibrational and rotational spectra. Electrons in solid, band theory. . Pre-requisite: PHY 205

REFERENCES

Physics for Scientists and Engineer with Modern Physics by R.A Serway and J.W Jewett

Introduction to modern physics by R.B Singh

Modern Quantum Mechanics by J.J Sakurai

Richtmyer, F.K., Kennard, E.H., and Cooper, John N, Introduction to Modern Physics, 6th Ed, McGraw-Hill, 1969

Serway, Raymond A., Moses, C. J., and Moyer, C. A., Modern Physics, 2nd Ed., Saunders College , 1997.

1000 Solved Problems in Modern Physics by Ahmad A. Kamal

PHY 207: Experimental Physics IIA (0-0-3) 1 Unit

Laboratory experiments which illustrate principles of experimentation and experimental techniques. These are chosen from topics such as stochastic behaviour, oscillatory mechanical systems, properties of matter, collisions and basic electrical and electronic instrumentation. Pre-requisite.: PHY 107, PHY 108.

PHY 208: Experimental Physics IIB (0-0-3) 1 Unit

Laboratory experiments which illustrate principles of experimentation in simple optical properties, basic electronic circuitry, simple atomic and nuclear properties. Pre-requisite: PHY 107, PHY 108.

PHY 301: Mathematical Physics (3-0-0) 3 Units

Integral calculus of functions of several variables: multiple integrals; change of variables; improper integrals; integrals depending on a parameter; the Leibnitz rule. Vector Integral Calculus: two- and three- dimensional theory; theorems of Green, Gauss and Stokes. Simply and multiply connected domains. Theory of functions of a complex variable: review of basic theory. Calculus of residues and applications. Conformal transfom1ation and applications. Tensor Analysis: Cartesian tensors; transformation properties. General tensor analysis; covariant differentiation; physical applications. Pre-requisite: MTH 201, MTH 202.

REFERENCES:

Advanced Engineering Mathematics by H.K Dass

SCHAUM'S outlines for complex variables Murray R. Spiegel et al

Mathematical Methods for Physicists by Tai L. Chow

Mathematical Methods in physical sciences by Boas

Mathematical Physics by Dass H.K and Verma Rama

Mathematical Physics by B.D Gupta

Engineering Mathematics by K.A Stroud

PHY 302: Classical Mechanics II (3-0-0) 3 Units

Coupled motion. Motion of continuous media including fluids. Motion in non-inertia frame of reference. Lagrangian and Hamiltonian mechanics; central forces; rigid bodies dynamics; small oscillations. Transformation theory, Poisson brackets, transition to quantum mechanics; conservation laws. Special Relativity: relativistic kinematics and dynamics

REFERENCES

Classical Mechanics by H. Goldstein

Classical mechanics by N.C Rana and P.S Joag

Mechanics by L.D Landau and E.M Lifhitz

Classical Mechanics by Michael Cohen

Mathematical Methods of Classical Mechanics by V.I Arnold

Lecture notes on Classical Mechanics for physics by Sunil Golwala

PHY 303: Electromagnetism I (3-0-0) 3 Units

Gauss Law and applications; Poisson and Laplace equations; boundary-value problems. Multipoles. Magnetostatics. Static fields and matter. Electric and magnetic energy. Time-varying fields; Faraday's law. Fields of uniformly moving charges. Pre-requisite: PHY 203

REFERENCES

Elements of Electromagnetism by M. Sadiku

Classical Electromagnetism by Richard Fitzpatrick

"Electromagnetic Theory" by U A Bakshi and A V Bakshi

"Electromagnetics (Int'l Ed) (McGraw-Hill Series in Electrical and Computer Engineering)" by John D Kraus and Daniel Fleisch

"Electromagnetic Waves and Radiating Systems" by Edward C Jordon and Keith G Balmain

"Field and Wave Electromagnetics (Addison-Wesley Series in Electrical Engineering)" by David K Cheng

"Electromagnetic Field Theories for Engineering" by Md Abdus Salam

"Transmission Lines: Equivalent Circuits, Electromagnetic Theory, and Photons (The Cambridge RF and Microwave Engineering Series)" by Richard Collier

PHY 304: Electromagnetism II (3-0-0) 3 Units

Maxwell's equations and applications to propagation in bounded and unbounded media. Elementary plasma physics. Radiation of electromagnetic waves; dipoles and antenna arrays. Guided waves Pre-requisite: PHY 303.

REFERENCES

Elements of Electromagnetism by M. Sadiku

Classical Electromagnetism by Richard Fitzpatrick

"Electromagnetic Theory" by U A Bakshi and A V Bakshi

"Electromagnetics (Int'l Ed) (McGraw-Hill Series in Electrical and Computer Engineering)" by John D Kraus and Daniel Fleisch

"Electromagnetic Waves and Radiating Systems" by Edward C Jordon and Keith G Balmain

"Field and Wave Electromagnetics (Addison-Wesley Series in Electrical Engineering)" by David K Cheng

"Electromagnetic Field Theories for Engineering" by Md Abdus Salam

"Transmission Lines: Equivalent Circuits, Electromagnetic Theory, and Photons (The Cambridge RF and Microwave Engineering Series)" by Richard Collier

PHY 305: Thermodynamics and Kinetic Theory (3-0-0) 3 Units

The laws of thermodynamics; thermodynamic temperature, heat and internal energy, reversibility, entropy, free energies. Applications of thermodynamics to simple systems - chemical potential; phase equilibrium and the phase rule; electrical potential, magnetization, surface energy. Absolute zero and low temperature phenomena, the third law of thermodynamics. Mathematical formulations of thermodynamics - exact differentials and state functions, transformation relationships for systems of two independent variables, Maxwell's relations and Legendre transformations. Kinetic theory, molecular flux, equation of state of an ideal gas, the principle of equip art it ion of energy, classical theory of specific heat capacity. Pre-requisite: PHY 101.

REFERENCES

Engineering Thermodynamics by M. Achuthan

Thermodynamics: Kinetic theory and Statistical thermodynamics by F.W Sears and G.L Salinger

Fundamentals of Engineering thermodynamics by M.J Moran and H.N Shapiro

Heat and Thermodynamics by M.W Zemansky

Fundamentals of Thermodynamics and Applications by Muller

Basic Engineering Thermodynamics by A. Venkatesh

PHY 306: Optics (3-0-0) 3 Units

Geometrical Optics: Fermat's principles and applications. Geometric theory of optical systems. Thick lens and lens systems. Aberrations, fiber optics. The wave theory of light. Principle of superposition. Collerent and incoherent disturbances. Group velocity. Huygen's principle. Interference: Interference of two beams by division of wavefront and division of amplitude. Young's experiment, Fresnel's biprism, refractometers utiIising interference phenomena. Interferometers - Michelson, FabryPerot. Diffraction: Fraunhoffer diffraction by single slit, double slit, multiple slit gratings. Resolving power of various optical systems, Fresnel diffraction; Fresnel integrals and Cornu's spiral; diffraction by apertures and obstacles; zone plates. Polarization: Analytical description of polarization of electromagnetic waves; production and detection of polarized light. Double refraction in crystals, Nicol prism, retardation plates Babinet compensator. Optical activity and other optical properties of matter. Non-linear phenomena Lasers; holography. Pre-requisite: PHY 101, PHY 102.

REFERENCES

Optics by Ajoy Ghatak

Young, Hugh D., Optics and Modern Physics, McGraw-Hill, 1968

Optics, Principles and Application by K.K Sharma

Principles of Optics by M. Born ans E. Wolf

Introduction to modern Optics by G.B Fowles

Optics(Schaum's outline series) by Eugene Hecht

Fundamentals of Optics by Francis Jenkins and Harvey White

PHY 307: Experimental Physics IIIA (0-0-6) 2 Units

Laboratory experiments essential to the development of contemporary physics and illustrating modern experimental techniques including spectroscopy, nuclear radiation techniques, advanced electronic circuits and vacuum techniques. Pre-requisite: PHY 207, PHY 208

PHY 308: Experimental Physics IIIB (0-0-6) 2 Units

This is a continuation of PHY 307 and includes a selection of open-ended experiments.

PHY 401: Mathematical Physics II (3-0-0) 3 Units

Special Functions of Mathematical Physics; Gamma functions; beta functions, Legendre functions; Bessel functions; Hermite functions; Laguerre functions; hypergeometric and confluent hypergeometric functions; Dirac delta functions and distributions. Integral Transfoms: Fourier series; Fourier transforms; Laplace transforms. Applications of integral transforms. Partial Differential Equations: Solution of boundary value problems of partial differential equations by various methods including separation of variables; method of integral transforms. Eigen function expansion method. Inhomogeneous equations; Green's functions. Integral Equations of Physics: Classification; Kernels; Neumann and Fredholm equations. Methods of solution and applications. Pre-requisite: MTH 201, MTH 202.

REFERENCES

Advanced Engineering Mathematics by H.K Dass

Mathematical Methods for Physicists by Tai L. Chow

Mathematical Methods in physical sciences by Boas

"Mathematical Physics with Classical Mechanics" by S Prakash

Mathematical Physics by Dass H.K and Verma Rama

Mathematical Physics by B.D Gupta

Mathematical Methods for Physicists by Arfken

Applied Mathematics for Engineers and Physicists by Pipes

PHY 405: General Solid State Physics (4-0-0) 4 Units

Crystal structure and binding. Elastic properties; lattice vibrations; thermal properties. Electrical properties; conductivity; band theory and application to metals, semiconductors and insulators. Superconductivity. Dielectric properties. Magnetic properties; magnetic resonance. Imperfections in solids. Pre-requisite: PHY 306.

REFERENCES

Ashcroft & Mermin, "Solid State Physics"

Kittel, C., "Introduction to Solid State Physics"

Kittel, C., "Quantum Theory of Solids"

Madelung, O., "Introduction to Solid State Theory"

Ziman, J. M., "Principles of the Theory of Solids"

Jones & March, "Theoretical Solid State Physics, vol. 1"

Callaway, J., "Quantum Theory of the Solid State"

Harrison, W., "Solid State Theory"

Slater, J., "Quantum Theory of Atoms, Molecules, and Solids"

Callaway, J., "Energy Band Theory"

Harrison, W., "Electronic Structure and the Properties of Solids"

Lundquist, B. & March, N., "Theory of the Inhomogeneous Electron Gas"

Parr, R. G. & Yang, W., "Density Functional theory of Atoms and Molecules"

Hedin, L. & Lundquist, S., "Solid State Physics,

PHY 431: Atmospheric Physics (3-0-0) 3 Units

Review of atmospheric variables and their measurements; meteorological instrumentation and observations; weather systems; Transmission of meteorological messages and preparation of meteorological maps. Analysis of scalar quantities; graphical analysis and computation. Upper-air sounding systems; Pilot balloons; radar, the radiosonde, constant level balloons. Dropsondes. Rockets and satellites; satellite imagery and application Use of meteorological charts; operations on thermodynamic charts, cross-section analysis; isentropic analysis; kinematic analysis. Pre-requisite: PHY 202, PHY 301.

REFERENCES

An Introduction to Atmospheric physics by David G. Andrew

Dynamic Meterology by J.R Horton

PHY 432: Atmospheric Physics II (3-0-0) 3 Units

Scales of motion in the atmosphere: The momentum equation; circulation and vorticity. Thermodynamics of the atmosphere. The general circulation of the atmosphere. Upper atmosphere: Ground-based radio investigation of the ionosphere. Radio wave propagation: physical processes in the propagation of ground, tropospheric, medium and short waves Ground to space communication: Worldwide satellite communications systems. Pre-requisite: PHY 202, PHY 301.

REFERENCES

An Introduction to Atmospheric physics by David G. Andrew

Dynamic Meterology by J.R Horton

PHY 436: Remote Sensing (2-0-0) 2 Units

Definition of remote sensing. Physical basis of remote sensing. Radiation characteristics of natural phenomena. Sensors for monitoring the environment (passive and active systems). Data collection, platforms and sensor packages (Landsat and SPOT systems). Manual and automatic data processing and interpretation Applications of remote sensing techniques in meteorology, geology, agriculture, forestry, urban studies and oceanography. Pre-requisite: Consent of the Instructor

REFERENCES

"Remote Sensing Principles and Interpretation" by Sabins F F

"Remote Sensing and Image Interpretation" by Lillesand T M and Kieffer R W

"Introduction to the Physics and Techniques of Remote Sensing" by Elachi C

"Remote Sensing Applications in Marine Science and Technology" by Cracknell

"Remote Sensing and GIS Technology" by Katara Pratibha

"Text Book of Remote Sensing and Geographical Information Systems" by M Anji Reddy