ADEYEMI COLLEGE OF EDUCATION
ONDO, ONDO STATE

DEPARTMENT OF PHYSICS NCE COURSE OUTLINE					
COURSE CODES	**COURSE TITLES**	**COURSE OUTLINES**	**UNITS**	**STATUS**	**REFERENCES**

PHY 111	Mathematics for Physics 1	Numerical Techniques Significant figure and decimal places Indices and Logarithms Standard Form Simple algebraic equations, inequalities and solutions Binomial theorem Matrices and determinants Numerical Techniques. **ANALYTICAL GEOMETRY AND TRIGONOMETRY** Compound angle geometry Sine and cosine rules Small angle approximations Triangular relations Vector algebra **CALCULUS** Partial fractions General rules of differentiation and integration Differentials and integrals of common functions Differential Equations and Partial Derivative.	1	Compulsory	Calculus: Early Transcendentals by James Stewart Hardback ISBN13: 978-1285741550 8th Edition

| PHY 112 | Electromagnetism 1 | **ELECTROSTATICS**
Concept of charge,
Coulomb's law
Electric fields and electric potential
Compare: gravitational fields and potentials
Charge distribution over conductors
Storage of charges - capacitance, dielectrics and problems relating to them
Van de Graaf Generator.
MAGNETOSTATICS
Concepts of magnetic fields including the earth's magnetic induction.
CURRENT ELECTRICITY
Ohm's law
Simple circuit analysis
Thermal electricity and applications
ELECTROLYSIS
Concept of electrolysis
Cells - primary and secondary cells e.g. simple Voltaic, Daniell, Leclanche, Weston, Lead-Acid, Nickel-Iron (NIFE) cells, etc.
CAPACITANCE
Parallel plate capacitor, | 2 | Compulsory | Advanced Level Physics, 7E (Pb) Paperback – 1995 by Nelkon / Parker |

		energy stored in capacitor, Charging and discharging a capacitor.			
PHY 113	Mechanics and Properties of Matter I	**QUANTITIES, UNITS AND DIMENSIONS** Fundamental quantities (mass, length, time, current, temperature, luminous intensity, amount of substance, Plane angle and Slid angle) Derived quantities (e.g.	2	Compulsory	Advanced Level Physics, 7E (Pb) Paperback by Nelkon / Parker (Author

		volume, speed, momentum etc). Fundamental and derived units Dimensions - dimensional equations and their uses **SCALARS AND VECTORS** Scalar and vector quantities Vector components Addition and subtraction of vectors Composition and resolution of vectors Vector and scalar products **MOTIONS** Displacement, velocity and acceleration One, two-dimensional motions Relative velocity Projectiles **OSCILLATORY AND CIRCULAR MOTIONS** Simple Harmonic Motion (Oscillation) Period, amplitude and phase Expression for period, frequency, velocity and acceleration Damped S.H.M. **Newton's LAWS OF MOTION**			

			Force, inertia and friction MOMENTUM Definition Newton's second law Law of conservation of linear momentum Collisions (elastic and inelastic; straight line & oblique).			
PHY 114	Introduction to Physics Practical		**THEORY** The theory of practicals: students are to be referred to relevant texts e.g. by Nelkon, Okeke, Armitage, Tyler etc. Reporting practicals Graphical skills - plotting experimental data, suitable choice of axes and scales; line of best fit Interpretation and expression of equations in the form of $y = mx + c$ Evaluation of slope and intercept - extrapolation and interpolation; plotting with logarithmic scales. Experimental errors and their treatment. Use and maintenance of simple measuring instruments e.g. verniercallipers, ammeter, galvanometer, micrometer screw gauge, etc.	1	Compulsory	Measurement in Physics in Akinwale and Nwankpa (Eds.). Experimental Physics for Tertiary Institutions. Babson Press Ltd Pp. 10-28.

PHY 121	Thermal Physics 1	**CONCEPTS OF HEAT AND TEMPERATURE** Nature (properties) of Heat and Temperature Various measurements involving them with emphasis on constant pressure and Resistant Thermometers. Other thermometric properties. **THERMAL ENERGY DEVELOPMENT** Quantity of heat and calorimetry including cooling corrections Change of state, molecular interpretations Gaseous process and laws; Definitions and measurements of latent heats Calculations involving quantity of heat and latent heat. **HEAT TRANSFER** Conduction, convection, radiation Black-body radiation Stefan's, Planck's and Wien's laws Prevost's theory of heat exchange Problems involving these. **KINETIC THEORY** Assumptions of the	2	Compulsory	1.Advanced Level Physics, 7E (Pb) Paperback – 1995 by Nelkon / Parker 2. Introduction to Thermal Physics by Daniel V. Schroeder Hardback 3. Thermal Physics by C. B. P. Finn Print On Demand ISBN13: 978-0748743797

		kinetic theory model of gases e.g. Brownian motion Ideal gas laws and equations Quantitative treatment of molecular speed and root mean square speed Differences between real and ideal gas Van der Waal's equation for real gases Zeroth and First laws of thermodynamics			
PHY 122	Introduction to Astronomy and Environmental Physics	**ASTRONOMY** Origin of the solar system Components of cosmos Night Sky Cosmology Atmosphere Figure of the Earth **ENVIRONMENTAL PHYSICS** This course is based on the premise that physics is a concept-laden discipline and that almost all human activities involve these concepts, theories, laws and principles of Physics. Students are therefore expected to use their knowledge of physics to explain natural phenomena and other	2	Compulsory	Physics and Astronomy (Custom) by Neufelder Paperback ISBN13: 978-1256585152

			incidental occurrences as well as developments in science and technology. Such phenomena or occurrences include:- *To provide detailed course content would defeat the objectives of this course. While a lecturer assigned the course serves as a co-ordinator, all staff should be encouraged to contribute. Students on their part should bring their own environmental observation, experiences and views on superstitions, development on science and technology for class discussions			
PHY 123	Basic and Digital Electronics		Passage of electricity in gases and in evacuated tubes and applications Induced electricity and their uses in some electronic devices Cathode rays, positive rays and their properties Simple electronic devices, diodes properties Oscilloscope T.V. tubes Band theory of solids LC	2	Compulsory	1. Basic Digital Electronics by Alvis J. Evans Print On Demand ISBN13: 978-0790611181 Digital Electronics by D. C. Green Print On Demand ISBN13: 978-

		(simple account) Energy level diagrams for conductors, semi-conductors and insulators Doping Types of semi-conductors:- P-types and N-types, P-N JUNCTIONS Rectifying property of a P-N Junction Forward and Reverse Biasings, simple transistors and oscillator circuits **TRANSISTOR CONFIGURATION** n-p- and p-n-, basic structures and terminologies and their applications Colour coding Integrated circuits (ICS) **DIGITAL ELECTRONICS** Binary, octal and BCD hexadecimal numbering system, conversion from one form to another, addition and subtraction of binary number, switch current, NOR gate, OR gate, exclusion or gate, exclusive and gate.			0582317369 5th Edition
PHY 124	Acoustics	**CONCEPT OF SOUND**	1	Compulsory	Fundamentals of

| | | | Definition of Sound Classification into infrasonic, sonic (audible) and ultrasonic and their applications. **WAVE NATURE OF SOUND** Characteristics of sound Intensity, quality or timbre, etc Speed of sound in various media (solid, liquid, gas) Echo, its effects and applications Vibrations of sound in strings, air columns and pipes Concept of resonance Doppler effects Musical instruments Acoustics of buildings Ultrasonic - General and practical application (Qualitative treatment only). | | | Acoustics by Lawrence E. Kinsler, Austin R. Frey and Alan B. Coppens Hardback ISBN13: 978-0471847892 |
| PHY 125 | Physics Practical I | | Consider at least two (2) practicals from each of the following courses: Thermal Physics I Mechanics and Properties of Matter I Electromagnetism I Optics I, and Basic Electronics (A minimum of 10 experiments is | 1 | Compulsory | Experimental Physics for Tertiary Institutions. Babson Press Ltd |

		expected from all the topes)			
PHY 211	Atomic and Quantum Physics I	**STRUCTURE OF ATOM** Atomic models- Thompson's, Rutherford's experiments etc Determination of e/m for the electron (Milikan's oil drop experiment, Thompson's experiment etc) **CONCEPT OF QUANTUM THEORY)** Photo-electricity and its applications (including Einstein's photoelectric equations) Compton effect Application of the Bohr's model to the one-electron atom Pauli exclusion principle and its application to the atom Energy and Spectra	1	Compulsory	1.Advanced Level Physics, 7E (Pb) Paperback – 1995 by Nelkon / Parker 2. Physics of Atoms and Quanta by Haken Hardback ISBN13: 978-35
PHY 212	Electromagnetism II	**MAGNETIC EFFECTS OF CURRENT** D. C. (direct current) Circuit analysis (Kirchhoff's laws. Thevenin's and Norton's equivalent circuits) Principle and applications of electromagnetic inductions	2	Compulsory	1.Advanced Level Physics, 7E (Pb) Paperback – 1995 by Nelkon / Parker 2. Essentials of Electromagnetics II by Research & Education Association Paperback ISBN13: 978-

		D.C. instruments and measurements - Voltmeter, ammeter, galvanometer, Wheatstone bridge, potentiometer, etc. Ampere's law, Biot-Savart's Law and their applications to the induction coil, electric generator, the dynamo and transformer. **GROWTH AND DECAY OF CURRENT** Inductive - time constant Capacitive - time constant Applications of capacitors and inductors in circuits (R-L, R-C, circuits)			0878915880
PHY 213	Mechanics and Properties of Matter II	**INERTIA OF RIGID BODY** Rotation of a rigid body about an axis, kinetic energy of rotation Moment of inertia Radius of gyration Principle of parallel and perpendicular axes Angular momentum and its conservation Torque **OSCILLATORY AND CIRCULAR MOTIONS** Simple Harmonic Motion (Oscillation)	3	Compulsory	1.Matter and Interactions, Vo.lume II (Looseleaf) by Ruth W. Chabay Loose-Leaf ISBN13: 978-0470619353 2. Advanced Level Physics, 7E (Pb) Paperback – 1995 by Nelkon / Parker (Author

		Period, amplitude and phase Expression for period, frequency, velocity and acceleration Damped S.H.M. **GRAVITATION** Kepler's laws of planetary motion 19 Newton's universal law of gravitation Measurement of G (universal constant of gravitation) Mass and density of the earth Earth's satellite Escape velocity **SURFACE TENSION** Explanation of surface tension Angle of contact Surface energy Capillary rise Drops and bubbles Calculations and applications of surface tension **FLUID MOTION** Stream-line flow Bernoulli's theorem and its applications Circular motion - angular velocity, angular			

		acceleration, centripetal force, centrifugal force,application to road and rail construction.			
PHY 214	Mathematics for Physics II	Vector differentiation D-Grad and D - Vector Divergence and curl Analytical Geometry and Trigonometry Multiple angle formula Application of vector algebra Divergence (Gauss and Stokes Theorems, dipole, energy relation) Introduction to complex numbers.	1	Compulsory	Calculus: Early Transcendentals by James Stewart Hardback ISBN13: 978-1285741550 8th Edition
PHY 215	Physics Practical II	Experiments should be selected from topics covered in the courses listed below with at leastthree (3) experiments drawn from each. A minimum of 10 experiments and maximum of 12 experiments should be covered. **Courses:-** PHY 211 - Thermal Physics II PHY 212 - Electromagnetism II PHY 213 - Mechanics and Properties of Matter II	1	Compulsory	*Experimental Physics for Tertiary Institutions. Babson Press Ltd*

PHY 221	Workshop Practice	Organization and safety in the workshop Classification and use of tools (Basic tools e.g. glass, metals, plastics, etc.) Construction and improvisation of some basic teaching aids e.g. lens holders, ray boxes, metrebridge, manometer, etc. (the constructions and improvisations, should involve the use of woods,metals, glass, etc.) Design of simple electrical/electronic circuits (half, full wave's rectifiers, etc.) Basic skills in Technical Drawing (Simple treatment only – e.g. drawing of angles, isomeric drawing, etc) **NOTE:** Lecturer(s) may be assigned to guide and supervise the course and also assess the works. However, the students are expected to produce individual construction works which will be defended by the students before all the lecturers in	2	Compulsory	Workshop Practice Series 17: Gears and by Ivan law ISBN13: 978-0852429112

			the department and this earns the students the (70%) of the total score for the course. Excursion to a manufacturing company and an excursion report to be submitted for assessment. (30%)				
PHY 222	Optics		**WAVE THEORY OF LIGHT** Determination of the velocity of light using the Michelson - Morley method Wave nature of light (Huygens's Principle). **INTERFERENCE AND ITS APPLICATION** Conditions for interference Young's double slit experiment Newton's rings Thin-films and wedges, blooming of lenses Simple problems relating to them **DIFFRACTION AND ITS EFFECTS** Fraunhofer and Fresnel's diffraction Diffraction gratings, criterion for optical resolution **POLARIZATION OF**	2	Compulsory	Optics by Eugene Hecht Hardback ISBN13: 978-0133977226 5th Edition

		LIGHT Polarization by reflection Qualitative description and applications of polarization **LASERS** and its applications - Qualitative treatment only.			
PHY 223	Thermal Physics II	Application of the concept of kinetic theory to: transport phenomenon in fluids - thermal Conductivity, viscosity, diffusion, osmosis and specific heat capacities. Second law of thermodynamics including Carnot Cycle and Car not Engine Application of Van da Waal's equation Derivation to include partial derivatives Further treatment of molecular speed (solving more problems in molecular speed and RM.S.). Degree of freedom and further applications of ideal gas equations Isothermal and adiabatic changes.	2	Compulsory	1.Advanced Level Physics, 7E (Pb) Paperback – 1995 by Nelkon / Parker 2. Introduction to Thermal Physics by Daniel V. Schroeder Hardback 3. Thermal Physics by C. B. P. Finn Print On Demand ISBN13: 978-0748743797
PHY 224	Physics Methodology	Philosophy of Science:- What is Science?	1	Compulsory	Methodology of

		What is Physics? Different aspects of Physics? Uses of Physics in society (why Physics?) Concepts, theories, laws and principles in physics Jobs for the physicists Assessment in Physics (theory and practical) Methods of teaching Physics (e.g. process, inquiry etc) Lesson plans and lesson notes in Physics The teaching of electricity and magnetism The teaching of radioactivity and atomic structure The teaching of electronics. Physics teaching aids Computer - assisted learning in Physics Gender and Physics Use of Physics Laboratory - Ordering, Cataloguing, storing of equipment; safety rules and First Aid, maintenance of equipment, Design of Physics Laboratory Micro-teaching			Teaching Physics by Bondada Ramesh

			FLHE- Decision making - Communication, Assertiveness, Negotiation and Finding Help.			
PHY 225	Methodology II		History of Physics - Galileo, Boyle, Newton Einstein, Faraday, Von Neumann, James Clark Maxwell, etc. (Emphasis should be on how their contributions revolutionized physics) The development Physics Education in Nigerian General Science Education Resources for teaching the following Physics concepts; Motion; energy, light, kinetic theory and waves. National Policy on Education and the Objectives of Science Education. The role of Physics in Science Education FLHE - Human Development - Body care, Body abuse and Drug abuse. STLs/HIV - Abstinence, Puberty and Self esteem.	2	Compulsory	Methodology of Teaching Physics by Bondada Ramesh
PHY 321	Electromagnetism III		A. C. theory and its applications (phase and vector diagrams)	2	Compulsory	1.Advanced Level Physics, 7E (Pb) Paperback – 1995

		A. C AND ELECTRICAL NETWORK Reactance, impedance, power in A.C. circuit, power factor, quality factor, concept of resonanceand applications. Rectification (half wave and full wave) and smoothing (show how the inductive - time constant,capacitive-time constant are used as wave sharpers). Concept of electrical oscillation with respect to L/C circuits - generation of radio wave - TUNED circuit - A.M., F.M. MAGNETIC PROPERTIES AND THEIR APPLICATIONS Diamagnetism, ferromagnetism, and paramagnetism Magnetic induction (B), magnetic Intensity (H), hysteresis Domain theory.			by Nelkon / Parker 2. Essentials of Electromagnetics II by Research & Education Association Paperback ISBN13: 978-0878915880
PHY 322	Atomic and Quantum Physics II	**X-RAYS** Origin, production and properties of X-rays - Bragg's and Moseley's Laws and their	1	Compulsory	1.Advanced Level Physics, 7E (Pb) Paperback – 1995 by Nelkon / Parker 2. Physics of Atoms

		applications X-ray spectra Applications of X-rays. **RADIOACTIVITY AND ITS APPLICATIONS** Concept of Radioactivity's Types of radioactivity Nature and properties of nuclear radiations Detection of nuclear radiation. Radiation damage, unit and safety precautions Decay laws and half-life Radioactive transformation and series "Geiger - Nuttal law" detection of nuclear radiations "Radiation detection instruments" (GM tube, cloud chamber, etc). **ARTIFICIAL RADIOACTIVITY** Production and uses of radioisotopes (e.g. carbon dating, and medical) Nuclear atom - history and features (nucleus, nuclide, nuclei, nucleon, atomic number, mass number, neutron, isotopes).			and Quanta by Haken Hardback ISBN13: 978-35

		Binding energy and stability (Apply mass-energy relation) - differentiate between atomic and nuclear binding energies. **NUCLEAR REACTIONS** Nuclear fission and fusion Chain reactions and their applications **WAVE - PARTICLE DUALITY** Uncertainty theory (principle) Application (Qualitative treatment only)			
PHY 323	Physics Practical III	Select experiments spanning through the courses taught with at least two (2) experiments from each course	1	Compulsory	Experimental Physics for Tertiary Institutions. Babson Press Ltd