100 LEVEL CCMAS
Department of Physics
University of Ibadan

COURSES OUTLINE
100 LEVEL 70%

Course Code	Course Title	Unit(s)	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian People a	2	C	30	-
COS 101	Introduction to ComputingSciences	3	C	30	45
MTH 101	Elementary Mathematics I	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
PHY 103	General Physics III	2	C	30	-
PHY 104	General Physics IV	2	C	30	-
PHY 107	General Practical Physics I	1	C	-	45
PHY 108	General Practical Physics II	1	C	-	45
Total units of compulsory courses = 21					

100 LEVEL 30%

Course Code	Course Title	Unit(s)	Status	LH	PH
MAT 103	Elementary Mathematics III (Vector, Geometry and Dynamics)	2	C	30	
STA 111	Descriptive Statistics	3	C	45	
STA 112	Probability I	3	C	45	-
STA 121	Statistical Inference I	3	E	45	
STA 122	Statistical Computing I	3	E	15	90
Total units of compulsory courses = 8					

PHY 101: General Physics I (Mechanics) (2 Units C: LH 30)

Learning Outcome

At the end of the course, students should be able to:
1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems on the basis of the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Contents
Space and time. Units and dimension. Vectors and scalars. Differentiation of vectors (displacement, velocity and acceleration). Kinematics. Newton's laws of motion (Inertial frames, impulse, force and action at a distance, momentum conservation). Relative motion. Application of Newtonian mechanics. Equations of motion. Conservation principles in physics (conservative forces, conservation of linear momentum, kinetic energy and work, potential energy). System of particles. Centre of mass. Rotational motion (torque, vector product, moment, rotation of coordinate axes and angular momentum). Coordinate systems. Polar coordinates. Conservation of angular momentum. Circular motion. Moments of inertia (gyroscopes, and precession). Gravitation (Newton's Law of Gravitation, Kepler's laws of planetary motion, gravitational potential energy, escape velocity, satellites motion and orbits).

PHY 102: General Physics II (Electricity & Magnetism) (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws;
6. explain the basic physical significance of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of AC voltages and currents in resistors, capacitors, and Inductors.

Course Contents
Forces in nature. Electrostatics (electric charge and its properties, methods of charging). Coulomb's law and superposition. Electric field and potential. Gauss's law. Capacitance. Electric dipoles. Energy in electric fields. Conductors and insulators. DC circuits (current, voltage and resistance). Ohm's law. Resistor combinations. Analysis of DC circuits. Magnetic fields. Lorentz force. Biot-Savart and Ampère's laws. Magnetic dipoles. Dielectrics. Energy in magnetic fields. Electromotive force. Electromagnetic induction. Self and mutual inductances. Faraday and Lenz's laws. Step up and step down transformers. Maxwell's equations. Electromagnetic oscillations and waves. AC voltages and currents applied to inductors, capacitors, and resistance.

PHY 103: General Physics III (Behaviour of Matter) (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. explain the concepts of heat and temperature and relate the temperature scales;
2. define, derive, and apply the fundamental thermodynamic relations to thermal systems;
3. describe and explain the first and second laws of thermodynamics, and the concept of entropy;
4. state the assumptions of the kinetic theory and apply techniques of describing macroscopic behaviour;
5. deduce the formalism of thermodynamics and apply it to simple systems in thermal equilibrium; and
6. describe and determine the effect of forces and deformation of materials and surfaces.

Course Contents
Heat and temperature (temperature scales). Gas laws. General gas equation. Thermal conductivity. First Law of thermodynamics (heat, work and internal energy, reversibility). Thermodynamic processes (adiabatic, isothermal, isobaric). Second law of thermodynamics (heat engines and entropy). Zeroth law of thermodynamics. Kinetic theory of gases. Molecular collisions and mean free path. Elasticity (Hooke's law, Young's, shear and bulk moduli). Hydrostatics (Pressure, buoyancy, Archimedes' principles). Bernoulli's equation and incompressible fluid flow. Surface tension (adhesion, cohesion, viscosity, capillarity, drops and bubbles).

PHY 104: General Physics IV (Vibration Waves and Optics) (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. describe and quantitatively analyse the behaviour of vibrating systems and wave energy;
2. explain the propagation and properties of waves in sound and light;
3. identify and apply the wave equations; and
4. explain geometrical optics and principles of optical instruments.

Course Contents
Simple harmonic motion (SHM). Energy in a vibrating system. Damped SHM. Resonance and transients. Coupled SHM. Q values and power response curves. Normal modes. Waves (types and properties of waves as applied to sound). Transverse and longitudinal waves (superposition, interference, diffraction, dispersion, polarization). Waves at interfaces (energy and power of waves). The wave equation. 2-D and 3-D wave equations. Wave energy and power. Phase and group velocities. Echo and beats. The Doppler-effect. Propagation of sound in gases, solids and liquids and their properties.
Optics: Nature and propagation of light. Reflection and refraction. Internal reflection. Scattering of light. Reflection and refraction at plane and spherical surfaces. Thin lenses and optical instruments. Wave nature of light. Dispersion. Huygens's principle (interference and diffraction).

PHY 107: General Practical Physics I (1 Unit C: PH 45)

Learning Outcomes
At the end of the course, students should be able to:
1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs; and
5. draw conclusions from numerical and graphical analysis of data.

Course Contents
This introductory course emphasizes quantitative measurements. Experimental techniques. The treatment of measurement errors. Graphical analysis. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc. (covered in PHY 101, 102, 103 and PHY 104). However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis, and deduction.

PHY 108: General Practical Physics II (1Unit C: PH 45)

Learning Outcomes
At the end of the course, students should be able to:
1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs;
5. draw conclusions from numerical and graphical analysis of data; and
6. prepare and present practical reports.

Course Contents
This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements, the treatment of measurement errors, and

graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

MTH 101: Elementary Mathematics I (Algebra and Trigonometry) (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. explain the basic definition of set, subset, union, intersection, complements and use of Venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. identify and use various types of numbers; and
5. solve some problems using binomial theorem.

Course Contents
Elementary set theory, subsets, union, intersection, complements, Venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

MTH 102: Elementary Mathematics II (Calculus) (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. identify the types of rules of differentiation and integration;
2. describe the meaning of function of a real variable, graphs, limits and continuity and their applications; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents
Function of a real variable (graphs, limits, and idea of continuity). The derivative as limit of rate of change. Techniques of differentiation. Extreme curve sketching. Integration as an inverse of differentiation. Methods of integration. Definite integrals (application to areas and volumes).

MTH 103: Elementary Mathematics III (Vectors, Geometry and Dynamics)(2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. solve some vectors in addition and multiplication;
2. calculate force and momentum; and
3. solve differentiation and integration of vectors.

Course Contents
Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition, scalar, multiplication of vectors, linear independence. Scalar and vector products of two vectors. Differentiation and integration of vectors with respect to a scalar variable. Two-dimensional co-ordinate geometry. Straight lines, circles, parabola, ellipse, hyperbola. Tangents, normals. Kinematics of a particle. Components of velocity and acceleration of a particle moving in a plane. Force, momentum, laws of motion under gravity, projectiles and resisted vertical motion. Elastic string and simple pendulum. Impulse, impact of two smooth spheres and a sphere on a smooth surface.

STA 111: Descriptive Statistics(3 Units C: LH 45)

Learning Outcomes
At the end of the course, students should be able to:
1. explain the basic concepts of descriptive statistics;
2. present data in graphs and charts;
3. differentiate between measures of location, dispersion and partition;
4. describe the basic concepts of Skewness and Kurtosis as well as their utility function in a given data set;
5. differentiate rates from ratio and how they are use; and
6. Compute the different types of index number from a given data set and interpret the output.

Course Contents
Statistical data. Types, sources and methods of collection. Presentation of data. Tables chart and graph. Errors and approximations. Frequency and cumulative distributions. Measures of location, partition, dispersion, skewness and Kurtosis. Rates, ratios and index numbers.

STA 112: Probability 1 (3 Units C: LH 45)

Learning Outcomes
At the end of the course, students should be able to:
1. explain the differences between permutation and combination;
2. explain the concept of random variables and relate it to probability and distribution functions;
3. describe the basic distribution functions; and
4. Explain the concept exploratory data analysis.

Permutation and combination. Concepts and principles of probability. Random variables. Probability and distribution functions. Basic distributions: Binomial, geometric, Poisson, normal and sampling distributions; exploratory data analysis.

STA 121: Statistical Inference I (3 Units E: LH 45)

Learning Outcome
At the end of the course, students should be able to:

1. differentiate population from sample as well as point from interval estimate;
2. test for hypothesis concerning population mean and proportions for large and small samples;
3. Compute regression and obtain the fitted line. Likewise, the computation for correlation coefficient well understood; and
4. Describe the fundamentals of time series analysis.

Course Contents
Population and samples. Random sampling distributions. Estimation (point and interval) and tests of hypotheses concerning population mean and proportion (one and two large sample cases). Regression and correlation. Elementary time series analysis.

STA 122: Statistical Computing I (3 Units E: LH 15; PH 90)

Learning Outcomes

At the end of the course, students should be able to:
1. explain the fundamentals of computer;
2. acquire knowledge of the applications and use of computers and calculators in relation to computing the measures of locations and dispersions;
3. explain the organizations of computations to access, transform, explore, analyze data and produce results; and
4. demonstrate the use of Microsoft excel and the installation of the analysis tool pack.

Course Contents

Introduction to computer: structure, type, uses and applications; computations (using computers and calculators), involving topics in STA111 and 121; organizations of computations to access, transform, explore, analyze data and produce results. Concepts and vocabulary of statistical computing. Microsoft excel and specifically the installation and the utility function of the analysis tool pack.

COS 101: Introduction to Computing Sciences (3 Units C: LH 30; PH 45)

Learning Outcomes
At the end of the course, students should be able to:
1. explain basic components of computers and other computing devices;
2. describe the various applications of computers;
3. explain information processing and its roles in the society;
4. describe the Internet, its various applications and its impact;
5. explain the different areas of the computing discipline and its specializations; and
6. demonstrate practical skills on using computers and the internet.

Course Contents
Brief history of computing. Description of the basic components of a computer/computing device. Input/Output devices and peripherals. Hardware, software and human ware. Diverse and growing computer/digital applications. Information processing and its roles in society. The

Internet, its applications and its impact on the world today. The different areas/programs of the computing discipline. The job specializations for computing professionals. The future of computing.

Lab Work: Practical demonstration of the basic parts of a computer. Illustration of different operating systems of different computing devices including desktops, laptops, tablets, smart boards and smart phones. Demonstration of commonly used applications such as word processors, spreadsheets, presentation software and graphics. Illustration of input and output devices including printers, scanners, projectors and smartboards. Practical demonstration of the Internet and its various applications. Illustration of browsers and search engines. How to access online resources.

GST 111: Communication in English (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to

1. identify possible sound patterns in English Language;
2. list notable Language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents

Sound patterns in English Language (vowels and consonants, phonetics, and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple, and complex). Grammar and Usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical considerations, copyright rules, and infringements. Writing activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing). Types of writing: summary, essays, letter, curriculum vitae, report writing, note making etc. Mechanics of writing. Comprehension Strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and Communication Technology in modern Language Learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigerian peoples and culture (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of Trade, Economic and Self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards Nation building;
6. analyse the role of the Judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture and art up to 1800 (yoruba, hausa and igbo peoples and culture, peoples and culture of the ethnic minority groups). Nigeria under colonial rule: (advent of colonial rule in Nigeria, Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, Nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics; Nigerian civil war). Concept of trade and economics of self-reliance (indigenous trade and market system, indigenous apprenticeship system among Nigeria people, trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification). Judiciary and fundamental human rights. Individual, norms, and values (basic Nigeria norms and values, patterns of citizenship acquisition, citizenship and civic responsibilities, indigenous languages, usage, and development, negative attitudes and conducts. Cultism, kidnapping and other related
social vices). Re-orientation, moral and national values (The 3R's – reconstruction, rehabilitation and re-orientation strategies, operation feed the nation (OFN), green revolution, austerity measures, war against indiscipline (WAI), war against indiscipline and corruption (WAIC), mass mobilization for self-reliance; social justice and economic recovery (MAMSER), national orientation agency (NOA), current socio-political and cultural developments in Nigeria).