**BAYERO UNIVERSITY, KANO**

**FACULTY OF EDUCATION**

**DEPARTMENT OF SCIENCE AND TECHNOLOGY EDUCATION**

**B. SC ED PHYSICS**

**CCMAS 30% CONTENT**

**LEVEL ONE**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **COURSE CODE** | **COURSE TITLE** | **UNIT** | **STATUS** | **LH** | **PH** |
| BUK–STE 101 | Foundation of Education II | 2 | C | 30 |  |
| BUK–STE 102 | Basic Computer Science | 3 | C | 30 | 45 |
| BUK–STE 105 | Basic Mathematics III | 2 | C | 30 | - |
| BUK–STE 114 | Basic Chemistry I | 2 | C | 30 |  |
| BUK–STE 115 | Basic Chemistry II | 2 | C | 30 |  |
| **TOTAL UNITS** | | **11** | | | |

**LEVEL TWO**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **COURSE CODE** | **COURSE TITLE** | **UNIT** | **STATUS** | **LH** | **PH** |
| BUK–STE 201 | Basic Educational Statistics | 2 | C | 30 | - |
| BUK–STE 202 | Introduction to Research Method | 2 | C | 30 | - |
| BUK-STE 203 | Introduction to Classical Physics | 2 | C | 30 |  |
| BUK-STE 204 | Electrons in Motion | 2 | C | 30 |  |
| BUK-STE 205 | Basic Differential Equations | 2 | C | 30 |  |
| BUK-STE 206 | Introduction to Sets, Logic and Algebra | 2 | C | 30 |  |
| **TOTAL UNITS** | | 10 | | | |

**LEVEL THREE**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **COURSE CODE** | **COURSE TITLE** | **UNIT** | **STATUS** | **LH** | **PH** |
| BUK–STE 301 | Educational Technology | 2 | C | 30 | - |
| BUK–STE 302 | Physics of Semiconductor | 3 | C | 45 |  |
| BUK–STE 303 | Complex analysis | 3 | C | 45 |  |
| **TOTAL UNITS** | | **8** | | | |

**LEVEL FOUR**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **COURSE CODE** | **COURSE TITLE** | **UNIT** | **STATUS** | **LH** | **PH** |
| BUK–STE 401 | Educational Structure, Administration and Planning | 2 | C | 30 | - |
| BUK–STE 402 | Guidance and Counselling in Science Education | 2 | C | 30 | - |
| BUK-STE 403 | ICT in Science and Technology Education | 2 | C | 30 | - |
| BUK – STE 415 | Geophysics | 3 | C | 45 |  |
| BUK – STE 416 | Physics of materials | 2 | C | 30 | - |
| **Total Units** | | **11** | | | |

**COURSE CONTENT AND LEARNING OUTCOMES**

**Level 100**

**BUK-STE 101 Foundation of Education II (2 Credits; Core; LH = 30)**

**Senate-Approved Relevance**

Coursework in foundation of education II is perhaps the most paramount and critical in the teacher education and training. It is in this course that student-teachers are taught the psychology and sociology of learner and learning, the trends of curriculum development and design, and the historical antecedents of education systems from the indigenous system, missionary to the present. Teacher education needs to avail the students with what, when and how of Nigeria education system so as to prepare them on the task of imparting knowledge, skills and improving students attitude and emotions. This is in line with the BUK’s mission of producing high quality human resources required for the promotion of the development of the host community, the nation, Africa and beyond.

**Overview**

This course provides a survey of the psychology, sociology, history and philosophy of education with emphasis on current problems in education, on significant educational innovations, and on the school as a social institution. The course is secondary to EDU 101 Introduction to Teaching and Foundations of Education and lays more emphasis on Intelligence, motivation, Remembering and forgetting, Transfer of learning, Education and Culture, social stratification and education, School as an organization, Educational development since 1950, The development and current structure of the Nigeria curriculum.

Therefore, the course provides an overview of the cultural, sociological, political, curriculum and historical underpinnings of the Nigeria education system as a requisite for teacher training. The importance of the course lies in meeting and providing high-quality education as enshrine in sustainable development goals (SDGs) in the area of education.

**Learning Objectives**

The objectives of the course are to.

1. Comprehend the concept of intelligence
2. Describe the influence of heredity and environment on intelligence
3. Understand the term motivation
4. List and explain theories of motivation
5. Define Memory
6. List and explain stages and agents of socialization;
7. Explain the influence of social stratification on education
8. Discuss equality of educational opportunity.
9. Trace educational development since 1950.
10. Write on the development and current structure of the Nigeria curriculum

**Learning Outcomes**

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

1. Define intelligence
2. Explain the influence of heredity and environment on intelligence
3. Define motivation
4. List and explain five theories of motivation
5. Define Memory
6. List and explain three stages and agents of socialization;
7. Explain the influence of social stratification on education
8. Discuss equality of educational opportunity.
9. Trace educational development since from 1950 to date
10. Write on the development and current structure of the Nigeria curriculum

**Course Contents**

Intelligence; definition; influence of heredity and environment; development and use of IQ tests; limitations of testing;' Introduction to motivation and its relation to learning; basic concepts; theories of motivation; educational implications; Remembering and forgetting: stages of memory; recognition; recall; relearning; causes of forgetting; factors affecting retention; implications for teaching; Transfer of learning: importance of transfer; learning sets; learning to learn; teaching for transfer. Education and Culture: Stages and agents of socialization; social stratification and education, equality of educational opportunity; education and social mobility; Social functions of education: The uses of literacy in society; education for democracy; education for leadership selection in education; School as an organization: Definitions and theoretical models; bureaucratization and professionalization of schooling. *Educational development since 1950.* The development and current structure of the Nigeria curriculum. Historical background: Pre-Islamic and pre-Christian curricula; The curriculum of Islamic education; the Christian mission curriculum; Colonial government schools and their changing curriculum; Post-colonial developments. Current Structure

**BUK-STE 102: Basic Computer Science (3 Units C: LH 30; PH 45)**

**Senate – Approved Relevance**

Training of high-quality graduates who are highly skilled and knowledgeable in carrying out basic operations involving computer software and hardware components in agreement with BUK’s mission to address African developmental challenges in producing graduates who are computer literate.

**Overview**

Basic computer sciences lead to acquisition of basic skills in hardware and software components. It will give students basic ideas in information processing and its roles in society.

Students will be required to complete lab assignments using the PC’s operating system, and several commonly used applications, such as word processors, spreadsheets, presentations, graphics and other applications. Internet and on-line resources, browsers, and search engines.

**Objectives**

The objectives of the course are to:

1. Trace historical development of computing to the current programmes in the discipline;
2. Distinguish the salient characteristics of the different programmes of the computing discipline;
3. Identify the roles and applications of computers and computing in different areas of human endeavour;
4. Identify and explain the basic components of a computer system;
5. Develop basic literacy on the use of computer systems;
6. Develop competence on the use of common Office productivity applications; and
7. Make purposeful use of the Internet for information gathering, learning and continuous professional development.

**Learning Outcomes**

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

1. Trace historical development of computing to the current programmes in the discipline;
2. Distinguish the salient characteristics of the different programmes of the computing discipline;
3. Identify the roles and applications of computers and computing in different areas of human endeavour;
4. Identify and explain the basic components of a computer system;
5. Develop basic literacy on the use of computer systems;
6. Develop competence on the use of common Office productivity applications; and
7. Make purposeful use of the Internet for information gathering, learning and continuous professional development.

**Course Contents**

History of computing sciences leading to the different programmes in the discipline. Characteristics of each programme in computing sciences. Hardware, Software; and human resources; Integration and application in business and other segments of society. Information processing and its roles in society; Students will be required to complete lab assignments using the PC’s operating system, and several commonly used applications, such as word processors, spreadsheets, presentations, graphics and other applications. Internet and on-line resources, browsers, and search engines.

**BUK-STE 105: Basic Mathematics III (Vectors, Geometry and Dynamics) (2 Units C: LH 30) Pre-requisite – BUK-STE 102**

Overview

Basic Mathematics III provides students with idea of Geometric representation of vectors in 1, 2 and 3 dimensions, and Scalar and vector products of two vectors. Students will have knowledge of Differentiation and integration of vectors with respect to a scalar variable, Two-dimensional co-ordinate geometry, Straight lines, circles, parabola, ellipse, hyperbola and Tangents.

The idea of Kinematics of a particle; such as 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 will be discuss and students would be required to solve numerical problems.

Learning objectives

At the end of the course students should be able to

1. Solve addition and multiplication of vectors in two dimension
2. Calculate velocity, and acceleration of particles
3. Explain Force, momentum, laws of motion under gravity, projectiles and resisted vertical motion, Elastic string and simple pendulum
4. To solve problems on Differentiation and Integration of vectors
5. To apply Differentiation and Integration of vectors in laws of motion under gravity

**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.

**BUK–STE 114: General Chemistry I (3 Units C: LH 45)**

**Overview**

Basic chemistry I provide basic ideas on atom, molecules and chemical reaction and modern atomic theories, periodic table and elements configurations, Simple balance oxidation – reduction equation and redox titration problems.

The students will be acquainted with idea of simple molecules and hybridization of orbitals, acid, base and salt, apply the principles of equilibrium to aqueous systems using Le Chatelier’s principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures. Analysis and simple calculation with enthalpy, entropy and free energy equation will be treated.

**Learning objectives**

At the end of the course students should be able to

1. Explain basic properties of atom
2. Define and explain atomic theories
3. State the effects of concentration, pressure and temperature on equilibrium mixture
4. Solve problems with enthalpy
5. Determine the entropy and free energy equation

**Learning Outcomes**

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

1. define atom, molecules and chemical reactions;

2. discuss the modern electronic theory of atoms;

3. write electronic configurations of elements on the periodic table;

4. justify the trends of atomic radii, ionization energies, electronegativity of the elements

based on their position in the periodic table;

5. identify and balance oxidation – reduction equation and solve redox titration problems;

6. illustrate shapes of simple molecules and hybridized orbitals;

7. identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;

8. apply the principles of equilibrium to aqueous systems using Le Chatelier’s principle to

predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;

9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and

10. determine rates of reactions and its dependence on concentration, time and

temperature.

**Course Contents**

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory

of atoms. Electronic configuration, periodicity and building up of the periodic table.

Hybridization and shapes of simple molecules. Valence Forces. Structure of solids. Chemical

equations and stoichiometry. Chemical bonding and intermolecular forces, kinetic theory of

matter. Elementary thermochemistry: rates of reaction, equilibrium and thermodynamics.

Acids, bases and salts. Properties of gases. Redox reactions and introduction to

electrochemistry. Radioactivity.

**BUK–STE 114: General Chemistry II (3 Units C: LH 45)**

**Overview**

Organic chemistry provides students with knowledge of the development and importance of organic chemistry to human being, electronic configuration and the quantitative and qualitative structure of organic chemistry. Students will be guided to understand the rule of nomenclature and functional group classes of organic chemistry.

The students would be required to classify functional group with brief description , predict mechanism reaction, compare elements of group Ia, IIa and Iva and describe the basic properties of transition metals.

Learning objectives

At the end of the course students should be able to

1. Calculate electronic configuration of elements
2. State the rules of nomenclature
3. Predict mechanism reaction
4. Describe the basic properties of transition metals.
5. Derive the chemical structure of chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones

**Learning Outcomes**

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

1. state the importance and development of organic chemistry;

2. define fullerenes and its applications;

3. discuss electronic theory;

4. determine the qualitative and quantitative structures in organic chemistry;

5. describe rules guiding nomenclature and functional group classes of organic compounds;

6. determine rate of reaction to predict mechanisms of reaction;

7. identify classes of organic functional group with brief description of their chemistry;

8. discuss comparative chemistry of group 1a, IIa and IVa elements; and

9. describe basic properties of transition metals.

**Course Contents**

Historical survey of the development and importance of Organic Chemistry. Fullerenes as

fourth allotrope of carbon, uses as nanotubes, nanostructures, Nano chemistry. Electronic

theory in organic chemistry. Isolation and purification of organic compounds. Determination

of structures of organic compounds including qualitative and quantitative analysis in organic

chemistry. Nomenclature and functional group classes of organic compounds. Introductory

reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes,

alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids

and derivatives. The Chemistry of selected metals and non-metals. Comparative chemistry of

group IA, IIA and IVA elements. Introduction to transition metal chemistry

**Level 200**

**BUK-STE 201 Basic Educational Statistics (2 Credits; Core; LH = 30)**

**Senate-Approved Relevance**

Production of high-quality, qualified and professional teachers requires expertise in educational statistics which is concern with analysis of data for diagnosis of learning and educational problems, students’ promotion and evaluation of success or otherwise of an instruction or entire educational program. This is in line with the BUK’s mission of producing high quality human resources required for the promotion of the development of the host community, the nation, Africa and beyond.

**Overview**

Educational statistics is designed to acquaint students with statistical knowledge of data analysis and results interpretation. The students will be exposed to the rudiment of descriptive and inferential statistics for data summary and drawing statistical inferences.

The importance of the course lies in meeting and providing high-quality education as enshrine in sustainable development goals (SDGs) in the area of education.

**Learning Objectives**

The students are expected to be able to:

1. Understand the concept of Educational Statistics
2. Identify types of data and scales of measurement.
3. Describe the various methods of organising and summarising data.
4. Calculate mean, median and mode of a given set of distributions
5. Understand and use measures of dispersion or variability.
6. Describe the methods of estimating relationship between two sets of a given distributions
7. Develop and test hypotheses using appropriate statistics.

**Learning Outcomes**

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

1. Define educational statistics
2. List and explain three types of data
3. Describe the methods of organising and summarising data
4. Calculate mean, median and mode of a given set of distributions
5. Calculate deviation and standard deviation of a given set of distributions
6. Compute relationship between two set of scores
7. Develop three null hypotheses and test them using appropriate statistics.

**Course Contents**

Introduction to Educational Statistics, Descriptive statistics, frequency distribution, measures of central tendency, measures of variability, percentiles, standard scores, norms. Inferential statistics; rationale for statistical inference, selection of appropriate statistical tests; parametric tests, t-tests, ANOVA, Pearson Product Moment Correlation. Non-parametric tests, chi-square, Spearman Rank-order Correlation.

**BUK-STE 202 Introduction to Research Methods in Education (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

Production of high-quality, qualified and professional teachers requires expertise in conducting educational research and providing solutions on problems in the area teaching, learning and educational management. This course research methods in education was design in line with the BUK’s mission of producing high quality human resources required for the promotion of the development of the host community, the nation, Africa and beyond. The course was meant to train student-teachers with the requisite knowledge of identifying educational problem, developing appropriate design in search for the cause/effect of the problem, conducting the study and recommending the ways out of the problem for educational development.

**Overview**

Research methods in education is designed to acquaint students with the knowledge of identifying educational problem, investigating the problem and providing solutions to the identified problem. The students will be exposed to the concept and types of educational research, sources of educational problems, techniques of literature review, research design, types of data collection instruments, validity and reliability of data collection instruments, and writing research proposal.

The importance of the course lies in meeting and providing high-quality education as enshrine in sustainable development goals (SDGs) in the area of education.

**Learning Objectives**

The learning objectives of the course are for the students to:

1. Understand the concept of educational research
2. Describe the different types of educational research
3. Identify a research problem
4. Formulate research hypotheses
5. Develop a research proposal

**Learning Outcomes**

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

1. Define educational research
2. Differentiate between three types of research
3. Identify a research problem in their area of specialization
4. Develop a research proposal
5. Formulate three testable null hypotheses
6. Write a research proposal

**Course Contents**

Topics include: Nature and purpose of research; Categories of research activities; descriptive, historical, experimental; Writing a research proposal; selecting a topic; contents and organization of the proposal; Literature review; its role; methods of citing literature; Research bias; political, religious and social bias in research; objectivity; cross- cultural applications; Ethical issues in research; subjects' understanding and co-operation with the researcher; confidentiality and publication; misinterpretation and misuse of research findings; Hypotheses and research questions; nature and use of hypotheses and research findings; Sampling procedures; rational and procedures; advantages and disadvantages of sampling procedures; Data collection techniques; questionnaires, interviews, observations, case studies, tests, government statistics, documentary analysis; Research validity and reliability’ Writing the research report; Review of the role of research in education.

**BUK-STE 203: Introduction to Classical Mechanics (2 Units C: LH 30)**

**Overview**

Introduction to classical mechanics is a course that gives students idea on Space and time. Linear kinematics. Linear and angular momentum. Force and torque. Motion in a plane. Newtonian gravity. The two-body systems. Forces and equilibrium.

Particle dynamics. Force fields and potentials. Collisions. Conservative forces. Inertial frames and non-inertial frames. Motion in rotating frames. Kepler’s laws. Rigid body motion and rotational dynamics. Moment of inertia. Free rotation and stability. Gyroscopes.

**Learning objectives**

At the end of the course students should be able to

1. Determine the relation between linear and angular momentum
2. Differentiate between force and torque
3. State the law of conservations of force
4. Define Kepler’s law
5. Establish relation between rigid body motion and rotational dynamics

**Learning Outcomes**

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

1. relate the concepts of space coordinates, time, and linear motion;

2. describe particle dynamics, equilibrium, and conservative forces;

3. solve problems on central forces, energy, and angular momentum;

4. explain the dynamics of rotational motion;

5. discuss and apply the potential theory;

6. explain the dynamics of rigid bodies;

7. apply Newton's theory of gravitation to problems of planetary motion and space travel;

9. derive the general relation between the angular velocity and angular momentum of a rigid;

body and use this to solve problems in rotational dynamics.

**Course Contents**

Introduction to classical mechanics. Space and time. Linear kinematics. Linear and angular momentum. Force and torque. Motion in a plane. Newtonian gravity. The two-body systems. Forces and equilibrium. Particle dynamics. Force fields and potentials. Collisions. Conservative forces. Inertial frames and non-inertial frames. Motion in rotating frames. Centrifugal force. Central force motions. Kepler’s motion in a central force field. Particle orbits as conic sections. Kepler’s laws. Rigid body motion and rotational dynamics. Moment of inertia. Free rotation and stability. Gyroscopes.

**BUK-STE 204: Electrons in Motion (2 Units C: LH 30)**

**Overview**

The course provides students with idea of Maxwell's equations and its application in wave solutions. Definition of scalar and vector potentials. Electrostatics and magneto statics and Poisson’s equation. Electrodynamics in Lorentz Gauge.

The inhomogeneous wave equation and the retarded time. Relativistic dynamics. Electromagnetic field tensor. Power radiated from an arbitrary moving charge. Multiple radiation, electric and magnetic dipole radiation; slow-down of pulsars. Rayleigh and Thomson scattering.

**Learning objectives**

At the end of the course students will be able to

1. State Maxwell’s equations and their application in wave solution
2. Define electrostatic and magneto static
3. Derive poisons equation
4. Explain magnetic and electric radiation
5. State and derive Rayleigh and Thomson scattering equation

**Learning Outcomes**

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

1. use scalar and vector potentials and explain the concept of gauge invariance;

2. demonstrate the compatibility of electrodynamics and special relativity;

3. use Lorentz covariant formalism in the context of electrodynamics and special relativity;

4. solve Poisson's equation and the inhomogeneous wave equation;

5. distinguish between radiation fields and other electromagnetic fields; and

6. calculate the radiated power produced by accelerating charges.

**Course Contents**

Maxwell's equations and wave solutions. Definition of scalar and vector potentials. Electrostatics and magnetostatics and Poisson’s equation. Electrodynamics in Lorentz Gauge. the inhomogeneous wave equation and the retarded time. Relativistic dynamics. Electromagnetic field tensor. Power radiated from an arbitrary moving charge. Multiple radiation, electric and magnetic dipole radiation; slow-down of pulsars. Rayleigh and Thomson scattering.

**BUK-STE 205: Elementary Differential Equations (2 Units C: LH 30)**

**Overview**

The course provides students with ideas on Derivation of differential equations from primitive physics etc. Orders and degree of differential equation, Techniques for solving first and second order linear and non-linear equations.

Solutions of systems of first order linear equations. Finite linear differential equations. Application to physics.

**Learning objectives**

At the end of the course students should be able to

1. Explain the ways of deriving differential equations form primitive physics
2. State the order and degrees of differential equation
3. Understand the techniques for solving first order and second order differential equation
4. Solve linear and nonlinear equation
5. Applied differential equation to solve physics problems

**Learning Outcomes**

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

1. Define the following: order and degree of a differential equation;

2. Describe some techniques for solving first and second order linear and non-linear equations; and

3. solve some problems related to geometry and physics.

**Course Contents**

Derivation of differential equations from primitive geometry, physics etc. Order and degree of differential equation. Techniques for solving first and second order linear and non-linear equations. Solutions of systems of first order linear equations. Finite linear differential equations. Application to geometry and physics.

**BUK-STE 206: Sets, Logic and Algebra I (2 Units C: LH 30)**

**Overview**

The course provides students with knowledge of modern mathematics and Topics which include: basic set theory: mappings, relations, equivalence and other relations, Cartesian products, binary logic, methods of proof, binary operations. Algebraic structures, semi-groups, rings, integral domains, fields.

Homeomorphics. Number systems; properties of integers, rational, real and complex numbers.

**Learning objectives**

At the end of the course students should be able to

1. Solve problems in set theory
2. Maps set in relation with other
3. Explain binary logic and methods of proofing binary operations
4. Define semi groups, ring, integral domain and field
5. State the properties of integers, rational, real and complex number

**Learning Outcomes**

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

1. Solve various problems using the concept of set theory;

2. Recognize Algebraic structures; and

3. Describe the meaning of logic in Mathematics.

**Course Contents**

Introduction to the language and concepts of modern mathematics. Topics include: basic set theory: mappings, relations, equivalence and other relations, Cartesian products, binary logic, methods of proof, binary operations. Algebraic structures, semi-groups, rings, integral domains, fields. Homeomorphics. Number systems; properties of integers, rational, real and complex numbers.

**BUK-STE 301 Educational Technology (2 Credits; Core; LH = 30)**

**Senate-Approved Relevance**

Production of high-quality, qualified and professional teachers requires expertise in selecting appropriate and systemic use of techniques, strategies, processes, procedures and instructional materials that enhance teacher instructional delivery an students learning. This course was designed to educate student-teachers on the appropriate and systematic use of hardware, software, processes and procedures in order to enhance teaching and learning, and achieve learning outcomes. This is line with the BUK’s mission of producing high quality human resources in the area of teaching required for the promotion of the educational development. The course was meant to educate student-teachers the knowledge of careful and systematic, preparation, planning and implementation of an instruction.

**Overview**

Educational Technology as a course was designed to acquaint students with the knowledge of educational aims and objectives, developing scheme of work, lesson planning and lesson notes, selecting and using appreciate instructional materials and teaching as communication.

The importance of the course lies in meeting and providing high-quality education as enshrine in sustainable development goals (SDGs) in the area of education.

**Learning Objectives**

The learning objectives of the course are for the students to.

1. Understand the concept of educational technology
2. Describe educational objectives as cornerstone of educational technology
3. Explain the different types of instructional materials for classroom teaching
4. List and explain the factors that affect selection and use of instructional materials
5. Explain the concept of teaching as communication
6. Discuss the purpose of educational field trip.

**Learning Outcomes**

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

1. Define educational technology
2. List and explain the three domains of educational objectives
3. Differentiate between projected and non-projected instructional media.
4. List and explain five factors that affect selection and use of instructional materials
5. Explain the concept of teaching as communication
6. Discuss the purpose of educational field trip.

**Course Contents**

This course will introduce students to the concept of Educational Technology and will continue with the familiarization of students with different types of Audio- Visual materials, their operations and uses. Educational technology: teaching as communication; educational objectives. Varieties of education media; Non-projected visuals for classroom teaching; audio media for class teaching; still-projected and motion projected media. Field trips; their purpose and organization; sources of A-V materials. Practical for audio, still, and motion projected media.

**BUK–STE 302: Physics of Semiconductor (3 Units C: LH 45)**

**Overview**

The course prepare students to have knowledge in Classes of semiconductor, The physics of semiconductors, Band structure of metals, semiconductors, and insulators, Semiconductor equilibrium, Doping and statistics. The idea of charge Carrier distribution, transport, and recombination, Carrier drift, diffusion, and conductivity, Hall effect semiconductor growth and depositions.

Semiconductor quantum structures. Modeling and application of selected semiconductor devices, P-n junction, bipolar transistor physics will be provided to the students. Major emphasis on MOS devices including field effect transistors and charge coupled devices. Consideration of advanced bipolar structures. Schottky barrier devices. Optical properties of semiconductors (light emitting diodes and photo-detectors) and Solar cells.

Learning objectives

At the end of the course students should be able to

1. Describe the structure of semiconductor
2. Differentiate between metal, semiconductor and insulator
3. Explain charge carrier distribution, generation and recombination
4. Describe pn junction and its application
5. State the optical properties of semiconductor

Learning Outcomes

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

1. Explain the type, functionality, and operation of semiconductor devices;
2. describe the crystal structure of representative semiconductor diodes and amplifying devices;
3. recognize the functional operation of diodes and amplifying semiconductor devices;
4. explain voltage-current characteristics of semiconductor devices;
5. explain the physics and operation of the transistors;
6. explain the basics of FET’s and MOSFET’s structures; and

**Course Contents**

Classes of semiconductor, The physics of semiconductors, Band structure of metals, semiconductors, and insulators, Semiconductor equilibrium, Doping and statistics. The idea of charge Carrier distribution, transport, and recombination, Carrier drift, diffusion, and conductivity, Hall effect semiconductor growth and depositions. Semiconductor quantum structures. Modeling and application of selected semiconductor devices, P-n junction. Review of junction and bipolar transistor physics will be provided to the students. Major emphasis on MOS devices including field effect transistors and charge coupled devices. Consideration of advanced bipolar structures. Schottky barrier devices. Optical properties of semiconductors (light emitting diodes and photo-detectors) and Solar cells.

**BUK–STE 302: Complex analysis (3 Units C: LH 45)**

**Overview**

Complex numbers. Functions of complex variable. Functions as mappings. Complex differentiation, analytic functions and the Cauchy-Riemann equations. Conformal mappings. solutions of 2D Laplace equation in physics. Integration in the complex plane. Contour integration. Cauchy’s Theorem. Cauchy’s integral formulae. Taylor and Laurent Series.

Cauchy’s residue theorem. Real integrals and series. Vector spaces. (Abstract vector spaces, linear independence, basis and dimensions, representations, Inner products, linear operators). Hermitian and unitary operators. Eigenvalues and eigenvectors.

**Learning objectives**

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

1. Define the solution of 2D Laplace equation in physics
2. Integrate complex values
3. Derive Taylor and Laurent series
4. Solve problems using Taylor and Laurent series
5. Explain Cauchy theorem

**Learning Outcomes**

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

1. determine whether or not a given function of a complex variable is differentiable;

2. use conformal mappings of the complex plane to solve problems in 2D electrostatics, fluid flow and heat flow;

3. construct the Taylor-Laurent series for functions that are analytic in an annular region of the

complex plane;

4. determine the location and nature of the singularities of a function and determine the order

of a pole and its residue;

5. use the residue theorem to evaluate integrals of functions of a complex variable, and identify

appropriate contours to assist in the summation of series and the evaluation of real integrals;

6. find an orthonormal basis for a given vector space;

7. define the adjoin of a linear operator and determine whether a given operator is Hermitian

and/or unitary; and

8. employ methods from this and prerequisite units to solve previously unseen problems in linear algebra, using Dirac’s notation where appropriate.

**Course Contents**

Complex numbers. Functions of complex variable. Functions as mappings. Complex differentiation, analytic functions and the Cauchy-Riemann equations. Conformal mappings. solutions of 2D Laplace equation in physics. Integration in the complex plane. Contour integration. Cauchy’s Theorem. Cauchy’s integral formulae. Taylor and Laurent Series. Cauchy’s residue theorem. Real integrals and series. Vector spaces. (Abstract vector spaces, linear independence, basis and dimensions, representations, Inner products, linear operators). Hermitian and unitary operators. Eigenvalues and eigenvectors.

**Level 400**

**BUK-STE 401 Educational Structure, Administration and Planning (2 Credits; Core; LH = 30)**

**Senate-Approved Relevance**

Educational Structure, Administration and Planning coincides with the BUK’s mission of producing high-quality graduates and the need to move forward the frontiers of human knowledge by providing excellent undergraduate and high-quality human resources. The course is meant to produce high-quality professional teachers who are managers of educational instructions. It is meant to educate student-teachers on structure of education as an organisation, processes and procedures for effective planning and administration of human and material resources in educational institutions.

**Overview**

Educational structure, administration and planning as a course was designed to acquaint students with the knowledge of educational structure, educational planning and educational administration.

The course helps in producing high-quality educational managers. This is in line with provision of high-quality education as enshrine in sustainable development goals (SDGs).

**Learning Objectives**

The objectives of the course are to.

1. Understand the concept of educational administration and planning.
2. Explain the principles of organization
3. Explain the various forms of records within an organization
4. Discuss the purpose and characteristics of educational planning
5. Explain the organizational structure of national education system
6. Describe the structure of federal and state ministry of education

**Learning Outcomes**

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

1. Define educational administration and planning
2. Explain at least four principles of organization
3. Explain the six different forms of records within an organization
4. Discuss the three purpose and characteristics of educational planning
5. Explain the organizational structure of national education system
6. Describe the structure of federal and state ministry of education

**Course Contents**

Educational administration; meaning and emergence; principles of organization and administration; communication in organizations; organizing schools for effective management; school records and procedure; time-table management; the nature and scope of educational planning definitions and characteristics of education planning; emergence of educational planning in world and Nigerian perspectives; reasons for the growth of interest in planning, objectives of education planning in Nigeria; constraints on educational planning in Nigeria. Organizational structure of the national education system and the operation of administrative policy relationships. The evaluation of the national education system, organization of Nigerian education, the federal ministry of education, the state ministry of education and related agencies such as NUC, NTI, JAMB, etc.

**BUK-STE 402 Guidance and Counseling in Science Education (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

Production of high-quality, qualified and professional teachers requires expertise in the field of educational guidance and counseling. The student-teachers need to be educated on educational guidance, vocational guidance, personal guidance and counseling practices. This is in line with the BUK’s mission of producing high quality human resources required for the promotion of the development of the host community, the nation, Africa and beyond.

**Overview**

Guidance and counseling in science education is meant to acquaint students with expertise educational, vocational and persono-social guidance and counseling practices. The students will be exposed to the rudiment of principles, scope and practice of guidance and counseling, role of guidance and counseling in learning and teaching,

vocational guidance, counseling theories, guidance services in Nigerian primary and secondary schools; the role of the school counselor in the Nigerian educational system. The importance of the course lies in meeting and providing high-quality education as enshrine in sustainable development goals (SDGs) in the area of education.

**Learning Objectives**

The learning objectives are for the students to.

1. Understand and define the concept of guidance and counselling
2. Explain the principles and practice of guidance and counselling
3. Describe types of guidance and counselling
4. Discuss the counselling theories

**Learning Outcomes**

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

1. Define the concept of guidance and counselling
2. Explain three principles and practice of guidance and counselling
3. Describe the three types of guidance and counselling
4. Discuss at least three counselling theories

**Course Contents**

Introduction to the principles, scope and practice of guidance and counseling; role of guidance and counseling in learning and teaching; vocational guidance and prominent career theories; guidance services in Nigerian primary and secondary schools; the role of the school counselor in the Ni

**BUK-STE 403 ICT in Science and Technology Education (2 Credits, Core, LH = 30)**

**Senate-Approved Relevance**

The 21st century student-teachers needs to be acquainted with knowledge, skills and competencies of using Information and Communication Technology in research, teaching and learning. The National Policy on Education (2013) has stressed the need to employ educational technology to improve the quality of education. ICT in Science and Technology Education will expose the student-teachers on how ICT can be used to improve **students’ engagement, performance and retention.** This is in line with the BUK’s mission of producing high quality human resources required for the promotion of the development of the host community, the nation, Africa and beyond

**Overview**

ICT in science and Technology Education as a course was designed to acquaint students with the knowledge of ICT and its application in teaching and learning of science and technology subjects, computer and its components, internet and other technological tools and resources that are being used in education.

This is in line with provision of high-quality education as enshrine in sustainable development goals (SDGs).

**Learning Objectives**

The objectives of the course are for the students to.

1. Understand and explain the meaning of Information and Communication Technology (ICT).
2. List and explain areas of application of ICT in Science and Technology Teaching
3. Examine computer application in learning.
4. Give overview of ICT Policy in education
5. Describe synchronous and asynchronous packaging of instruction.
6. Outline basic programming languages and stages
7. Identify factors influencing the use of ICT in teaching and learning
8. Outline the problems, prospects and challenges of application of ICT in Science and Technology education in developing world.

**Learning Outcomes**

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

1. Clearly define and explain the meaning of Information and Communication Technology (ICT).
2. List and explain three broad areas of application of ICT in teaching Science and Technology.
3. Give overview of ICT Policy in education
4. Describe synchronous and asynchronous packaging of instruction.
5. Outline six programming languages
6. Identify five factors influencing the use of ICT in teaching and learning
7. Outline the five problems, prospects and challenges of application of ICT in science and Technology education in developing world.

**Course Contents**

Concept of ICT, Categories of ICT, ICT in Science and Technology Education, Areas of Application of ICT in Science and Technology Education, Factors influencing the use of ICT in teaching and learning, ICT Policy in education. the problems, prospects and challenges of application of ICT in education in developing world., Computer in Science and Technology Education, Internet in Science and Technology Education, Synchronous and Asynchronous packaging of instruction, Computer programming

**BUK – STE 415 Geophysics (3credits, core and 45hours)**

**Senate Approved Relevance**

Physics education consists of teacher education programs meant to produce senior secondary school and college teachers who are knowledgeable in the area of physics and methodology of the subjects. They are to have all the relevant skills to succeed in their work. To help them in understanding their students and carry out their work efficiently, they are exposed to relevant general educatory courses such as education curriculum studies etc. They are to also be conversant with industrial application of the subjects.

**Overview**

Geophysics provides students with knowledge of continental crust, structure and explosion seismology. It also provide students with ideas of the origin of crust, gravitational anomalies, continental drift, sea floor spreading and ridges; magnetic anomalies, plate tectonics and seismology of mantle and core.

The students can also have knowledge in temperature and composition of mantle and core, internal source of heat, heat flow through lithosphere and crust, and geology of crust and mantle.

**Learning objectives**

At the end of the course students would be able to

1. Explain the characteristics of continental crust
2. Describe the origin of earth’s crust formation
3. Explain gravitational anomalies and continental drift
4. Explain the internal sources of heat and derive heat flow equation
5. Explain geology of crust and mantle

**Learning outcomes**

At the end of the course, students would be able to

1. Describe continental crust, structure and explosion seismology
2. Explain gravitational anomalies
3. To calculate the temperature and composition of mantle and core
4. To derive equation of heat flow
5. Solve problems using heat flow equation.

**Course Content**

Shape, mass and moment of inertia; origin and explosion composition; the continental crust; earthquake and explosion seismology; structure and origin of the crust; gravitational anomalies; continental drift, oceanic crustal structure; sea floor spreading and ridges, magnetic anomalies, plate tectonics; seismology of the mantle and core; temperature and composition of the mantle; structure, composition and temperature of the core, origin and secular variation of the geomagnetic fields; internal sources of heat; heat flow through lithosphere and crust; geology of crust and mantle.

**PHY 414: Physics of materials (2 Units C: LH 30)**

**Overview**

Students will have an idea in Crystal structure and binding. Reciprocal lattice. Basic concepts of the quantum theory in solids. The free electron model. Weak and tight binding approximations. Energy band structures in metal, semiconductors and insulators. Electrons in solids. Density of states. Fermi surface. Fermi-Dirac distribution.

Weidemann-Franz law. Interaction of electron with crystal lattice. Scattering of electrons. Crystal defects. Physics of surfaces. Schottky devices. Use of photo-electric emission in the study of solids. Elastic properties. Lattice vibrations. Super-conductivity. Graphene (Band structure and properties.

**Learning objectives**

**At the end of the course students would be able to**

1. Identify crystal structures of atoms of some elements
2. Obtain reciprocal lattice of certain element ad compounds
3. Derive Fermi Dirac distribution
4. Define the interaction the use of photo-electric emission in the study of solids.
5. Determine elastic properties and lattice vibration

**Learning Outcomes**

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

1. explain crystal binding, structure, and dynamics;

2. describe models of the free electron and transport properties of conduction electron

3. describe band structure;

4. determine reciprocal lattices of simple crystal structure and relate them to x-ray diffraction data;

5. calculate band structures for simple 2D and 3D tight-binding models and construct nearly free electron approximations;

6. use the nearly-free-electron approximation to calculate equilibrium properties;

7. apply the semi classical dynamics of electrons in solids to interpret magneto-conductance data

and its relationship with the Fermi surface; and

8. describe and make use of the relationship between bonding and electronic structure of

semiconductors, metals, and insulators;

**Course Contents**

Crystal structure and binding. Reciprocal lattice. Basic concepts of the quantum theory in solids. The free electron model. Weak and tight binding approximations. Energy band structures in metal, semiconductors and insulators. Electrons in solids. Density of states. Fermi surface. Fermi-Dirac distribution. Weidemann-Franz law. Interaction of electron with crystal lattice. Scattering of electrons. Crystal defects. Physics of surfaces. Schottky devices. Use of photo-electric emission in the study of solids. Elastic properties. Lattice vibrations. Super-conductivity. Graphene (Band structure and properties).