GODFREY OKOYE UNIVERSITY
ENUGU, ENUGU STATE, NIGERIA
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B.S. ED PHYSICS

The Core Curriculum Minimum Academic Standards (*CCMAS*)

September, 2023.

Overview

The B.Sc. Physics Education curriculum can compare with any B.Sc. Physics Education curriculum from the best universities globally. Courses are organised to contain theoretical, practical, and entrepreneurial skills needed in the program. Some distinguishing features such as 21st-century skills, competencies skills, behavioral attitudes, and employability skills underscored the attainment levels in physics education. Graduates of the program are expected to acquire hands-on and mind-on skills and competencies needed to excel as 21stcentury physics teachers.

Philosophy

The program's philosophy is to teach physics contextually, promote students' interactions with nature, and relate physics concepts to the daily life activities of students and natural occurrences.

Objectives

The objectives of physics education program are to;

1. provide students with a broad and balanced foundation of Physics knowledge and practical skills;
2. instill in students a sense of enthusiasm for Physics and appreciation of its applications in different contexts;
3. instill in students a culture of creativity and critical thinking that will enable them to seek solutions to problems;
4. develop in students the ability to apply their knowledge and skills in Physics to solve theoretical and practical problems;
5. develop in students through an education in Physics a range of transferable skills of value in physics and other areas; and
6. provide students with a knowledge and skills base for further studies in Physics or multidisciplinary areas involving physics.

Unique Features of the programme

The unique features of the program are:

1. the course content was designed such that theoretical knowledge has practical components where necessary;
2. entrepreneurial course specific to the program is included;
3. learning outcomes are highlighted for every course; and
4. there is a list of expected skills and competencies to be acquired by the graduates.

Employability Skills

The graduate of B.Sc. Physics Education should be equipped with the following employability skills:

1. theoretical and practical knowledge and competence to teach Physics effectively;
2. ability to establish and run a primary or secondary school;

3. ability to establish and run some spin-off outfits (such as workshops on repairs of electronic devices, hand-set, house wiring);
4. ability to facilitate the establishment of science laboratory; and
5. ability to produce different physics instructional materials.

21st Century Skills

The B.Sc. Physics Education CCMAS has the capability of inculcating into the pre-service physics teachers

Admission and Graduation Requirements

Admission Requirements

4-year Programme

In addition to acceptable UTME score, five Senior Secondary School Certificate (SSC) (or its equivalent) in not more than Two sittings including English Language, Mathematics, Physics, and Chemistry, with credit in one other relevant science subject, preferably, Biology. Agricultural Science and Geography to be considered.

Direct Entry Mode

Five Senior Secondary School Certificate SSC (or its equivalent) credit pass including English Language, Mathematics, Physics and Two of which must be at the Advanced Level in the following:

1. A pass at merit level in a relevant Diploma Programme (provided the O/L requirements are satisfied).
2. Passes in Physics and any of Mathematics, Chemistry or Biology Science at Advanced level.
3. Passes in Physics and any of Mathematics, Chemistry, Biology or Computer Science in the NCE.
4. Board examination or Cambridge Moderated Schools of Basic Studies Terminal Examinations or International Baccalaureate from a recognized institution.

Graduation Requirements

In addition to the general requirements for graduation at the university, students must offer and pass courses totaling 120 credit hours, 60 of which must come from the relevant option areas in Physics and Science Education for the four-year program. They must also complete and receive a pass grade in teaching practice and a research project report on a topic approved by the Department.

Global Course Structure

100 Level

Course Code	Course Title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Logic, Philosophy and Human Existence	2	C	30	

EDU 101	Introduction to Teaching and Foundations of Education	2	C	30	-
MTH 101	Elementary Mathematics I	2	C	30	-
MTH 102	Elementary Mathematics II (Calculus)	2	2	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 Physics Practical I	1	C	-	45
PHY 108	General Physics Practical II	1	C	-	45
GOU-SED 151	Introductory Biological Concepts for Physics Education	3	C	45	0
GOU-SED 153	Fundamental Chemical Concepts for Physics Education	3	C	45	0
GOU-EDU 103	Sociology of Education in South-East Nigeria	2	C	30	0
GOU-SED 156	Educational Approach to Teaching of Structure of Matter	2	C	30	0
	TOTAL	30			

200 Level

Course Code	**Course Title**	**Units**	**Status**	**LH**	**PH**
GST 212	Philosophy, Logic and Human Existence	2	C	30	
ENT 211	Entrepreneurship and Innovation	2	C	15	45
EDU 201	Curriculum, Curriculum Delivery, and General Teaching Methods	2	C	30	
PHY 201	General Physics V (Modern Physics)	2	C	30	-
PHY 202	**Introduction to Electric Circuits and Electronics**	2	C	30	
PHY 204	General Physics VI (Waves and Optics)	2	C	45	-
PHY 205	Thermal Physics	3	C	45	-
PHY 206	General Physics VII (Energy & Environment)	2	C	30	-
PHY 207	Practical Physics III	2	C		45
PHY 208	General Physics Practical	1	C	-	45
PHY 211	Workshop Practice	2	C	15	45

GOU-EDU 202	Innovative Approaches to Micro Teaching in Enugu Socio-Cultural Milieu	2	C	15	45
GOU-EDU 211	Career Guidance for Learners in Enugu Socio-Cultural Environment	2	C	15	45
GOU-PHY 251	Radar Physics	2	C	15	45
GOU-SED 253	Special Pedagogical Method in Physics Education	2	C	15	45
GOU-SED 254	Measurement and Quantities in Physics Education	2	C	15	45
	TOTAL	32			

300 Level

Course Code	Course Title	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
EDU 301	Teaching Practice I	3	C	-	135
EDU 302	Educational Measurements, Tests, Research Methods and Statistics	3	C	45	-
PHY 301	Analytical Mechanics I	3	C	45	-
PHY 303	Electromagnetism	3	C	45	-
PHY 304	Electromagnetic Waves and Optics	3	C	45	-
PHY 305	Quantum Physics	3	C	45	-
PHY 306	Statistical and Thermal Physics	3	C	45	-
GOU-EDU 303	Psychology of Education in South-East Nigeria	2	C	30	0
GOU-PHY 331	Renewable Energy Sources	2	C	15	45
GOU-EDU 305	Indigenous Education Resources for Curriculum Implementation	2	C	15	45
GOU-SED 352	Laboratory Techniques in Physics Teaching	2	C	15	45
	TOTAL	31			

400 Level

Course Code	Course Title	Units	Status	LH	PH
EDU 401	Teaching Practice II	3	C		135
EDU 400	Project	3	C		135
PHY 401	Quantum Mechanics I	3	C	45	-

PHY 402	Quantum Physics II	3	C	45	-
PHY 403	Mathematical Methods in Physics I	3	C	45	-
PHY 404	Mathematical Methods in Physics II	3	C	45	-
PHY 405	Physics Entrepreneurship	2	C	45	
GOU-EDU 403	Ethno-Pedagogy and Curriculum of Non-School Environment	2	C	30	0
GOU-SED 451	Curriculum Development in Science Education	2	C	30	0
GOU-SED 452	Physics Laboratory Organization and Management	2	C	15	45
GOU-SED 454	Teaching of Coal as a Source of Energy	2	C	30	0
	TOTAL	28			

Course Contents and Learning outcomes

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 and Note making. 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. analyze 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. analyze 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. analyze 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 selfreliance (indigenous trade and market system; indigenous apprenticeship system among Nigeria people; trade, skill acquisition, and self-reliance). Social justice and national development (law definition and classification. Judiciary and fundamental 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. Reorientation 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.

EDU 101: Introduction to Teaching and Foundations of Education (2 Units C: LH 30)

Learning Outcomes

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

1. state the important roles of Teaching as a profession;
2. raise and judge some ethical issues in education.
3. list the intellectual and practical competencies required by the teacher;
4. justify the need for education in the development of a nation;
5. state an account of the history of education from ancient times to the present day modern education in Nigeria;

6. present an overview of the National Policy on Education;
7. identify the stages of child and adolescent development;
8. state the behaviorist, cognitive and socio-cultural perspectives of learning; 9. enumerate historical and current developments in sociology of education; and
10. highlight the historical and current developments in philosophy of education.

Course Contents

Teaching as a profession. Ethics of the teaching profession. Intellectual and practical competencies required by the teacher. Link between education and development. Educational Development from ancient times to the present with particular reference to the evolution of modern education in Nigeria. The National Policy on Education. Brief treatment of learning theories from the behaviorist, cognitive and socio-cultural perspectives. Child and adolescent development. Historical and current developments in philosophy of education. Historical and current developments in sociology of education.

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

Learning Outcomes

On completion, the student 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 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, work and Potential energy. System of particles; centre of mass; rotational motion; torque, vector product, moment, rotation of coordinate axes and angular momentum. 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

On completion, the student 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 physics 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 and Gauss's law. Capacitance; Electric dipoles; energy in electric fields; conductors and insulators, current, voltage and resistance, Ohm's law and analysis of DC circuits. Magnetic fields; Lorentz force; Biot-Savart and Ampère's laws; magnetic dipoles; dielectrics and 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, resistance, and combinations.

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

Learning Outcomes

On completion, the student 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 behavior;
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 and Temperature scales. Gas laws; General gas equation. Thermal conductivity; First Law of thermodynamics; heat, work, and internal energy and reversibility. Thermodynamic processes; adiabatic, isothermal and isobaric. Second law of thermodynamics; heat engines and entropy, Zero's 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 (2 Units C: LH 30) Vibration Waves and Optics:

Learning Outcomes

On completion, the student should be able to

1. describe and quantitatively analyze the behavior 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, Q values, and power response curves, Forced SHM, resonance and transients and coupled SHM. 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 1-D wave equation, 2-D and 3-D wave equations, wave energy and power, phase and group velocities, echo, beats, The doppler effect, propagation of sound in gases, solids and liquids, and their properties.
Optics; Nature and propagation of light; reflection, refraction,internal reflection, dispersion, scattering of light, reflection and refraction at plane and spherical surfaces, thin lenses and optical instruments; wave nature of light; Huygens's principle, interference and diffraction.

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

Learning Outcomes

On completion, the student 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 analyze graphs; and
5. draw conclusions from numerical and graphical analysis of data.

Course Contents

This introductory courses emphasize quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat and viscosity. These are 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 (1 Unit C: PH 45)

Learning Outcomes

On completion, the student 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 analyze 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 Mathematic I (2 Units C: LH 30)
(Algebra and Trigonometry)

Learning Outcomes

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

1. apply 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 and Venn diagrams. Real numbers; integers, rational and irrational numbers. Mathematical induction, real sequences and series, theory of quadratic equations and 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 (2 Units C: LH 30)
(Calculus)

Learning Outcomes

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

1. explain and apply the 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.

GOU-SED 151: Introductory Biological Concepts for Physics Education (3 Units; Compulsory; LH =45; PH = 0)

Senate -Approved Relevance

This course will expose students of Physics Education to the basic knowledge of living organisms, especially the Homo sapiens. Students would be predisposed to basic knowledge of biology, function and organization cells and cell structure that form tissue and organs, etc. With the knowledge of this course, Physics Education students would be acquainted with the prerequisite knowledge and skillsets required for career advancement and inter-disciplinary research. This is in agreement with Godfrey Okoye University's mission and vision to empower their graduates with knowledge and skillsets to become competitive in labour market and become outstanding entrepreneurs. This empowerment is, also in line with Nigeria's action on the Sustainable Development Goals, for education which emphasizes inclusive and sustainable education for all children.

Overview

This course is a foundation course for every science-inclined students. Positive impact of the course cannot be overemphasized in that Physics Education student is mandated to have in-depth knowledge of cell structures, and organisation, tissue as well as functional mechanisms of human organs. Given this, Physics education students will leverage on these knowledge and skillsets in advancing their potential career and research.

The knowledge will also help them in Medical physics, Biophysics, Health, Bioelectronics, Biomedical engineering, etc. Moreover, knowledge of this course would enhance and hone the students skillsets in construction of Bioelectronic devices like hearing aid, visual paired device, and other human aided devices that can be of immense asset to human being that have health ailment that can be corrected with constructed human-electronic interface devices.

Objectives

The objectives of this course are to:

(i) Explain cell, cell structure, and organisations of cell.
(ii) Explain tissue and organs of living organism.
(iii) Classify living organisms.
(iv) Describe the characteristics of living organism especially Homo sapiens.
(v) Analyse the similarities of plants and animals species.
(vi) Describe the concept of cell evolution and heredity.
(vii) Describe the interrelationship between living organisms.
(viii) Enumerate the habitats of living organisms.

(ix) Discuss the ecological adaptations of living organisms.
(x) Describe different systems in living organisms.

Learning Outcomes

At the end of lectures, students should be able to:
(i). Explain cells structures and organisations.
(ii). Summarize functions of cellular organelles.
(iii). Characterize living organisms and state their general reproduction.
(iv). Describe the interrelationship that exists between organisms.
(iv). Discuss the concept of heredity and evolution.
(v). Enumerate habitat types and their characteristics.
(vi). Describe ecological adaptations in the plant and animal kingdoms.
(vii). Explain nutrition, respiration, excretion and reproduction in plants and animals.
(viii). Describe growth and development in plants and animals.

Course Content

Cell structure. Cell organisation. Functions of cellular organelles. Characteristics of living thing. Classification of living things. Chromosomes. Genes. Relationships. Between chromosomes and genes. Importance of chromosomes and genes. General reproduction. Interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism). Heredity and evolution (introduction to Darwinism and Lamarkism, Mendelian laws, explanation of key genetic terms). Elements of ecology and types of habitat. Identification and Characteristics of viruses, bacteria and fungi. Similarities of animal kingdoms. Similarities of plant kingdoms. Differences of animal kingdoms. Differences of plant kingdoms. Nutrition. Respiration. Circulatory system. Excretion. Reproduction. Growth. Development.

Minimum Academic Standard

Plants and animals within environment.
Slides.
Microscopes.
Dissecting set.
A good biology laboratory.

GOU-SED 153: Fundamental Chemical Concepts for Physics Education (3 Units; Compulsory; LH =45; PH = 0)

Senate - Approved Relevance

Chemistry is the fundamental knowledge of atoms, elements, compounds, and their interaction in an environment. Knowledge of physical chemistry is very vital for Physics students to hone their skillsets on chemical reactions. The aim to produce Physics Education graduates who will be outstandingly excellent in learning, balanced in character and personality and ready to pursue epistemic unity is in agreement with Godfrey Okoye University's mission and vision to empower their graduates with skills to be excellent teachers. This is also in agreement with the Sustainable Development Goals (SDG) objective of inclusive and sustainable education for the Nigerian child.

Overview

GOU-SED 153 intend to acquaint the Physics Education students with basic knowledge of atom, element, and compounds and their interactions via electrovalent, covalent, and other chemical bonding. The course utilizes the Periodic Table to teach the students the arrangement of atoms and their valency electrons. Electronic configuration of elements in Periodic Table, and identification of characteristics of acids, bases, and salts and knowledge of chemicals reactions between these substances are important components of the course.

Moreover, the chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and their derivatives will be extensively discussed. Physics Education students will leverage on this basic knowledge while advancing their potential skillsets and career and becomes outstandingly excellent. Knowledge acquired here will also be used in Thin-film technology, Micro-electronics and Nano-science and Technology, medical physics, to the advantage of our graduates who will advance in their studies in these areas.

Objectives

The objectives of this course are to:

1. Explain chemical bonding between an atom/elements.
2. Discuss modern electronic theory of atoms.
3. Write electronic configurations of elements in the Periodic Table.
4. Identify and balance oxidation – reduction reactions.
5. State LeChatelier's principle and apply it to solving problems.
6. Analyze and perform calculations on the thermodynamic variables.
7. Discuss the importance of organic chemistry and its qualitative and quantitative structure.
8. Discuss comparative chemistry of group 1A, IIA and IVA elements.
9. Discuss basic properties of Transition metals.

Learning Outcomes

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

1. Define atom, molecules and explain chemical bonding between atoms/elements.
2. Discuss the Modern electronic theory of atoms.
3. Write electronic configurations of elements in the periodic table.
4. Identify and balance oxidation – reduction equation and solve redox titration problems.
5. Identify at least four characteristics of acids, bases and salts, and solve problems based on their quantitative relationship.
6. Apply the principle of equilibrium to aqueous systems using LeChatelier's principle.

7. State the importance and development of organic chemistry.
8. Define fullerenes and its applications.
9. Describe two rules guiding nomenclature and functional group classes of organic chemistry.
10. Identify three classes of organic functional groups with brief description of their chemistry.
11. Discuss comparative chemistry of group 1A, IIA and IVA elements.

Course Content

Atoms. Molecules. Elements. Compounds. Chemical reactions. Modern electronic theory of atoms. Electronic configuration. Periodicity. Building up of the periodic table. Hybridization. Shapes of simple molecules. Valence Forces. Structure of solids. Chemical equations. 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. Historical survey of the development and importance of Organic Chemistry. Fullerenes as fourth allotrope of carbon. Uses as nanotubules, nanostructures, nanochemistry. 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.

Minimum Academic Standards

1. A standard chemistry laboratory.
2. Acids, Bases, and salts of various elements.
3. Basic chemistry apparatus and equipment.
4. A big chart of periodic table.

GOU-EDU 103: Sociology of Education in South East Nigeria (2 Units; Compulsory; LH = 30; PH = 0)

Senate-Approved-Relevance

The training of prospective teachers in Sociology of Education in a way that they will acquire the knowledge and skills that would enable them operate most effectively in the Enugu Nigerian cultural environment is a need. The course underscores the importance of determining how public and social institutions and the experience of people in South Eastern Nigeria affect education and its outcomes. This is in line with the mission and vision of Godfrey Okoye University Enugu that focuses on quality training of students in learning and character in order to be productive to their immediate environment. Therefore, graduates of this course will play a crucial role in helping the locals to achieve their economic, health, and political wellbeing.

Overview

This course applies the philosophy and theories of sociology of education to the study of how social and cultural institutions affect education in South Eastern Nigeria. This course on the Sociology of Education will help the students acquire knowledge and skills that will help them to tap the potentials of their natural/cultural environment for the benefit of education.

Furthermore, this course is designed to expose learners to some contemporary sociological thoughts and skills for dealing innovatively with situations in the area of their discipline of study. It is also designed to prepare prospective teachers for their future career in human and societal development. Most importantly, it is designed to instil in the student teachers the desired skills in human relationships.

Objectives

The objectives of this course are to:

1. Explain the concept of Sociology of Education.
2. Expose the philosophical root of sociology of education.
3. Discuss theories of Sociology of Education.
4. Expose the functions of Sociology of Education.
5. Discuss pertinent sociological topics in South-Eastern socio-cultural environment.
6. Evaluate the teaching of societal values in schools.
7. Discuss how South Eastern social institutions affect education and its outcome.
8. Examine the ways education can encourage social integration and cultural innovation.

Learning Outcomes

By the end of this course, the student should be able to:

1. Define Sociology of Education
2. Discuss the ideas of the Founders of Sociology of Education.
3. Discuss two theories of sociology of Education.
4. Explain the importance of Sociology of Education.
5. Discuss three functions of Sociology of Education.
6. Analyse the concept of Sociology of Education in relation to three social institutions in the South East.
7. Explain the importance of teaching societal values in schools.
8. Discuss five ways in which a selected social institution affect education in the South East.

Course Content

Concept of Contemporary Sociology of Education. Philosophical roots of Sociology of Education. The Founders of Sociology of Education. Theories of sociology of education. Importance of Sociology of Education. Functions of Sociology of Education. The Socio-Cultural environment in the South East. Social Institutions in South Eastern Nigeria. The Public School System. Adult and Continuing Education. The Igbo Apprenticeship system. Training in Special Education. Training in Geriatric and Child care. Gender Relations. Race and Ethnicity. Rural and Urban Residence in South-Eastern Nigeria. Teaching societal values in schools. Effect of social institutions on education.

Minimum Academic Standards

1. 3-D Technology
2. Computers (1:3 students)
3. Other NUC-MAS requirement facilities

GOU SED 156: Educational Approach to Teaching of Structure of Matter (2 Units; Compulsory; LH = 30; PH = 0)

Senate Approved Relevance

This course is intended for the education of prospective teachers who will be highly knowledgeable in teaching with resources in the environment and equipped with the required knowledge to make contribution to sustainable development. This is in line with the vision of Godfrey Okoye University to be a centre of academic excellence by laying a strong foundation for disciplines offered by the University. This is very important to the students, who on graduation should utilize it in teaching, research, community service and sustainable economic development especially as physics is at the centre of technological practice. As inclusive and quality education is a high point in the 2063 sustainable development goals for Nigeria.

Overview

The assumed abstractness of the subject physics, to students at the secondary school level has been traced to poor foundation laid at that level. In the general physics courses taught in the 100 Level of our universities, attention is not given to physics education students for proper background in physics for their future career (teaching). This lack of attention is caused by large number of students in a class at that level since all classes for science and science related programmes such as biological, chemical, geological, engineering, medical etc programmes, are combined in the same class.

Physics basically concerns itself with study of matter, its structure, interactions within the matter and other external matters. Since this course prepares students teachers, who on graduation go to teach physics at the secondary school level, they should be equipped with needed knowledge and ability to employ the resources in the environment to teach physics.

Objectives

The objectives of the course are to:

1. Conceptualise matter.
2. Explain the constituents of matter.
3. Name the fundamental particles in a matter.
4. Draw the arrangement of particles in a matter.
5. Name some forces acting in a matter.
6. State the kinetic theory of matter.
7. Enumerate some assumptions that guide the kinetic theory of matter.
8. Define bonding in a matter.
9. Name types of bonding.
10. Name the states of matter.
11. Discuss transition of particles in a matter.
12. Define an ideal gas.
13. State an ideal gas law.

Learning Outcome

On completion of this course, students should be able to:

1. Explain what matter is.
2. Explain the constituents of matter.
3. Name at least three particles in a matter.
4. Draw a diagram showing arrangement of particles in a matter.
5. Name at least two forces acting in a matter.
6. State the kinetic theory of matter.
7. Name at least three assumptions that guide kinetic theory of matter.
8. Define bonding in a matter.
9. Name at least two types of bonding in a matter
10. Name the three states of matter.
11. Discuss the transition of particles from one energy level to the other in a matter.
12. Define an ideal gas.
13. State an ideal gas law.

Content

The idea of matter. The fundamental particles in a matter. Arrangement of particles in the matter. Types of force in the matter. Kinetic theory of matter. Bonding. Types of bonding in matter. States of matter. Energy levels. Particle transition. An ideal gas. Gas law. Non ideal gas. Universal gas Law. Mole of gas. Gas constant. Gas equation.

Minimum Academic Standard

1. Classroom or good laboratory
2. Boyle's Law apparatus
3. Charles Law apparatus
4. Thermometer. Pressure gauge
5. Dalton's Law apparatus
6. Others in NUC MAS

GST 212: Philosophy, Logic And Human Existence (2 Units C: LH 30)

Learning Outcomes

A student who has successfully gone through this course should be able to:

1. explain the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. explain the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents

Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy andhuman conduct, philosophy and religion, philosophy and human values, philosophy and character molding.

ENT 211: Entrepreneurship and Innovation (2 Units C: LH 15; PH 45)

Learning Outcomes

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

1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk-taking
2. state the characteristics of an entrepreneur;
3. analyze the importance of micro and small businesses in wealth creation, employment, and financial independence
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership, and networking, including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa, and the rest of the world;
8. state the basic principles of e-commerce.

Course Contents

Concept of Entrepreneurship (Entrepreneurship, Intrapreneurship/Corporate Entrepreneurship). Theories, rationale, and relevance of Entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity, opportunity-based entrepreneurship and creative destruction). Characteristics of Entrepreneurs (Opportunity seeker, risk-taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (Concept of innovation, dimensions of innovation, change, and innovation, knowledge and innovation). Enterprise formation, partnership, and networking (basics of business plan, forms of business ownership, business registration, and forming alliances and joint ventures). Contemporary entrepreneurship. Issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship and entrepreneurship support institutions). Youth enterprise networks, and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

EDU 201: Curriculum, Curriculum Delivery and General Teaching Methods (2 Units C: LH 30)

Learning Outcomes

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

1. explain at an appropriate level of confidence the meaning and types of curriculum;
2. describe the process of curriculum development; analyze and critique the Nigerian Core curricula as a guide to curricula delivery;
3. use different methods in the delivery of curriculum content justify the need for education in the development of a nation;
4. identify local epistemologies and context and the use of CTCA in the Nigerian context;
5. plan and schedule lessons as well as monitor and evaluate the outcome of each lesson;
6. identify and use learning resources and media and improvise whenever necessary;
7. manage classrooms under different conditions and address the needs of individual students, especially those with special needs, including the gifted; and
8. demonstrate ICT skills, set up and manage online classes.

Course Contents

Definition and types of curriculum. The curriculum development process. Curriculum delivery to include general teaching methods and strategies: lecture, class discussion, demonstration, problem-solving, cooperative learning and guided-discovery, concept mapping, metacognition, argumentation, project-based learning, competency-based learning, CulturoTechno-Contextual approach (CTCA). Developing the lesson plan/note. Assessment of learning. Resources for teaching, improvisation. General classroom management. Teaching in a 21st-century classroom. Setting up and managing online classes. Attending to students with special needs.

SED 202: Physics Methods (2 Units C: LH 15; PH 45)

Learning outcomes

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

1. explain the philosophy and aims of teaching physics;
2. state at least five objectives of teaching physics;
3. describe the National Secondary School Physics Curriculum;
4. draw a specific lesson plan in physics; and
5. demonstrate the teaching of specific physics concepts individually.

Course Contents

Philosophy, Aims, and objectives of teaching Physics in schools. A critical view of the National Secondary School Physics Curriculum. Preparation for teaching of physics. Teacher's entry behavior, Previous knowledge, Performance objective, and Lesson plan writing. Instructional materials, facilities and methods for teaching of physics. Teaching of difficult concepts (for teachers) and difficult concepts (for students) in physics. Evaluation of physics lessons, Microteaching sessions.

PHY 202: Introduction to Electric Circuits and Electronics (2 Units C: LH 30) Pre-requisite -PHY 104

Learning Outcomes

On completion, the student should be able to

1. identify circuit diagrams and symbols;
2. determine current flows, potential drops, power, and energy dissipation in circuits using Ohm's law;
3. simplify series and parallel combinations of resistors;
4. state Kirchhoff's laws and apply same in solving for currents and voltages in dc. and ac. Circuits;
5. apply potential divider and current divider techniques in calculating circuit potential differences and branch currents;
6. state and apply circuit theorems and principles to solve problems;
7. apply the Mesh currents and Node – Voltage methods in network analysis;
8. discuss the nature of ac. currents and voltages in resistors, inductors, capacitors and determine impedances;
9. analyze a.c. circuits using phasor diagrams;
10. determine power, Q-factor, and resonance in ac. Circuits;
11. explain the principle of the transformer and applications;
12. distinguish between conductors, semiconductors, and insulators and explain crystal and band structure;
13. identify semiconductor devices and explain their principle of operation;
14. explain the current-voltage characteristics of semiconductor devices; and 15. explain the function of semiconductor devices (diodes, transistors and others).

Course Contents

D.C. Circuits; Kirchhoff's Laws, sources of end and current, network analysis and circuit theorems. A.C. Circuits. Inductance, capacitance, the transformer, sinusoidal wave-forms runs and peak values, power, impedance and admittance series RLC circuit, Q factor, resonance. Network analysis, and circuit theorems: Mesh currents method, Node-voltage, Thevenin and Norton theorem. Superposition principle. Electronics: filters; Amplification and the transistor; field-effect transistors, bipolar transistors, equivalent circuits, amplifiers, feedback, and oscillators; signal generators. Semiconductors: Devices and characteristics, the pn-junction, simple diodes, photodiodes, LEDs.

PHY 204: General Physics V (3 Units C: LH 45)

(Waves and Optics)

Pre-requisites -PHY 101, PHY 104, and MTH 102

Learning Outcomes

On completion, the student should be able to;

1. describe the wave phenomena and explain the nature and properties of waves;
2. explain wave propagation in different media;
3. describe geometric optics and image formation;
4. analyze simple examples of interference and diffraction phenomena;
5. identify and explain functions of optical devices;
6. explain the principles of optical instruments and applications;

7. explain the principles of operation of the Michelson interferometer; and
8. describe the polarization states of light.

Course Contents

Wave phenomena: Types and properties of waves, SHM, harmonic oscillator, waves on a string, energy in wave motion, acoustical waves, longitudinal waves, standing waves. Group and phase velocity, doppler effect. Physical Optics; spherical waves; interference, superposition, Young's slits, multiple slits, the Michelson interferometer; diffraction; single and double slits; the diffraction grating and spectrometers; thin films; dispersion and scattering. Echo, Beats, Doppler effects, sound in gases, liquids, and solids. Geometrical Optics, Waves and rays; reflection at plane and spherical surfaces, refraction, thin lenses, prism, optical lenses, and optical instruments, such as microscopes, telescopes and other lens maker's formula. Polarization: Polarization states; unpolarised and partially polarized light; Brewster's angle; Polarizing beam splitters; Photometry and light spectrum analysis.

PHY 205: Thermal Physics (3 Units C: LH 45)

Pre-requisites -PHY 102 and MTH 102

Learning Outcomes

On completion, the student should be able to;

1. discuss the concept of heat and temperature;
2. explain and determine thermodynamic processes;
3. explain and evaluate properties of real and ideal gase;
4. evaluate the consequences of the thermodynamic laws;
5. describe the basis of the kinetic theory; and
6. describe the statistical behaviour of gases with applications.

Course Contents

The Foundations of classical thermodynamics including the zeroth and definition of temperature; the first law, work heat and internal energy; Carnot cycles and the second law; entropy and irreversibility, thermodynamic potentials, and the Maxwell relations. Ideal gas equation and internal energy, including internal molecular modes. Qualitative discussion of phase transitions: Gibbs Free energy; Clausius-Clapeyron equation, examples of phase transitions including Van der Waals gas; Kinetic theory; Mean free path; Equi-partition of energy; Heat transfer; Diffusion rate; .

PHY 207: Practical Physics III & IV (1 Unit C: PH 45)

Pre-requisite -PHY 107/108

Learning Outcomes

On completion, the student should be able to

1. verify some equations, physical laws, and theorems;
2. identify apparatus and set up experiments; and
3. investigate relationships between physical quantities numerically and graphically.

Course Contents

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

PHY 213: Classical Physics I (2 Units C: LH 30)

Learning Outcomes

On completion, the student 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;
8. Use nertial forces to explain motion from the viewpoint of rotating frames of reference; and
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, straight line 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 and Kepler's laws. Rigid body motion and rotational dynamics. Moment of inertia, free rotation and stability, Gyroscopes.

MTH 201: Mathematical Methods 1 (2 Units C: LH 30)

Pre-requisite –MTH 103. ,

Learning Outcomes

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

1. determine Real-valued functions of a real variable,
2. solve some problems using Mean value Theorem and Taylor Series expansion; and
3. evaluate Line Integral, Surface Integral, and Volume Integrals.

Course Contents

Real-valued functions of a real variable. Review of differentiation and integration and their applications. Mean value theorem. Taylor series. Real-valued functions of two and three variables. Partial derivatives chain rule, extrema, Lagrangian multipliers. Increments, differentials, and linear approximations. Evaluation of line integrals. Multiple integrals.

GOU-EDU 202: Innovative Approaches to Micro-teaching in Enugu Socio-cultural Milieu (2 Units; Compulsory; LH = 15; PH = 45)

Senate-Approved Relevance

Proper preparation of professional teachers with adequate and useful knowledge, skills methods, values and initiative is important in Enugu socio-cultural environment. Godfrey Okoye University exists in this socio-cultural milieu to impart quality knowledge to the teeming youths in this part of the country who are desirous of education. This course is meant to help student teachers to acquire the right method, techniques and confidence which will enable them to teach their students effectively. This is in line with the epistemic dialogue that Godfrey Okoye University is anchored on. Therefore, student teachers who acquire skills, confidence and knowledge in this course can easily impact knowledge to secondary school students using various and relevant methods in teaching any topic and can easily give extra classes (that is as lesson teachers). This is also in line with the entrepreneurial mindset of Godfrey Okoye University, Enugu, Nigeria.

Overview

Poor performance of students in almost all standardized examinations in both primary and secondary schools call for the need for the development of the course. Recently there is an outcry from the public about this falling standard of education and it is believed that if student teachers acquire confidence and effective methods of teaching it will improve their efficiency in imparting knowledge. This creates the need for proper attention on the teaching methods acquired by student teachers.

The course includes topics such as innovative pedagogy, peer and microteaching. During the course, students will be guided on innovative ways of preparing lesson plan and lecture notes; to develop their educational potentials and desired learning outcomes. The course will expose the student teachers to peer teaching and self-appraisal that will lead them to become effective professional teachers.

Objectives

The objectives of this course are to:

1. Justify the relationship between innovative pedagogy, peer teaching and microteaching.
2. Discuss the concept of peer teaching.
3. Explain the concept of micro-teaching.
4. Describe the process of teaching in a micro-teaching laboratory.
5. Outline the role of instructional methods and instructional materials in micro-teaching.
6. Explain how to write a lesson plan/note.
7. Recognize the different skills in micro-teaching.
8. Analyze supervisory skills and their usefulness in teaching and learning.
9. Illustrate a micro-teaching practicum.
10. Apply pedagogy of peer and micro-teaching in extra classes.

Learning Outcomes

By the end of this course, the student should be able to:

1. Define innovative pedagogy.

2. Give the meaning of peer teaching.
3. Explain the concept of micro-teaching.
4. Discuss micro-teaching and its relevance to teacher education
5. Describe ten importance of peer teaching and micro-teaching.
6. Select five teaching skills involved in teaching objectives
7. Draw out micro-teaching practicum.
8. Describe five teaching methods.
9. Discuss the preparation of a lesson plan.
10. Describe micro-teaching supervisory skills.
11. Explain professionalism in relation to extra classes.

Course Content

Definition of innovative pedagogy. Meaning of peer teaching. Explanation of the concept of micro-teaching. Micro-teaching procedure. Explanation of micro-teaching. Relevance of micro teaching to teacher education. Importance of micro-teaching to student teacher education. Teaching skills involved in teaching objectives. Teaching methods relevant to teachers' education. Instructional materials. Lesson plan. Lesson note. Classroom control. Classroom management. Micro-teaching supervisory skills. Micro-teaching practicum. Laboratory activities. Teaching as a profession in Nigeria.

Minimum Academic Standards

1. Micro-teaching Laboratory.
2. Video tape.
3. Projectors.
4. Computers (1:1 student).
5. Other NUC-MAS requirement facilities.

GOU-EDU 211: Career Guidance for Learners in Enugu Socio- Cultural Environment (2 Units; Compulsory; LH = 15; PH = 45)

Senate -Approved Relevance
Sufficient training of professional career guidance teachers with deep knowledge, skills and positive attitudes is a need in this local environment; Enugu State, where Godfrey Okoye University is situated. This course is meant to help prospective teachers to reach out to those living on the margins, and help them attain their full career potentials or fulfilment in life. Therefore, apart from teaching in formal classroom setting, student teachers who acquire skills and knowledge in this course can easily become home career guidance and own their career guidance centres eventually. This is in consonant with the entrepreneurial mindset of Godfrey Okoye University.

Overview
The intellectual climate from which guidance emerged as an important activity in education is based on the continuous poor performance of students in examinations in both primary and secondary education, social ills, and lack of employment opportunities. More, so, the inability of the education sector to attain to the career guidance needs of those living on the margins in Enugu socio-cultural environment. This calls for the need of the design of this course. Many a time, parents have no time to oversee the academic assignments of their children. This creates the need for proper career guidance in the educational needs of their wards.

This course is designed to enable the prospective teachers to acquire the needed knowledge and skills that will help them to develop their educational potentials, and acquire the desired learning outcomes in guidance and counselling with special emphasis on career guidance to their students and to those living on the margins in Enugu socio-cultural environment. It will give the prospective teachers the opportunity to reach out to many young people on the margins who have no opportunity for proper career guidance. In addition, it will expose the student teachers on the need to own and manage their own guidance and counselling centres and become employers of labour.

Objectives
The objectives of this course are to:
1. Explain the concept of career guidance.
2. Discuss different careers in Enugu socio-cultural environment.
3. Justify different methods of counselling.
4. Outline the role of different methods of counselling.
6. Explain the concept “living on the margins.”
5. Describe how counselling leads people to be self-reliant.
7. Identify the need for innovation in counselling that will lead to student teachers being self- reliant.

Learning Outcomes
By the end of this course, the student should be able to:
1. Define career guidance.
2. Identify at least four career opportunities in Enugu socio-cultural environment.
3. Discuss the relationship between guidance and counselling.
4. Justify the concept of counselling.
5. Discuss at least two methods of counselling
6. Draw out the relationship between marginalisation and counselling.
7. State the need for career guidance and counselling in schools.
8. Organize group career guidance and counselling in at least five schools.

Course Content

Meaning and Definition of Guidance. Meaning and Definition of Counselling. Meaning of Guidance and Counselling. Relationship between Guidance and Counselling. History of the Introduction of Guidance and Counselling in Schools. Philosophical roots of Guidance and Counselling. Rational for counselling in schools. Careers in Enugu Socio- Cultural environment. Scope of counselling. Methods of Counselling. Various guidance services rendered in schools. . Various counselling services rendered in schools. Marginalisation and counselling. Types of guidance. Types of counselling. Approaches to guidance. Approaches to counselling.

Minimum Academic Standards

1. Guidance and Counselling Laboratory.
2. Videos.
3. Other NUC – MAS requirement facilities.

GOU-PHY 251: Radar Physics (2 Units; Compulsory; LH = 30; PH = 0)

Senate -Approved Relevance

Radar Physics is a constantly evolving brand of new techniques, technologies, development and advancement. Radar system technology has a wide range of applications in military, aviation, weather forecasting, and so on. This course is developed to impart positively on the Physics students the principles and application of Radar technology in diverse areas of human endeavor. This is in agreement with Godfrey Okoye University's mission to train and empower it students with state-of-the art knowledge and skill sets in order for them to be outstandingly excellent in character and learning, competitive in the labour market and hone entrepreneurial skills.

Overview

This course will go through radar equations, wave forms, the Doppler Effect, synthetic aperture radar (SAR) and antenna, propagation and radar applications/usages in different human endeavour.

Graduates of this course can work as technologists, radar scientists or professional data trackers in information and telecommunication, military, oil and gas industries that employ radar technology for different applications/usages.

Objectives

The objectives of this course are to:

1. Discuss the concept of radar.
2. State the branches of radar technology.
3. State the use of radar technology in information technology.
4. Explains the applications of radar in Physics.
5. Describe the advantages and disadvantages of radar technology.
6. Explain the operational principles of radar technology.
7. Examine the conditions necessary for the accurate performance of radar technology.
8. Distinguish radar from optical and infrared sensing devices.
9. Explain the radar transmission of electromagnetic energy towards a target.
10. Measure the range of transmissions of a radar system.

Learning Outcomes

On successful completion of this course, the students should be able to:

1. Explain the interactions of radiation with the Earth's surface and atmosphere.
2. Design new sensors, using the knowledge of radar systems.
3. Solve at least three (3) specific problems in information technology using radar sensing.
4. Differentiate infrared and optical sensing from radars.
5. Explain remote sensing instrumentation in radar physics.
7. Set up and launch simple radar systems for data transfer.
8. Describe at least three characteristics of images formed by synthetic apertures.
9. Identify the importance of Antennas in radar communication.

Course Contents

Introduction to Radar Technology. Electromagnetic Waves and Propagation. Radar Range Equation. Radar Cross Section. Antennas for Radar Systems. Signal Processing in Radar Systems. Radar Systems Architecture. Radar Pulse Compression Techniques. Radar Detection and Tracking. Doppler Radar and Its Applications. Synthetic Aperture Radar. Ground Penetrating Radar. Meteorological Radar. Airborne Radar. Space-Based Radar. Radar Jamming and Counter measures. Radar System Design. Implementation.

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Minimum Academic Standards

RADAR network workshop with NUC-MAS requirements and facilities.

GOU-SED 253: Special Pedagogical Methods in Physics Education (2 Units; Compulsory; LH = 15; PH = 45)

Senate-Approved Relevance

This course is intended for the training of high quality graduates who are also highly skilled and knowledgeable in various methods of teaching physics at the secondary school level. This is in line with the vision of Godfrey Okoye University to be a centre of academic excellence. A clear understanding of physics principles would be better achieved by students at that level of special methods, particularly when resources from the environment are employed with creativity and innovation. This is also in agreement with the tenets of SDG for inclusive and sustainable education for Nigeria.

Overview

The assumed abstractness of physics to students at the secondary school level requires special methods of teaching the subject at that level. Such methods should include relating physics to the culture of the environment by employing the resources in the locality in teaching.

It is hoped that if special methods are employed in physics teaching, resources in the environment are used in teaching, many abstract concepts in physics would be demystified. Equally, if even appliances at home, most of which operate on physics principles are employed in teaching, children would enjoy physics classes and many of them would be attracted to enrol in physics programmes at higher levels of education.

Objectives

The objectives of the course are to:

1. Describe the philosophical basis of physics education.
2. List the characteristics of good physics teaching.
3. Enumerate various methods of teaching physics.
4. Determine factors that guide the choice of method(s) to be used in physics teaching.
5. Name the skills to be acquired in the method(s) chosen.
6. Determine the techniques needed for physics teaching.
7. Name the ways by which interest in physics could be generated.
8. Enumerate ways of sustaining interest among students.
9. List resources/media for physics teaching.

Learning Outcome

On completion of the course, students should be able to:

1. Describe the philosophical basis of physics education.
2. List at least three characteristics of good physics teaching.
3. Enumerate at least four methods of teaching physics.
4. Determine at least three factors that guide the choice of method(s) for physics teaching
5. Name at least two skills that would be acquired in the chosen methods(s).
6. Determine the techniques needed for good physics teaching.
7. Name at least two ways of generating interest in physics among children.
8. Enumerate at least three ways of sustaining interest in physics among students.
9. List at least four media for physics teaching.

Course Content

Philosophical basis of physics education. The concept of teaching. Relevance of Physics. Characteristics of good physics teaching. Local Resources available for teaching Physics. Various methods of physics teaching. Factors that determine choice of method. Teaching skills in physics education. Teaching techniques in physics

education. Generating interest in physics education. Sustaining interest in physics education. Experimental group work. Computer-Aided method. Use of multimedia in teaching physics. Simulation in physics teaching. Field work in physics teaching. Bringing Physics close to daily life and Human Experience.

Minimum Academic Standard

1. A good basic physics laboratory.
2. Basic physics apparatus.
3. Basic physics equipment such spectrometer, oscilloscope. Computer.
4. Others as prescribed by NUC MAS.

GOU-SED 254: Measurement and Quantities in Physics Education (2 Units; Compulsory; LH = 15; PH = 45)

Senate - Approved Relevance

This course is intended for the education of well qualified graduates who are also highly grounded and knowledgeable in physics education. Such graduates shall be equipped with the required knowledge and skills to make contribution to sustainable development which is in line with the mission and vision of Godfrey Okoye University to be a centre of academic excellence, by utilizing the available resources in the environment for teaching, research and clear understanding of physics concepts and principles which will make them better teachers in the society.

Experience shows that many secondary school physics teachers are unable to use some basic apparatus and equipment. This course would afford them the opportunity to even meet the SDG set by Nigeria for inclusive and sustainable education in the country.

Overview

It is generally known that the low enrolment and poor performance of students in physics in public examinations in secondary schools are due to poor teaching of physics at that level. It is equally observed that in the general pure physics courses taught in the 100 level of our university education, attention is not given to physics education students for proper background in physics for their future career (teaching). This situation is caused by large number of students in a class at that level since all science oriented disciplines such as biological, chemical, geological, architectural, sciences and engineering are combined in one class. Eg. PHY 101, PHY 102 etc.

Accurate measurements, their units and physical quantities are fundamental to physics education. Since this course prepares students teachers, who on graduation, go to teach physics at the secondary schools, they have to be equipped with the ability to use basic apparatus and equipment in the Physics laboratory and in the environment.

Objectives

The objectives of the course are to:

1. Define a physical quantity.
2. Differentiate between basic and derived quantity.
3. Explain what “dimension” means.
4. Write some scientific notations.
5. Write order of magnitude.
6. Measure distances in space or sizes of objects.
7. Determine errors in measurement.
8. Mention names of measuring devices.
9. Draw graph of variables from data collected.
10. Draw conclusion from such graphs.

Learning Outcomes

On the completion of the course, students should be able to:

1. Define a physical quantity.
2. Say the difference between basic and derived quantity.
3. Explain what “dimension” means.
4. Write at least four scientific notations.
5. Write order of magnitudes.
6. Measure distances in space or sizes of objects.

7. Determine errors in measurements.
8. Mention the names of at least four measuring devices.
9. Draw graphs from collected data.
10. Draw conclusion from graphs.

Course Content

Measurement of physical quantities. Basic quantities. Derived quantities. Dimension. Scientific notations. Order of magnitudes. Errors in measurements. Measurements. Measuring with Vernier Calipers. Micro meter screw gauge. Speherometer. Spectrometer. Beam balance. Triple beam balance. Lever balance. Thermometer. Metre rule. Ameter. Voltmeter.

Minimum Academic Standard

1. A good physics laboratory.
2. Classroom.
3. Instruments such Vernier Calipers. Micrometer screw guage. Spherometer. Beam (Chemical) balance, Triple beam balance. Spectrometer. Meter rule. Ameter. Voltmeter
4. Other NUCMAS.

GST 312: Peace and Conflict Resolution (2 Units C: LH 30)

Learning Outcomes

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

1. analyse the concepts of peace, conflict, and security;
2. list major forms, types, and root causes of conflict and violence;
3. differentiate between conflict and terrorism;
4. enumerate security and peace building strategies; and
5. describe roles of international organizations, media, and traditional institutions in peace building

Course Contents

Concepts of peace, conflict, and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, economic, geo-political conflicts, structural conflict theory, realist theory of conflict, Frustration-Aggression conflict theory. Root causes of conflict and violence in Africa: Indigene and settlers phenomenon, boundaries/border disputes, political disputes; ethnic disputes and rivalries; economic inequalities; social disputes; nationalist movements and agitations.Selected Conflict Case Studies – Tiv-Junkun; Zango Kartaf, Chieftaincy and Land disputes. Peace building. Management of conflicts and security. Peace and human development. Approaches to peace and conflict management --- (religious, government, community leaders and others). Elements of peace studies and conflict resolution. Conflict dynamics assessment scales. Constructive & Destructive. Justice and Legal framework; Concepts of Social Justice; The Nigeria Legal System. Insurgency and Terrorism. Peace Mediation and Peace Keeping. Peace & Security Council (International, National, and Local levels). Agents of Conflict resolution – Conventions, Treaties Community Policing: Evolution and Imperatives. Alternative Dispute Resolution, ADR. Dialogue (b). Arbitration, (c). Negotiation (d). Collaboration. Roles of International Organizations in Conflict Resolution. (a). The United Nations, UN, and its Conflict Resolution Organs. (b). The

African Union & Peace Security Council (c). ECOWAS in Peace Keeping. Media and Traditional Institutions in Peace Building. Managing Post-Conflict Situations/Crisis: Refugees. Internally Displaced Persons, IDPs. The role of NGOs in Post-Conflict Situations/Crisis

ENT 312: Venture Creation (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students, through case study and practical approaches, should be able to

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises;
7. conduct entrepreneurial marketing and e-commerce;
8. apply a wide variety of emerging technological solutions to entrepreneurship; and
9. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity Identification (Sources of business opportunities in Nigeria, Environmental scanning, demand and supply gap/unmet needs/market gaps/market research, Unutilised resources, social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organizations, and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, E-commerce business models and successful E-Commerce companies). Small business management/family business. Leadership & management, basic book keeping, nature of family business and family business growth model. Negotiation and business communication (Strategy and tactics of negotiation/bargaining, Traditional and modern business communication methods). Opportunity discovery demonstrations (Business idea generation presentations, business idea contest, brainstorming sessions, Idea pitching). Technological solutions (The concept of market/customer solution, customer solution, and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoT), Blockchain, Cloud Computing, Renewable Energy and others. Digital Business and E-Commerce strategies).

EDU 301: Teaching Practice I (3 Units C: PH: 145)

Learning Outcomes

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

1. knowledge of the subject matter;
2. the necessary pedagogical skills;
3. acquired understanding of child psychology;

4. the needed attitude towards Teaching;
5. proper use of instructional facilities;
6. knowledge of individual differences in actual classroom situations and how to use this knowledge to assist children in real-time; and
7. effective classroom management skills.

Course Contents

Effective and responsive teaching practices and interactions are key for all learning in professional teacher preparation. Teaching practice is important to provide the students with an opportunity to apply their pedagogical knowledge and skills in practice. Therefore, the practical implementation of teaching and learning strategies in the classroom, as applied to the subject area, should be taught through micro-teaching before students embark on the exercise.

EDU 302: Educational Measurements, Tests, Research Methods and Statistics (3 Units C: LH 45)

Learning Outcomes

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

1. measure and assess learning outcomes and use the results in decision making and judgments;
2. identify the different domains of learning; develop and use appropriate instruments for measuring each.

3. identify the different kinds of data that can be yielded in different contexts and the appropriate statistical tool for analysing each type of data;
4. explain the meaning, aim, types, role, and processes of research in educational settings;
5. acquire communication skills and skills in reporting of research;
6. carry out hypothesis testing, and employ the knowledge of critical values and error in interpreting results and making inferences.
7. gain skills in the use of IBM-SPSS and other relevant packages in the analysis of data; and
8. judge and address ethical issues in research.

Course Contents

Types of educational measurements. Types of tests. Development of tests, test blueprint, item analysis, reliability, and validity of instruments. Domains of learning and taxonomy of cognitive outcomes. Meaning of research. Types of research with focus on descriptive and experimental research. The research process. Writing a research proposal. Research designs. Theoretical/conceptual framework and review of literature. Sample and sampling techniques. Types of data, data gathering, data processing, data analysis, and interpretation. Probability, critical values, and error and their place in inferences. Ethical considerations (political, economic religious, and cultural) in research. Data analysis using IBM-SPSS in data analysis. Reporting educational research.

PHY 301: Analytical Mechanics I (3 Units C: LH 45)
Pre-requisites -MTH 201, and MTH 202

Learning Outcomes

On completion, the student should be able to

1. explain particle motion in one, two, and three dimensions
2. describe the two-body problem and many-body systems
3. define and solve problems of conservative forces
4. explain Newton theory of gravitation
5. describe the nature of generalized motion
6. explain the theory of relativity
7. choose an appropriate set of generalized coordinates to describe a dynamical system and obtain its Lagrangian in terms of those coordinates and the associated 'velocities'.
8. derive and solve the corresponding equations of motion. Treat small oscillations as an eigenvalue problem.

Course Contents

Review of Newtonian mechanics; motion of a particle in one, two and three dimensions. Internal forces, external forces, forces of constraint. Systems of particles and collision theory. Newtonian gravitation. Conservative forces and potentials. Oscillations, central force problems; accelerated frames of reference. Rigid body dynamics. Rotational problems and

3.
polar coordinates. Mechanics of continuous media. Galilean relativity; Relativistic kinematics and dynamics, Applications of relativistic kinematics.

PHY 303: Electromagnetism (3 Units C: LH 45)
Pre-requisites -PHY 201 and MTH 202

Learning Outcomes
On completion, the student should be able to;
1. derive Maxwell's equation set from the empirical laws of electromagnetism.
2. use the fundamental laws of electromagnetism to solve simple problems of electrostatics, magnetostatics, and electromagnetic induction in a vacuum;
3. modify Maxwell's laws to apply in the presence of materials and solve problems involving them;
4. derive the electromagnetic boundary conditions that apply at the interface between two simple media and use them to solve problems involving two or more materials.
5. explain the properties of plane electromagnetic waves in a vacuum and in simple media and to be able to derive these properties from Maxwell's equations
6. apply the special theory of relativity to problems in electromagnetism

Course Contents
Review of vector calculus. Electrostatics and magnetostatics, Magnetization and magnetic susceptibility. Laplace's equation and boundary value problems. Multipole expansions, EM waves in dielectric and magnetic materials; Polarization of EM waves. Electromagnetic induction; Faraday's and Lenz's laws. A.C. Circuits. Maxwell's equations. Lorentz covariance and special relativity. Gauss theorem in dielectrics. Poisson's equations; Uniquenes's theorem; magnetron; magnetic properties; motors; Generators and Poynting vectors.

PHY 304: Electromagnetic waves and optics (3 Units C: LH 45) Pre-requisite -PHY 102

Learning outcomes
At the end of the course, students should be able to:
1. explain plane electromagnetic waves and waves propagation;
2. derive the wave equation;
3. describe the transport of electromagnetic energy;
4. explain scattering, interference, diffraction, reflection, polarization, and refraction of electromagnetic waves;
5. use complex notation competently for wave phenomena;
6. solve problems which require the use of wave representations of electric and magnetic fields in propagating electromagnetic waves;
7. analyse simple examples of interference and diffraction phenomena;

3.

8. explain the principles of operation of a range of equipment used in modern optics, notably the Michelson interferometer and Fabry-Perot etalon;
9. explain the physics of the laser and processes involved in producing laser radiation to solve simple problems;

Course contents

Review of Maxwell's equations and wave equations in a dielectric. Electromagnetic potentials. Propagation of plane and spherical waves. Huygen's wavelets and Fermat's principle. Recap of polarization states. Interference. Michelson interferometer and Fabry-Perot etalon. Fourier transform spectroscopy. Young's slits. Lloyd's mirror. Fraunhofer diffraction. Resolution of optical instruments. Reflection and refraction. Transmission lines. Wave guides and optical cavities. Lasers (rate equation, Steady state operation; threshold and efficiency).

PHY 305: Quantum Physics (3 Units C: LH 45)

Pre-requisite-PHY201

Learning Outcomes

On completion, the student should be able to;

1. explain the origin of quantum physics and principles of quantum theory;
2. apply the mathematical tools of quantum physics;
   explain how quantum states are described by wave functions;
4. apply operators and solve eigenvalue problems in quantum mechanics;
5. solve the Schrodinger equation and describe the properties of the simple harmonic oscillator;
6. use the algebra of angular momentum operators and solve the simple eigenvalue problems of an angular momentum in quantum mechanics;
7. apply quantum mechanics to describe the hydrogen atom;
8. employ quantum mechanics to describe the properties of one-electron atoms; and
9. use quantum mechanics to describe the simple multi-electron systems such as helium atom and hydrogen molecule.

Course Contents

Wave-particle duality and the Uncertainty Principle. Basic principles of the quantum theory. Time dependent Schrodinger equation. Energy levels in potential wells. Reflection and transmission of potential barriers. Operators and quantum states. Commutation relations and compatibility of different observables. Orbital angular momentum. Particle in two dimensions. Familiar wave phenomena and their associated wave equations. Physical interpretation of the wave function as a probability amplitude. Energy levels and stationary states, energy bands in periodic lattice. Solution of Schrodinger equation for a central potential in three dimensions; The hydrogen atom, Multi-electron atoms. The harmonic oscillator. Exchange symmetry.

PHY 306: Statistical and Thermal Physics I (3 Units C: LH 45)

3.

Pre-requisites -PHY 102 and PHY 305

Learning Outcomes

On completion, the student should be able to

1. describe an ideal gas on the basis of classical statistics
2. explain the basic concepts of statistical mechanics, including entropy, its statistical interpretation and relation to disorder, and the statistical origin of the second law of thermodynamics;
3. illustrate the canonical and grand-canonical partition functions for systems in thermal equilibrium, and use them to obtain thermodynamic quantities of interest.
4. describe the implications of the indistinguishability of particles for systems of noninteracting quantum particles
5. deduce the Bose-Einstein and Fermi-Dirac distribution functions, and apply them to calculate the properties of Bose and Fermi gases, for example in the context of White Dwarf stars and black-body radiation.
6. explain the physical origin of Bose-Einstein condensation, to characterize it quantitatively, and to explain the experiments confirming Bose-Einstein condensation

Course Contents

Basic theory of thermodynamics. Basic of probability theory; microstates and macrostates. The concept of ensembles. Statistical interpretation of entropy and temperature; Isolated systems and the microcanonical ensemble. Statistical physics of non-isolated systems. Derivation of the Boltzmann distribution and canonical ensemble. The partition function in thermodynamics. Non-interacting systems. Equipartition theorem. Density of states; Grand canonical ensemble. Fermi-Dirac and Bose-Einstein distributions. The ideal Fermi gas; Fermi energy. Electronic heat capacity, The ideal Bose gas, Black body radiation, Bose-Einstein condensation.

GOU-EDU 303: Psychology of Education in South-East Nigeria (2 Units; Compulsory; LH = 15; PH = 45)

Senate-Approved Relevance

Adequate preparation of professional teachers with useful knowledge, skills, values, initiatives and understanding and application of human knowledge to the principles of teaching and learning is important in Enugu, Nigeria, where Godfrey Okoye University, is located. This course is meant to help student educators to acquire the right techniques which is important for understanding the learner, his/her socio-economic environment and which will enable the student educators to teach their students effectively. This is in line with the epistemic dialogue that Godfrey Okoye University is anchored on. Therefore, during the course of teaching and learning, the student educators who acquired skills and knowledge in this course can easily find out individual differences among the students and guide the students to put in their best thereby preventing students in their studies dropping out of school.

Overview

3.

The concept of student dropout in educational system has aroused interest of many professional academics and the public in general. Students may drop out of schools with or without the consent of the school either to another school or to sit at home. Some of the reasons for dropout from school are poor academic performance, lack of sufficient individualized attention and conflict between school and household duties. If student educators acquire the psychological skills that will make them understand the individual differences and needs of their students' they will teach more effectively, and dropout from schools will reduce or curbed entirely. This creates the need for proper attention on the application of principles and techniques of psychology to the solution of problem in the classroom.

This course is designed to enable the student educators acquire skills to understand human behaviour in relation to teaching and learning and the environment in which education takes place. It will give the student teachers the opportunity to understand the learner, apply the learning theories of motivation and memory processing in effective teaching and learning. It will expose the student educators to the need for home teaching and manage their own learning centres and become employees of labour.

Objectives

The objectives of this course are to:

1. 2. Justify the need for psychology of teaching and learning.
3. Discuss various theories of learning and their implications for the classroom teacher.
4. Examine the concept of dropout.
5. Identify the development patterns that influences the learners' behaviour.
6. Describe the theories of motivation and their application to the classroom.
7. Explain memory processing, encoding and retrieval process.
8. Analyze forgetting and remembering
9. Discuss the transfer of learning and its implications for the classroom.
10. Apply psychology of teaching and learning to home studies.

Learning Outcomes

By the end of this course, the student should be able to:

1. Define psychology of teaching and learning.
2. Discuss theories of learning and their implications to the classroom teacher.
3. Describe the relevance of motivation to classroom learning.
4. Select at least five adequate learning experiences and materials for school and home learners.
5. Draw out the relationship between learning and individual differences and fashioning appropriate techniques for solving the problems resulting from such differences.
6. Demonstrate how learning process can be effectively guided and preserved.
7. Distinguish developmental characteristics of the learners and fashion a way of solving certain problems resulting from such characteristics.
8. Discuss professionalism in relation to the study.

Course Content

Meaning of psychology. Meaning of educational psychology. Critical analysis of developmental patterns. Characteristics of individuals. Theories of learning. Implication learning theories to the classroom teacher. Concept of dropout from school. Theories of motivation. Motivational problems encountered in the classroom. How to solve the motivational problems. Issues of dropout from school. Enugu experience. Memory processing.

3.

Forgetting. Remembering. Classroom management. Need for home study. Professionalism in home school teaching. Learning establishment of a study centre. Students' attitudes. Students' aptitudes. Students' interest.

Minimum Academic Standards

1. Projectors.
2. Other NUC-MAS requirement facilities.

3.

GOU-EDU 305: Indigenous Educational Resources for Curriculum Implementation (2 Units; Compulsory; LH = 15; PH = 45)

Senate-Approved Relevance
This course is designed for the training of highly skilled and knowledgeable education graduate teacher on local educational resource for teaching and learning in Enugu, Nigeria which aligns properly with the mission and vision of Godfrey Okoye University, Enugu to produce graduate teachers that could contribute maximally to high quality education entrepreneurship, and sustainable socio-economic human development. This is also in agreement with Nigeria SDG for equitable, inclusive and sustainable education.

Overview
Presently students of education are not made to learn about skills for production of instructional materials from local resources like palm trees and other forest trees and soil for teaching and learning various school subjects. In terms of impacting the knowledge, these skills would enable graduate teachers to utilize the local environmental resources to produce instructional materials for schools here and outside Enugu.

The course therefore is designed to adequately expose graduate education teachers of Godfrey Okoye University to look inward in the production of various educational instructional materials from local resources for Enugu and Nigerian schools.

Objectives
The objectives of the course are to:
1. Define the concept curriculum.
2. Discuss problems encountered in defining curriculum.
3. Explain the aim and scope of curriculum.
4. Describe the different programs in education curriculum.
5. Define resources in education curriculum.
6. Outline the different types of resources in education curriculum.
7. Describe improvisation of instructional materials in education curriculum.
8. Describe the various local educational resources for teaching and learning in Enugu.
9. Discuss the merits and demerits of utilizing local educational resource in production of instructional materials.
10. Describe the main qualities of a good instructional material.

Learning Outcomes
By the end of this course, the student should be able to:
1. Define the concept curriculum in three different ways.
2. Explain at least five problems encountered in defining education curriculum.
3. Describe at least five aims and scope of education curriculum.
4. Describe the three main programs of education curriculum.
5. Explain at least five local educational resources in education curriculum.
6. Differentiate at least five local educational resources in education curriculum.

3.

7. Describe the meaning of improvisation of instructional materials in teaching and learning.
8. Explain at least five local educational resources for producing teaching and learning materials.
9. Describe at least five merits and demerits of using local educational resource in production of instructional materials.
10. Describe at least five qualities of good instructional materials.

Course Content

Definition of terms. An overview of the course. Aim of the course. Objective and Contents. Learning experiences. Scope of the course. Education and curriculum. Curriculum programmes. Programme of studies. Program of guidance. Program of activity. Resources in education curriculum. Human and material resource from plant, soil etc. Meaning of instructional materials. Improvisation of instructional materials. Qualities of good instructional material: durable, clarity cost etc. Advantages of local educational resources.

Minimum Academic Standard

a) Micro teaching laboratory.

b) Computers (1:5 students).

c) Other NUC – MAS requirement facilities.

3.

GOU-PHY 331: Renewable Energy Sources I (2 Units; Compulsory; LH = 30; PH = 0)

Senate-Approved Relevance

Renewable energy is a source of clean energy supply, and the raw materials like solar radiations, coal and waste products and animal dungs are often available. Harnessing these alternative energy sources for domestic utilization and industrial applications/usages are paramount for economic development. Fossil fuel energy supply is gradually depleting and renewable energy need to be integrated into the National grid energy supply chain for domestic, agricultural, and industrial applications/usages. This course shall acquaint the Physics students with the prerequisite knowledge and skillsets in harnessing alternative energy sources. This is in agreement with Godfrey Okoye University's Mission to empower their graduates with knowledge and skillsets to make them outstandingly excellent in their career and/or become self-employed.

Overview

Harnessing alternative energy sources and integrating them into National grid is a penance to epileptic and intermittent power supply in Nigeria. This course introduces the students to different forms of renewable energy sources, and the techniques of harnessing them.

The students employ the techniques of harnessing the alternative energy using local available material, and transform the energy generated for domestic, agricultural and industrial usages.

Objectives

The objective of the course are to:

1. Discuss different alternative energy sources, and their generation.
2. Harness alternative energy.
3. Discuss solar energy and storage systems.
4. Discuss wind energy and its characteristics.
5. Discuss hydro power generations and flow-rate.
6. Discuss energy generation from coal and nuclear materials.

Learning Outcomes

On the completion of this course students should be able to:

1. List at least six different alternative energy sources.

3.
2. Explain chemical processes and energy storage in plant.
3. Explain techniques involved in generation of energy from Solar, Coal and animal dung.
4. Explain solar energy system.
5. Explain different applications of solar energy system.
6. Explain the operations of turbines.

Course Content

Alternative energy sources (Solar, thermal, Wind, Biomass, hydro, coal, nuclear). Solar radiation and measuring instrument. Basic flat plate collector, Selective surfaces anti-reflective coatings, and Collector designs. High density batteries and fuel cells. Solar energy and application. Thermal power generation and energy storage. Biomass energy. Sources of Biomass fuel (wood, animal wastes, etc) and synthesis of fuel. Applications/uses of Biomass energy. Wind energy and power. Characteristics of the wind, estimation of wind speed. Hydro power, principle and flow rate. Impulse and reaction type of turbines. Coal as a source of energy and types. Energy generation and applications/uses of coal. Nuclear materials, energy and application/uses.

Minimum Academic Standards/Requirements

Classroom, White board and marker, overhead projector, Laptop, textbooks on alternative energy sources, instructional materials, internet access, Photocells, Solar batteries, Solar cells, Light meter, coal, prototype turbine engine, Transmission lines.

3.

GOU-SED 352: Laboratory Techniques in Physics Teaching (2 Units; Compulsory; L = 15; P = 45)

Senate - Approved Relevance

This course is intended for the training of high quality graduates who are highly skilled and knowledgeable in various physics laboratory techniques for secondary school physics laboratories. This is in line with the vision of Godfrey Okoye University to be a centre for academic excellence, as the physics laboratory equipment provide the lecturers and students resources for teaching, research and community service. In doing these, both the students and teachers would be exposed to different techniques available to them in physics laboratories. With constant practice the students would be able to carry out repairs of laboratory equipment and similar domestic equipment in the surrounding society; this is also in line with Nigeria's SDG for inclusive and sustainable education.

Overview

The officially recommended staff of secondary physics laboratories are trained technicians or laboratory assistants. Experience has shown that these personnel are unfortunately absent and their duties fall on teachers. More worrisome is that a course like this one is absent in our curriculum. By including it now, the students would be exposed to different techniques of handling laboratory apparatus, their repairs and maintenance.

On graduation, and when they find themselves as teachers in schools, they would be equipped with difference techniques, especially of handling, repairing and maintaining different equipment. This when continuously practiced would definitely enhance entrepreneurship and wealth creation for self-reliance as similar devices or appliances in the locality could be repaired by the teachers as community service.

Objectives

The objectives of this course are to:

1. Identify physics laboratory apparatus and equipment.
2. Ensure the provision and supply of needed physics laboratory apparatus and equipment.
3. Receive properly all apparatus and equipment supplied to the laboratory.
4. Keep a laboratory inventory of apparatus and equipment.
5. Observe correctly the engraving/scale marks on equipment.
6. Read correctly the positions of scale pointer on equipment.
7. Identify zero errors (if any) on equipment.
8. Carryout correction on such zero errors.
9. Tabulate results properly in an experiment.
10. Draw graphs correctly with data obtained.
11. Design a physics laboratory.
12. Improvise scarce or costly equipment.

Learning Outcome

3.

On completion of this courses, the students should be able to:

1. Identify any physics apparatus and equipment.
2. Place order for supply of physics laboratory apparatus and equipment.
3. Receive properly all apparatus and equipment supplied to the laboratory.
4. Keep a laboratory inventory of apparatus and equipment.
5. Observe correctly the scale reading on laboratory equipment.
6. Read correctly positions of scale pointer on equipment.
7. Identify zero error (if any) on an equipment.
8. Carry out correction on such equipment error.
9. Tabulate results properly in an experiment.
10. Draw graphs correctly with data obtained.
11. Design a physics laboratory.
12. Improvise scarce or costly equipment.

Course Content

Basic physics laboratory apparatus. Basic physics laboratory equipment. Ordering of equipment. Receiving of laboratory equipment. Storage of equipment. Stocking of Laboratory equipment. Laboratory inventory. Uses of laboratory apparatus. Use of laboratory equipment. Zero errors in equipment. Correcting such errors. Tabulation of experimental data. Graph plotting. Gradients (slopes) of graphs. Laboratory design. Types of laboratory. Laboratory furniture. Improvisation of apparatus equipment. Minor repair of laboratory equipment.

Minimum Academic Standard

1. A Physics laboratory.
2. Computers (1:5 students).
3. Other NUC – MAS requirement facilities.

EDU 401: Teaching Practice II (3 Units C: PH 135)

Learning Outcomes

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

1. knowledge of the subject matter;
2. the necessary pedagogical skills;
3. acquired understanding of child psychology;
4. the needed attitude towards Teaching;
5. proper use of instructional facilities;
6. knowledge of individual differences in actual classroom situations and how to use this knowledge to assist children in real time.
7. effective classroom management skills.

Course Contents

Effective and responsive teaching practices and interactions are key for all learning in professional teacher preparation. The importance of teaching practice is to provide the

3.
students with an opportunity to apply their pedagogical knowledge and skills in practice. Therefore, the practical implementation of teaching and learning strategies in the classroom, as applied to the subject, area should be taught through micro-teaching before students embark on the exercise.

EDU 400: Project (3 Units C: LH 135)

Learning Outcomes

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

1. identify researchable project topics on contemporary problems in relevant subject specialization in education;
2. search and review literature pertinent to identified topical issues;
3. conceptualize and design a research study to address an identified problem;
4. develop valid and reliable tests, questionnaires and other relevant research instruments for research project;
5. plan and implement a scheme for selection of study sample;
6. determine statistical tools for analyzing data collected based on research objectives;
7. write a coherent report on research conducted;
8. cite and reference sources of information used in their research report; and
9. work independently to accomplish a research project with the guidance of the research supervisor.

Course Contents

Application of knowledge and skills acquired in research methods, statistics and evaluation in identifying and proffering solutions to educational problems. Working independently under the guidance of a Project Supervisor. Planning and execution of a well-conceptualized research and presenting a written report on the study conducted.

SED 402: Entrepreneurship in Physics Education (2 Units C: LH 30)

Learning Outcomes

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

1. explain the concept of entrepreneur in relation to physics education
2. identify entrepreneurial opportunities inherent in physics education
   explain feasibility study with copious illustrations
4. write sample proposals for different spin-of business setup
5. evaluate at least two cases of entrepreneurial setup in physics education.

Course Contents

Concept of an Entrepreneur, Meaning of Entrepreneurship in Physics Education. Entrepreneurial opportunities in physics education. Teaching of entrepreneurship in physics education through project-based and work-based experiences. Feasibility study and writing

3.
of proposal for the establishment of a spin-off business in physics education. Students to report on a successful entrepreneurial outfit in physics education.

PHY 401: Quantum Mechanics I (3 Units C: LH 45)
Pre-requisites -PHY 305 and MTH 202

Learning Outcomes
On completion, the student should be able to
1. state the postulates of quantum mechanics
2. explain the basics of vectors and tensor operators
3. solve a variety of physical problems using the Schrodinger equation.
4. work with angular momentum operators and their eigenvalues both qualitatively and quantitatively.
5. explain electron spin and the Pauli principle
6. apply perturbation theory and other methods to find approximate solutions to problems in quantum mechanics, including the fine-structure of energy levels of hydrogen.

Course Contents
The formulation of quantum mechanics in terms of state vectors and linear operators.Time evolution of the Schrodinger equation. The theory of angular momentum and spin. Electron spin and the Stern-Gerlach experiment. Identical particles and the Pauli exclusion principle, Multi-electron atoms. Approximation methods; Variational methods and WKB approximation for bound states and tunneling. Time-independent Perturbation theory. The fine structure of hydrogen. Harmonic oscillator. Creation and annihilation operators. External fields: Zeeman and Stark effects in hydrogen.

PHY 402/502: Quantum Mechanics II (3 Units C: LH 45)
Pre-requisites -PHY 401

Learning outcomes
At the end of the course, students should be able to:
1. apply the mathematical tools of quantum mechanics;
2. understand approximation methods in quantum mechanics;
3. explain the scattering theory;
4. find the unitary transformations linked to symmetry operations;
5. apply time-dependent perturbation theory to variety of problems;
6. derive a mathematical description of quantum motion in electromagnetic fields;
7. apply the relativistic wave equations to simple single-particle problems;
8. use Dirac notation to represent quantum-mechanical states and manipulate operators in terms of their matrix elements.

Course contents

3.
Time-independent and time-dependent perturbation theory. Scattering theory. Elastic potential scattering. Green's function and partial wave methods. Symmetries in quantum mechanics. Rotations, space-time reflections and parity. Selection rules for atomic transitions. Emission and absorption of radiation. Selection rules for hydrogen. Description and interpretation of selected phenomena from each of atomic physics, molecular physics, solidstate physics, and nuclear physics using quantum mechanical models. Relativistic wave equation. The Klein-Gordon equation. The Dirac equation. Chirality. Lorentz invariance and non-relativistic limit.

PHY 403: Mathematical methods for physics I (3 Units C: PH 45) Pre-requisites -MTH 202

Learning outcomes
At the end of the course, students should be able to:
1. explain the concepts of scalar and vector fields;
2. describe the properties of div, grad and curl and be able to calculate the divergence and curl of vector fields in various coordinate systems;
3. calculate surface and volume integrals in various coordinate systems;
4. calculate flux integrals and relate them to the divergence and the divergence theorem;
5. calculate line integrals and relate them to the curl and to Stokes' Theorem;
6. apply the methods of vector calculus to physical problems;
7. calculate the fourier series associated with simple functions and apply them to selected physical problems.

Course contents
Vector and scalar fields. Vector operators. Div, grad, and curl. Divergence theorem. Stoke's theorem. Linear Algebra and functional Analysis. Transformations in linear vector spaces and matrix theory. Hilbert space and complete sets of orthogonal functions. Special functions of mathematical physics (The gamma function; hypergeometric functions; Legendre functions; Bessel functions. Hermite and Laguerre functions. The Dirac - Delta function. Integral transforms and fourier series. Fourier series and fourier transforms. The Dirichlet conditions. orthogonality of functions. Fourier coefficients. Complex representation of fourier series. Laplace transform. Applications of transform methods to the solution of elementary differential equations of interest in physics and engineering.

PHY 404/504: Mathematical methods for physics II (3 Units C: LH 45)

Learning outcomes
At the end of the course, students should be able to:
1. describe the properties of different types of functions and be able to sketch them in both 2D Cartesian and polar coordinates;
2. integrate and differentiate functions of one variable using a range of techniques and be able to apply integration and differentiation to a range of physical problems;

3.
3. show how smooth functions can be expressed in terms of power series;
4. explain the properties of complex numbers and construct some basic complex functions;
5. employ matrix notation, carry out matrix algebra and use matrices to solve systems of linear equations;
6. compute the properties of determinants, be able to evaluate them, and use them to test for unique solutions of linear equations;
7. solve first and second order ordinary differential equations using a range of techniques.

3.

Course contents

Partial differential equations. Solution of boundary value problems of partial differential equations by various methods which include separation of variables, the method of integral transforms. Sturm-Liouville theory; uniqueness of solutions. Calculus of residues and applications to evaluation of integrals and summation of series. Applications to various physical situations, which may include, electromagnetic theory, quantum theory, diffusion phenomena; complex variable theory and their relation to selected physical problems. Complex differentiation and integration. Cauchy's theorem. Taylor's and Laurent's series. Ordinary differential equations of first and second order and their physical applications. Homogeneous partial differential equations.

PHY 405: Physics Entrepreneurship (2 Units C: LH 45)

Learning Outcomes

On completion, the student should be able to;

1. develop creative ability to apply physics knowledge to real-world settings;
2. denerate ideas of innovation and entrepreneurship; and
3. apply entrepreneurial skills and mindset in approaching societal problems.

Course Contents

Creativity: Developing questioning attitude, concept development, reconstructionism, critical thinking and brainstorming, use of practical and creative techniques in concept development. Identifying underlining physics principles in real life situations and physics principles driving equipment; Product development and requirements: Team building, product and service design concepts, consumer driven design, business planning, marketing and market research. Intellectual property, pricing and financial strategies, finding sources of funding.

GOU-EDU 403: Ethno-Pedagogy and Curriculum of Non-School Environment (2 Units; Compulsory; LH = 30; PH = 0)

Senate-Approved Relevance

Adequate formation of professional teachers with sustainable knowledge, skills, values, and positive attitudes is a need in the local environment of Enugu where Godfrey Okoye University is located. This course is meant to help student teachers to reach out to every learner in their homes and help them to achieve their educational needs. This is in line with the epistemic dialogue that Godfrey Okoye University is anchored on. Therefore, apart from teaching in the formal classroom setting, students who acquire skills and knowledge in this course can easily become home teachers and own their own study centres. This is also in line with the entrepreneurial mind-set of Godfrey Okoye University Enugu, Nigeria.

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Overview

Continuous poor performance of students in formal school setting in almost every standardised examination in both primary and secondary education calls the need for the development of this course. In recent times, parents are always busy with work. Many a time, they find it difficult to look at the academic work of their wards. This creates the need for proper attention on the educational needs of their children.

This course is designed to enable the student teachers acquire the required knowledge and skills to help learners to develop their educational potentials and desired learning outcomes. It will give the student teachers the opportunity to manage home lessons. More so, it will expose the student learners on the need to own and manage their own learning centres and become employers of labour.

Objectives

The objectives of this course are to:

1. Justify the relationship between ethno-pedagogy and curriculum.
2. Explain the concept of non-school environment.
3. Discuss curriculum as a process for transferring knowledge into application.
4. Analyse the relevance of curriculum based on the national policy on education.
5. Explain selection of objectives and learning experiences in curriculum.
6. Outline the role of instructional methods and materials in curriculum.
7. Explain evaluation processes in curriculum.
8. Identify the need for curriculum innovation in Enugu.
9. Apply ethno-pedagogy at home schools.

Learning Outcomes

By the end of this course, the student should be able to:

1. Define ethno-pedagogy.
2. Give the meaning of curriculum.
3. Discuss the relevance of curriculum based on the national policy on education.
4. Draw out the relationship between curriculum and instruction based on the three domains of learning.
5. Select adequate learning experiences and materials for home school learners.

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6. Identify at least five scaffolding activities for home school teaching and learning.
7. Explain curriculum innovation in the subject area.
8. Name three instruments used in evaluating learners' performance in home school teaching and learning.
9. Discuss professionalism in relation to home school teaching and learning.
10. Identify five ways of public relations regarding home school teaching and learning.
11. Suggest three methods of establishing study centres.

Course Content

Concept of ethno-pedagogy. Meaning of curriculum. Concept of non-school environment. Critical analysis of curriculum in terms of their relevance and national goals. Relationship between curriculum and instruction in terms of objectives specification. Selection of learning experiences. Learning materials. Methods and media of instruction. Scaffolding activities. Evaluation. Curriculum innovation in a subject matter area with particular reference to Enugu experience. Professionalism in home school teaching and learning. Public relations in home school teaching and learning. Establishment of study centres. Application of ethno-pedagogy at home schools.

Minimum Academic Standards

1. Microteaching Laboratory.
2. Computers (1 computer per student).
3. Other NUC-MAS requirement facilities.

GOU-SED 451: Curriculum Development in Science Education (2 Units; Compulsory; LH = 30; PH = 0)

Senate - Approved Relevance

This course is intended for the education of well qualified graduates who are also highly knowledgeable in materials that should or should not be included in science education that should be taught at the secondary school level. With such knowledge the graduates should be able to make contribution to sustainable development which is in line with the vision of Godfrey Okoye to be a centre of academic excellence by utilizing available resources within the environment for teaching, research and community service. A curriculum based on

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resources within an environment would be of more utility value than a global or even national one. Such would ensure one of the Goals of the strategic Development in the country which is equitable and inclusive education.

Overview
Historically, the bane of education in Nigeria is hoisted on her by her colonial master – Great Britain. Since the independence in 1960, a lot of reformation has taken place in the curriculum for the education of our children. This reformation is still ongoing, hence the new agenda of the Core Curriculum Minimum Academic Standard for Universities in the country.
The major concern about the present curriculum is that its products (our graduates) are neither employable nor are capable of employing themselves. Equally a school of thought has it now that students should be part of the decision-making body on what they want to learn. This idea can only be achieved if curriculum development in science education is included as a course at the appropriate programme of their education.

Objectives
The objectives of this course are to:
1. Explain the meaning of curriculum in science education.
2. State the scope of science education curriculum.
3. Explain the place of science in secondary school curriculum.
4. Describe the science education curriculum development processes.
5. Discuss science education curriculum implementation in Nigeria.
6. Outline the role of science teachers in science education curriculum innovation.
7. Describe the roles of science education professional bodies in Nigeria in the innovation of science education curriculum.
8. Describe the roles of Federal and State ministries of education and agencies in science education curriculum innovation.
9. Discuss the roles of universities in science education curriculum innovation.
10. Critique science education projects such as BPSP, APSP, SERA, NISP.
11. Discuss the readability and suitability of some science education textbooks.

Learning Outcomes
On completion of this courses, students should be able to:
1. Explain the meaning of curriculum in science education.
2. State the scope of science education curriculum.
3. Explain the place of science in secondary school curriculum.
4. Describe the science education curriculum development processes.
5. Discuss science education implementation in Nigeria.
6. Outline the role of science teachers in science education curriculum innovation.
7. Discuss the roles of science education professional bodies in Nigeria in science education curriculum innovation.
8. Describe the roles of Federal and State Ministries of Education and Agencies in science education curriculum innovation
9. Discuss the roles of Universities in science education curriculum innovation.
10. Critiques at least two science education projects.
11. Choose three science education textbooks, and discuss their readability and suitability.

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Course Content

Meaning and scope of curriculum in science. The place of science and maths in primary and secondary school curriculum. Process of curriculum development. Implementation of curriculum in Nigeria with – particular reference to the sciences and mathematics. The role of science and mathematics teachers in the development and innovation of science and Maths curriculum. Examination of roles of Science Teachers Association of Nigeria (STAN), Nigeria Education Research Commission (NERDC), Comparative Education Study and Adaptation Centre (CESAC), Curriculum Development and Instructional Materials Centre (CUDIMAC), Mathematical Association of Nigeria (MAN). The Federal and State Governments in the innovation of science curricula. Introduction to Science Education Projects. Biological Science, Patterns and Processes (BSPP). Science Education Programme for Africa (SEPA). Nigerian Secondary School Science Project (NSSSP). Nigerian Integrated Science Programme (NISP). The role of universities in science and Maths curriculum development. Science and Maths text books as resource and curriculum material. Readability and suitability of science and Maths textbooks.

Minimum Academic Standard

1. A classroom with white board.
2. Multimedia.
3. Curriculum materials such as BPSP; APSP; SERA; NSSSP; NISP.
4. Others as prescribed by NUC – MAS.

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GOU-SED 452: Physics Laboratory Organization and Management (2 Units; Compulsory; LH = 15; PH = 45)

Senate Approved Relevance

The course is intended for the training of high quality graduates who are highly skilled and knowledgeable in physics laboratory resources and their uses. This is in line with the vision of Godfrey Okoye University to be a centre of academic excellence by utilizing the available resources provided or sourced from the environment for teaching, research and clear understanding of physics principles which will make them better teachers in the society.

Overview

Any science teaching or learning without laboratory activities is no science at all. While physics education in Nigeria suffers from many ills, perhaps the most serious is the lack of physics laboratories and inadequacy of the laboratory apparatus and equipment in many schools. This brings to fore the need to relate physics to the culture of the environment, hence employing the cultural resources of the environment to teaching this course. For this, creativity and innovation are involved, especially in improvising apparatus from locally available materials.

Improvisation of science apparatus for our laboratories should not be downplayed. The production of needed apparatus locally should be the evidence of the proper working of the "Workshop Practice", which is a core course in Physics Education (Physics). By careful planning and improving on some apparatus made by students in successive years, the production of standard apparatus would be achieved. This forms a ground for entrepreneurship and wealth creation for self-reliance of the students after University education.

Objectives

The objectives of the course are to:

1. Distinguish a school physics laboratory among other laboratories.
2. Name and list at least five characteristics of a good physics laboratory.
3. List at least three skills acquired in a laboratory.
4. List at least three vital areas of space in a physics laboratory.
5. List at least twenty basic apparatus in a school physics laboratory.
6. Explain how the apparatus should be stored in the laboratory.
7. Describe different ways students should be arranged during practical sessions vis-à-vis their population.
8. Describe how to keep inventory of apparatus holding in the laboratory.
9. Name and explain some of the hazards in a physics laboratory.
10. List and discuss relevant safety precautions to be taken in a physics laboratory

Learning Outcome

On completion of this course, students should be able to:

1. Distinguish a school physics laboratory among others.

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2. Name/list at least five characteristics of a good physics laboratory.
3. Name/list at least three skills that should be acquired in a laboratory.
4. Name at least three vital areas of space in a physics laboratory.
5. List at least twenty basic apparatus to be found in a school physics laboratory.
6. Explain how apparatus should be stored in a school physics laboratory.
7. Describe ways students should be grouped during practical sessions.
8. Describe how to keep inventory of apparatus in a school physics laboratory.
9. Explain at least two hazards in a school physics laboratory.
10. Describe three relevant safety precautions to be taken in a school physics laboratory.

Course Content

Physics laboratory. Characteristics of Physics laboratory. Laboratory work space. Preparatory room. Demonstration platform. Laboratory tables. Laboratory stools. Water pipelines. Gas pipelines electricity fittings. Basic physics apparatus. Basic physics equipment. Laboratory store. Experiment groups. Demonstration. Sorting and storage of apparatus. Inventory of apparatus. Laboratory rules and regulations. Laboratory hazards. Safety precautions.

Minimum Academic Standard

1. Standard laboratory.
2. Basic Physics apparatus.
3. Basic physics equipment.
4. Gas supply and water supply.
5. Other NUC – MAS requirement.

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GOU SED 454: Teaching of Coal as a Source of Energy in Enugu (2 Units; Elective; LH = 30; PH = 0)

Senate - Approved Relevance

This course is intended for the education of high quality graduates who are highly skilled and knowledgeable in the teaching resources in the environment and equipped with the required knowledge to make contribution to sustainable development. This is in line with the vision of Godfrey Okoye University to be a centre of academic excellence by utilizing the available resources in the environment for teaching, research community service and sustainable economic development especially as Enugu and her environs have the largest deposits of coal in the country, hence the acronym for Enugu as coal city. This is also in agreement and sustainable education.

Overview

The assumed abstractness and fear of the unknown among students in enrolling in physics as a subject, requires relating this discipline to the culture of the environment, hence employing the cultural resources of the environment to teaching this course. Creativity and innovation are involved in maximizing the use of economic resources of the environment which definitely enhances entrepreneurship and wealth creation for self-reliance. Before the Nigeria – Biafra civil war, Enugu was the largest exporter of coal in Nigeria. This industry has become moribund and presently, many children even, in Enugu do not know anything about coal anymore.

Coal mining and processing is one of the resources which can promote sustainable economic development of the entire South – Eastern states and Nigeria as a nation. This is because coal reserves are found in varying quantities in Nigeria at Enugu, Imo, Kogi, Delta, Plateau, Aambra, Abia, Benue, Edo, Ondo, Bauchi, Adamawa and Kwara. (Kogbe, 1989)

Objectives

The objectives of the course are to:

1. Describe coal formation in the earth crust.
2. Discuss the scientific theories of coal formation.
3. List techniques of coal mining.
4. Discuss traditional techniques in coal extraction.
5. List and explain entrepreneurial skills in coal mining.
6. State the importance of coal production.
7. Explain the socio-economic factors influencing the modern coal mining technology.
8. Identifying technological training needs for indigenous mining of coal.
9. Discuss environmental hazards in coal mining.
10. List different by-products of coal and their uses.

Learning Outcome

On completion of this course students should be able to:

1. Describe how coal is formed in the earth crust.
2. Discuss the scientific theories of the coal formation.
3. List at least two techniques of coal mining.
4. Discuss traditional techniques(s) of coal mining.
5. List and explain at least two entrepreneurial skills in coal mining.
6. State the importance of coal production.
7. Explain at least two socio-economic factors influencing modern coal mining technology.

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8. Identify technological training needs for indigenous mining of coal.
9. Discuss environmental hazards of coal mining.
10. List at least two by-products of coal and their uses.

Course Content

Coal formation. Scientific theories of coal formation. Techniques of coal mining. Indigenous techniques in coal mining. Entrepreneurial skills in coal mining. Importance of coal production. Socio-economic factors influencing coal mining technology. Technological training needs for indigenous mining of coal. Environmental hazards of coal mining. By-products of coal. Coal tar products. Coal gas. Coal oil. Physical properties of coal. Specific gravity of coal. Density of coal. Thermal capacity of coal. Electrical resistivity of coal.

Minimum Academic Standard

1. Good quantity of coal specimen.
2. Specific gravity apparatus.
3. Electrical resistivity apparatus.
4. A good standard physics laboratory.
5. Any other NUC MAS equipment.

Minimum Academic Standards

Facilities

1. A Demonstration Laboratory in the Physics Unit of the Department
2. An Educational Technology Laboratory
3. A Micro-teaching Laboratory
4. Other Laboratories in the cognate Department of Physics in the Faculty of Science

Equipment

1. Scale pan
2. Slotted masses
3. Bar magnet
4. Tuning fork
5. Weighing balance
6. Spring balance
7. Vernier Calliper
8. Stop Watch
9. Spiral Spring
10. Split Cork
11. Dynamo
12. G-Clamp
13. Boyles Law Apparatus
14. Charles Law Apparatus
15. Gold Leaf Electroscope
16. Force on Conductor Apparatus

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17. Stop Clock, Stop Watch
18. Micrometre Screw Gauge
19. Displacement Vessel
20. Time Scaler
21. Pulley
22. Retort Stand
23. Pendulum Bob
24. Knife Edge
25. Meter Rule
26. Young Modulus Apparatus
27. Drilled Meter Rule
28. Density Bottle
29. Sonometer Box
30. Constantan Wire (18, 20, 22SWG)
31. Iron Metal Filling
32. Compass Needle
33. Viscometer
34. Sonometer
35. Test Tube Rack
36. Bunsen Burner
37. Fly Wheel, Rope
38. Concave/Convex Lens
39. Prism (45^0, 60^0)
40. Spherometer
41. Spectrometer
42. Rectangular Glass Block
43. Sodium Lamp
44. Optical Bench
45. Lens Holder
46. Mirror
47. Travelling Microscope
48. Lycopodium powder
49. Beaker (250ML, 300ML, 500ML)
50. Resonance Tube
51. Ray Box
52. Drawing Board
53. Optical Pins
54. Calorimeter
55. Thermometer
56. Tripod Stand
57. Hose

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58. Stirrer
59. Steam Heater
60. Water Trap
61. Test Tube
62. Naphthalene
63. Water Basin
64. Gas Cylinder
65. Accumulator (3V)
66. Dry Cells (2, 3V)
67. Potentiometer
68. Wheatstone Bridges
69. Switch Key (DOUBLE/SINGLE POLE)
70. Resistance Box
71. Standard Resistor (1Ω, 2 Ω, 5Ω)
72. Circuit Key, Galvanometer
73. Rheostat
74. Ammeter (3A, 5A)
75. Voltmeter (3V, 5V)
76. Leclanche Cell
77. Millimetre
78. Standard Cell
79. Zinc Rod
80. Carbon Electrolyte
81. Transformer
82. Metal Bridge
83. Connecting Wire (SINGLE STRAND)

Staffing

1. Academic(s) core to the discipline should possess PhD
2. There should be at least 2 academic staff cores to the programme (with specialization in physics education)
3. At least one out of the two should be in the professorial cadre
4. Actual staff/ student ratio should comply with NUC guidelines on staffing

Library

1. A standard physical library with reference text (Journals and recommended textbooks) should be available for the programme
2. Reference text, recommended text and journals in the library should be of good quality, relevant and adequate.
3. Recommended text and journals are very current
4. There should be evidence of adequate subscription to e-library resources at the University Library.

3.

Classroom, laboratories, workshops, and offices

Office

1. Lecturers' office should be well ventilated, illuminated and adequate in space
2. The office should contain standard tables, chairs, bookshelves, file cabinets, fans/air conditioner depending on status.

Classrooms

1. There should be classrooms designated to the programme
2. The sizes of the classrooms/lecture rooms should not be smaller than those specified in the NUC space standards.
3. There should be adequate chairs and tables in the classrooms
4. The classroom should be well ventilated and illuminated
5. The classrooms should be well equipped with basic facilities

Laboratories/ workshop

1. The laboratories should have enough space as stipulated in the NUC guidelines. 2. The facilities available in the laboratories should be relevant and adequate 3. The facilities should be functional and well maintained.