

**GODFREY OKOYE UNIVERSITY
ENUGU, ENUGU STATE, NIGERIA**

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B.SC. BIOLOGY

Student Handbook

2023 – 2028

Course Contents

Overview

The current B.Sc. Biology curriculum has undergone several reviews and modifications to satisfy the needs of the 21st century. This curriculum contains the basic concepts and principles of Biology from the simple structure and function of the cell to more complex tissues, organs, systems, organisms and their relationships with the biosphere.

At the 100 and 200 Levels, special emphasis has been given to basic units of life, the interaction of these units and the challenges encountered and their adaptiveness to our ecosystem, in an evolutionary manner. At the 300 and especially 400 level, the curriculum gradually moves and encourages student on the use of scientific processes to thinking critically and how to go about conducting research, to reporting accordingly, and how their findings can be applied to satisfy varied needs of the biotic and abiotic components of the ecosystem. This paradigm shift has been achieved by introducing courses such as bioinformatics, applied biotechnology, bioentrepreneurial options, animal in prophylactics and therapeutics, amongst others. Such courses will enable graduates of Biology to become an entrepreneur or competent employable individual in any organisation or a researcher/graduate student elsewhere in the world.

Philosophy

To produce graduates that will apply scientific knowledge and skills that are of biological values in solving problems and developmental needs of mankind and the environment.

Objectives

The objectives of the degree programme in Biology are to:

1. equip students with a broad and balanced foundation of biological knowledge and practical skills;
2. cultivate in students the ability to apply knowledge and skills to solving theoretical and practical problems in biology;
3. develop in students, a range of transferable skills that are of value in biological and non biological employment;
4. provide students with knowledge and skills base from which they can proceed to further studies in specialized areas of biology or multi-disciplinary areas involving biology;
5. prepare, through training and orientation, an appreciation of the solitary rewards of inter- and multi-disciplinary approach to the solution of complex life problems;
6. generate in students an appreciation of the importance of biology in industrial, economic, environmental, technological and social development;
7. instil in students a sense of enthusiasm for biology, an appreciation of its application in different contexts and to involve them in an intellectually stimulating and satisfying experience of learning, discovering and innovating; and
8. Provide expert advice and consultancy services to local, national and international organisations on general biology issues.

Unique Features of the Programme

The unique features of the programme include:

Course Contents

1. incorporation of biotechnology to solving ecological problems and human needs;
2. infusion of bioinformatics to enhance students understating of molecular biology;
3. incorporation of prophylactic and therapeutic plants and animals in promoting public health;
4. exploring the analytical skills of students in handling and processing biological data; and
5. grooming students into bio-entrepreneurship options.

Employability Skills and Opportunities

1. B.Sc. Biology programme prepares graduates for entrepreneurship in agroactivities, animal production systems, science school proprietorship, establishing and running analytical science laboratories, development and marketing of bio-products, bio-consultancy, establishing and running environmental NGOs, farming (Fish, poultry, horticulture, heliculture etc).
2. B.Sc. Biology programme also provides employment opportunities in:
 - i. nongovernmental organisations (NGOs) at national and international levels such as Nigerian Conservation Foundation (NCF), International Union for Conservation of Nature (IUCN) and World Wildlife Fund (WWF) etc.
 - ii. Intergovernmental organisations such as UNICEF, UNIDO, WHO, UNDP etc.
 - iii. Research institutions such as International Institute of Tropical Agriculture (IITA), National Veterinary Research Institute (NVRI), National Horticultural Research Institute (NHORT), National Root Crops Research Institute (NRCRI) etc.
 - iv. The private sector as science journalist, researcher, analyst, publisher, environmentalist, commercial farming etc. and
 - v. Government organizations as science teacher, researcher, political adviser on science education, analyst, environmentalist, technocrats in ministry, conservationist with National Parks Service or State Game Reserves, medical, paramilitary and military establishment and many more.

21st Century Skills

1. Information technology and self-motivation to succeed in this century.
2. Analytical and problem-solving ability.
3. Critical thinking.
4. Collation and synthesizing data.
5. Research skills, including imaginative, innovative and writing/publishing skills.

Admission and Graduation Requirements

UTME Entry Mode

4-year degree programme

The entry requirements shall be, at least, credit in five subjects including English language and Mathematics as the core subjects, with credits in three other relevant science subjects, preferably Biology, Chemistry and Physics. Agricultural science and Chemistry at the Senior Secondary Certificate (SSC) or its equivalent may be considered with, at least, a credit in Physics. In addition, an acceptable pass in the University Tertiary Matriculation Examination (UTME) into 100-level is required.

Course Contents

Direct entry mode

Five SSC (or equivalent) credit passes in relevant subjects, two of which are at the Advanced Level.

Graduation Requirements

Expected duration for Direct Entry (DE) candidates with two A level passes (graded A-E) at the

Advanced Level or its equivalent, in relevant subjects (Biology, Botany, Zoology, Chemistry, Mathematics and Physics) may undertake the three-year degree programme beginning from 200level.

Students are required to complete a minimum of 120 units for graduation, 60 of which must come from the relevant option areas in Biology.

Global Course Structure

100 Level

Course Code	Course Title	Unit(s)	Status	LH	PH
GST 111	Communication in English	2	C	15	45
GST 112	Nigerian Peoples and Culture	2	C	30	-
MTH 101	Elementary Mathematics I	2	C	30	-
MTH 102	Elementary Mathematics II	2	C	30	-
COS 101	Introduction to Computing Science	3	C	30	45
BIO 101	General Biology I	2	C	30	-
BIO 102	General Biology II	2	C	30	-
BIO 107	General Biology Practical I	1	C	-	45
BIO 108	General Biology Practical II	1	C		45
CHM 101	General Chemistry I	2	C	30	-
CHM 102	General Chemistry II	2	C	30	-
PHY 101	General Physics I	2	C	30	-
PHY 102	General Physics II	2	C	30	-
GOU-BIO 104	Mammalogy	2	C	30	-
	Total	27			

200 Level

Course Contents

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
BIO 201	Genetics I	2	C	30	-
BIO 203	General Physiology	2	C	30	-
BIO 205	Introductory Developmental/Cell Biology	2	C	30	-
Course Code	Course Title	Units	Status	LH	PH
BIO 202	Introductory Ecology	2	C	15	45
BIO 204	Biological Techniques	2	C	15	45
BIO 206	Hydrobiology	2	C	15	45
BIO 208	Biostatistics	2	C	30	-
GOU-BIO 222	Tropical Animals Biotechnology	2	E	15	45
GOU-BIO 223	Bioremediation of Polluted Aquatic Ecosystems	2	C	15	45
GOU-BIO 244	Environmental Impact Assessment	2	C	30	-
GOU-BIO 256	Fresh Water Ecology	2	C	15	45
	TOTAL	26			

300 Level

Course Code	Course Title	Unit(s)	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	-
ENT 312	Venture Creation	2	C	15	45
BIO 300	Industrial Attachment (SIWES)	3	C	-	-
BIO 301	Genetics II	2	C	15	45
BIO 302	Population Biology and Evolution	2	C	30	-
BIO 303	Biogeography and Soil Biology	2	C	30	

Course Contents

BIO 304	Nigerian Flora and Fauna	2	C	30	45
BIO 306	Systematic Biology	2	C	15	45
BIO 307	Field Course	1	C	-	
GOU-MCB 301	Coal Microbiology and Biotechnology	3	C	30	45
GOU-BIO 308	Agro waste and industrial pollution management	2	C	15	45
GOU-BIO 315	Basic Techniques in Microbial cell culture	2	C	15	45
GOU-BIO 328	Introductory Immunology	2	E	15	45
GOU-BIO 355	Oceanography	3	C	30	45
	TOTAL	30			

400 Level

Course Code	Course Title	Unit(s)	Status	LH	PH
BIO 400	Project	6	C	-	270
BIO 402	Principles of Plant and Animal Breeding	2	C	30	-
BIO 403	Wildlife Conservation and Management	2	C	30	-
BIO 404	Nigerian Plants and Animals in Prophylactics & Therapeutics	2	C	30	45
BIO 406	Principles of Pest Management	2	C	30	-
BIO 407	Field Course II	1	C	-	45
BIO 408	Applied Biotechnology	2	C	15	30
BIO 410	Bio-Entrepreneurship Options	2	C	30	
BIO 413	Bioinformatics	2	C	30	-
BIO 414	Molecular Biology	2	C	15	45
GOU-BIO 405	Principles and practice of streams, lakes and Rivers monitoring	2	C	30	-
GOU-BIO 415	Aquapreneurship	2	C	15	45
GOU-BIO 416	Use of Equipment and Techniques in Hydrobiology & Limnology	2	C	15	45
GOU-BIO 419	Embryology	3	C	30	45

Course Contents

GOU-BIO 420	Hydroponics, Aquaponics and Algaeculture	3	C	30	45
GOU-BIO 428	Fish Biology and Physiology	2	C	15	45
	TOTAL	37			

Course Contents and Learning Outcomes

100 Level

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 (phonetics and phonology, vowels and consonants). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations and many more). Sentence in English (types: structural and functional, simple and complex). Grammar and usage (tense, mood, modality, concord and 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; paragraphing, types of writing, summary, essays, letters, curriculum vitae, report writing, note making and many more. and mechanics of writing). Comprehension strategies (Reading and types of reading, comprehension skills, 3RsQ). Information and Communication Technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112- Nigerian Peoples and Culture

(2 Units C: LH 30)

Learning Outcomes

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

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;

Course Contents

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

Course Contents

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria, Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics and Nigerian Civil War). Concept of trade and economics of self-reliance (indigenous trade and market system, indigenous apprenticeship system among Nigeria people, trade, skill acquisition and self-reliance). Social justices and national development (law: definition and classification). Judiciary and fundamental 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). Re-orientation Strategies: Operation Feed the Nation (OFN), Green Revolution, Austerity Measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

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

Learning Outcomes

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

1. explain basic definition of Set, Subset, Union, Intersection, Complements and use of Venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. identify 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 and the argand diagram. De-Moivre's theorem, nth

Course Contents

roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

MTH 102: Elementary Mathematics II (Calculus)

(2 Units C: LH 30)

Learning Outcomes

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

1. identify the types of rules in differentiation and integration;
2. describe the meaning of Function of a real variable, graphs, limits and continuity; 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 and integration as an inverse of differentiation. Methods of integration and definite integrals. Application to areas and volumes.

COS 101: Introduction to Computing Sciences

(3 Units C: LH 30; PH 45)

Learning Outcomes

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

1. explain basic components of computers and other computing devices;
2. describe the various applications of computers;
3. explain information processing and its roles in the society;
4. describe the Internet, its various applications and its impact;
5. explain the different areas of the computing discipline and its specializations; and
6. demonstrate practical skills on using computers and the internet.

Course Contents

Brief history of computing. Description of the basic components of a computer/computing device. Input/Output devices and peripherals. Hardware, software and human ware. Diverse and growing computer/digital applications. Information processing and its roles in society. The Internet, its applications and its impact on the world today. The different areas/programs of the computing discipline. The job specializations for computing professionals. The future of computing.

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

Course Contents

BIO 101: General Biology I

(2 units C: LH 30)

Learning Outcomes

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

1. explain cells structures and organisations;
2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms; 5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

Course Contents

Cell structure and organisation, functions of cellular organelles. characteristics and classification of living things. chromosomes, genes; their relationships and importance. 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. //

BIO 102: General Biology II

(2 Units C: LH 30)

Learning Outcomes

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

1. List the characteristics, methods of identification and classification of Viruses, bacteria and fungi;
2. state the unique characteristics of plant and animal kingdoms;
3. describe ecological adaptations in the plant and animal kingdoms;
4. explain nutrition, respiration, excretion and reproduction in plants and animals; and
5. describe growth and development in plants and animals.

Course Contents

Basic characteristics, identification and classification of viruses, bacteria and fungi. A generalized survey of the plant and animal kingdoms based mainly on the study of similarities and differences in the external features. Ecological adaptations. Briefs on physiology to include nutrition, respiration, circulatory systems, excretion, reproduction, growth and development.

BIO 107: General Biology Practical I

(1 Unit C: PH 45)

Learning Outcomes

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

1. outline common laboratory hazards;
2. provide precaution on laboratory hazards;
3. state the functions of the different parts of microscope;

Course Contents

4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and 6. apply scaling and proportion to biological diagrams.

Course Contents

Common laboratory hazards. prevention and first aid. measurements in biology. uses and care of microscope. compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy and proportion. use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101**.

BIO 108: General Biology Practical II

(1 Unit C: PH 45)

Learning Outcomes

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

1. describe the anatomy of flowering plants;
2. differentiate types of fruit and seeds;
3. state ways of handling and caring for biological wares; 4. describe the basic histology of animal tissues; and
5. identify various groups in the animal kingdom.

Course Contents

Anatomy of flowering plants, primary vegetative body. stem, leaf and root to show the mature tissues namely parenchyma, collenchyma, sclerenchyma, xylem and phloem. Types of fruits and seeds. Care and use of dissecting kits and other biological wares. Dissection and general histology of animal tissues based on vertebrate forms. Morphology and functions of epithelial, muscular, nervous and connective tissues. Examination of various groups of lower invertebrates under microscopes, identification of various groups of organisms in Animal Kingdom. And any experiment designed to emphasize the practical aspects of topics in BIO 102.

CHM 101: General Chemistry I

(2 Units: C: LH 30)

Learning Outcomes

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

1. define atom, molecules and chemical reactions;
2. discuss the Modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionization energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation – reduction equation and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridized orbitals;
7. identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;

Course Contents

8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. determine rates of reactions and its dependence on concentration, time and temperature.

Course Contents

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridization and shapes of simple molecules. Valence Forces and structure of solids. Chemical equations and stoichiometry, chemical bonding and intermolecular forces, kinetic theory of matter. Elementary thermochemistry, rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

CHM 102: General Chemistry II

(2 Units C: LH 30)

Learning Outcomes

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

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements and
9. describe basic properties of Transition metals.

Course Contents

Historical survey of the development and importance of organic chemistry, fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures and 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.

PHY 101: General Physics I (Mechanics)

(2 Units C: LH 30)

Course Contents

Learning Outcomes

On completion, the students should be able to:

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

Course Contents

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

PHY 102: General Physics II (Electricity & Magnetism)

(2 Units C: LH 30)

Learning Outcomes

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

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

Course Contents

Course Contents

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

GOU-BIO 108: Mammalogy (2 Units; Compulsory: LH = 30; PH = 0) **Senate-Approved Relevance**

Students who study mammalogy as a biology major, have a deeper understanding of the role that mammals play in ecological communities especially in Enugu, including their interactions with other organisms and the ways in which they contribute to ecosystem functioning. 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. This knowledge is important so as to place conservation effort on mammalian species in Enugu and for understanding the impacts of human activities on these mammals.

Overview

Mammalogy is the scientific study of mammals, a class of animals that includes more than 6,000 species ranging from tiny shrews to massive whales. Mammals are characterized by a number of distinctive features, including hair, mammary glands that produce milk for nourishing their young, and three middle ear bones. Mammals also have a wide range of ecological roles, from herbivores that graze on grasses and leaves to carnivores that hunt other animals.

Mammalogists study a wide range of topics related to mammals, including their anatomy, behavior, ecology, evolution, and conservation. They use a variety of methods to study mammals, including field observations, genetic analysis, and laboratory experiments. Mammalogists may work in a range of settings, including universities, museums, zoos, and government agencies. Their research has important implications for understanding and conserving mammal populations and ecosystems, as well as for addressing human health issues related to mammalian disease. First year student of Biology would start with a good knowledge of mammalogy in their first year. As students of Biology mammals are organism we meet daily and knowledge of the animals would form a good background upon which other biology teaching can rest

Objectives

The course will have the following objectives;

1. Classify mammals and explain the basis for classification of mammals and special features.
2. Examine the biology of mammals with an emphasis on dentition and the structures/functions associated with locomotion.

Course Contents

3. Describe the ecology, behavior, and habitat requirements of mammals.
4. Identify the diversity of mammals and learn the characteristics of the orders of mammals of the world and the families of mammals of Africa and Tropics.
5. Explain the skin, skull or dental characteristics, mammal species of Africa and Nigeria in particular.
6. Describe the monogastrics, digastrics among mammal and welfare.
7. Explain the natural history of a selected species and develop scientific writing skills by preparing a species account for species.
8. Explain the conservation of mammals and biodiversities.
9. Describe the physiology and anatomy of mammals, bipedalism in mammals.

Learning Outcomes

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

1. Classify mammals.
2. Identify characteristic features of mammals.
3. Distinguish between the marsupials and other animals.
4. Describe the ecological diversities of mammals.
5. Explain the special features of different groups of mammals.
6. Classify the mammals of Africa and of Nigerian in particular.
7. Identify the mammals of Africa and of Nigerians in particular.

Course Contents

Classification of Mammalia. Detailed understanding of the biology. Detailed understanding of ecology. Diversity of mammals. The Rodentia. The Ungulates. The ruminants. Aquatic mammals. The characteristics and members of the orders of mammals of the world. The families of Mammals of tropics, in Africa and Nigeria. Differences between marsupials and other mammals. Bipedalism and modifications of limbs. Identification of mammals from sign, skins, skulls, and dental characteristics. Mammalian Ecology. Conservation and Management of Mammals. Mammalian Evolution. Mammalian Biogeography.

Minimum Academic Standard

As are present in the 70% CCMAS.

200 Level

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. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know 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;

Course Contents

6. critically assesses 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 and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, and many more.

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. analyse 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; and
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 and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, rRisk 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, nowledge and innovation). Enterprise formation, partnership and networking

Course Contents

(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, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

BIO 201: Genetics I

(2 Units C: LH 30)

Learning Outcomes

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

1. distinguish between heritable and non-heritable characteristics;
2. explain the likelihood of genetic events (probability) and how well those events
3. (results) fit into a set of observation;
4. discuss polygenic variations; and
5. describe concepts in population genetics.

Course Contents

Hereditary and non-hereditary characteristics. Probability and tests of goodness of fit. Quantitative inheritance. variation in genome structure. introduction to population genetics.

BIO 202: Introductory Ecology

(2 Units C: LH 15; PH 45)

Learning Outcomes

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

1. explain various concepts and terminologies associated with the ecosystem;
2. list and explain features of various habitat types;
3. explain natural destruction/disaster, community and natural cycles; and
4. explain and describe factors responsible for changes in population.

Course Contents

Concept and definition of ecosystem. ecology at community level. ecological classification of habitat types. terrestrial and aquatic biomass. specific features of each, biotic components of habitat. Natural destruction. factors of communities, success of community interaction. natural cycle and dynamics of population.

BIO 203: General Physiology

(2 Units C: LH 30)

Learning Outcomes

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

1. explain the chemistry of organic compounds and their biological importance;

Course Contents

2. state the general characteristics of enzymes;
3. describe nutrition, digestion and absorption in plants and animals;
4. discuss the cell membrane structure and list its functions;
5. summarize osmoregulation, excretion and transport in animals
6. enumerate growth hormones in plants and their functions;
7. explain the homeostasis, their coordination and functions in animals; and 8. explain the plant water relation, growth and growth regulation.

Course Contents

Chemicals of life: the chemistry of carbohydrates, lipids, proteins and nucleic acids and their biological importance. General characteristics of enzymes. Nutrition. digestion and absorption in plants and animals. Biosynthesis, photosynthesis and protein synthesis. Cell membrane structure and function.

A general study of osmoregulation, excretion, transport. growth hormones and enzymology. homeostasis and their co-ordination in animals. Plant water relation. growth and growth regulation.

BIO 204: Biological Techniques

(2 Unit C: LH 15; PH 45)

Learning Outcomes

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

1. list the different parts of a light microscope and state their functions;
2. state and explain the stages involved in preparation of slides;
3. describe the basic principles of spectrophotometry, colorimetry, photometry;
4. describe polarimetry, chromatography, refractometry, melting points and colligative properties;
5. describe the basic collection and preservation processes of plant and animal materials and their preservation in herbarium and museum respectively; and
6. explain the need for experimental design, basis of report writing and presentations.

Course Contents

Microscopy. handling of microscopes. preparation of microscope slides (microtomy) for microscopic examinations. use of hand lens. biological drawings and diagrams.

Spectrophotometry. Colorimetry. Photometry. Polarimetry. Chromatography.

Refractometry. melting points and colligative properties. Herbarium and museum techniques. Experimental designs, report writing and presentations.

BIO 205: Introductory Developmental/Cell Biology

(2 Units C: LH 15; PH 45)

Learning Outcomes

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

1. illustrate the detail structure of plant and animal cells and state the functions of the 2. organelles;
3. summarize and state the differences and similarities between mitosis and meiosis;
4. describe cell differentiation and its growth; and

Course Contents

5. explain the molecular basis of cell structure and development.

Course Contents

History and present trends in cell biology. Ultra-structure of the plant and animal cells. organelles and their basic structures and functions. mitosis and meiosis. cell differentiation and growth of cells. A brief study of the molecular basis of cell structure and development.

BIO 206: Hydrobiology

(2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of the lectures in Hydrobiology, students should be able to:

1. discuss the physical properties of water;
2. explain the thermal stratification of lakes;
3. summarize the importance and interplay of oxygen, carbon-dioxide and pH in water,
4. describe fresh water communities;
5. list factors influencing the distribution and productivity of aquatic macrophytes, phytoplanktons, benthic algae and zooplanktons;
6. discuss the importance and adaptive features of Estuarine communities; and
7. explain colonisation and succession in aquatic ecosystem.

Course Contents

Principles of aquatic biology with particular reference to limnology. The physical properties of water and their biological significance. Thermal stratification of lakes. waves and currents and their effects on substratum. dissolved oxygen, carbon-dioxide and inorganic ions in freshwater. the carbonate-bicarbonate system and pH. oligotrophic and Eutrophic lakes. The chemical composition of African lake waters. freshwater communities. factors influencing the distribution and productivity of aquatic macrophytes, phytoplanktons, benthic algae. zooplanktons in freshwater. marine brackish water/estuarine communities and their chemical factors. Colonisation and succession in aquatic ecosystems. adaptations and inter-relationships.

BIO 208: Biostatistics

(2 Units C: LH 30)

Learning Outcomes

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

1. differentiate between continuous and discontinuous data;
2. explain sampling procedures in biology;
3. summarize and present biological data;
4. describe measures of central tendency and probability theory; and
5. conduct ANOVA, Chi-square, t-tests and F-tests and state their importance.

Course Contents

Course Contents

Variability in biological data: continuous and discontinuous variables. statistical sampling procedures. observations and problems of estimation. representation and summarization of biological data. frequency distribution. measures of central tendency and dispersion. Probability theory. normal, binomial and Poisson distribution. t-test, f-test and chi-square test. analysis of variance (ANOVA) and covariance. principles of experimental design. correlation, linear and curvilinear regression and transformation.

GOU-BIO 222: Tropical Animals Biotechnology (2 Units; Elective; LH = 15; PH = 45)

Senate approved relevance

Tropical Animals Biotechnology provides a broad perspective on the relationship between animals, microorganisms, and human societies, and can help microbiologists to understand the ecological and economic factors that influence the distribution and transmission of microorganisms. This is in harmony with the vision of Godfrey Okoye University to be a center of academic excellence by means of utilizing the available resources in the environment for teaching, research, community service and sustainable economic development.

Overview

Tropical Animals Biotechnology aids a microbiologist in understanding the relationship between animals and microorganisms in various ecological and economic systems. Tropical Animals Biotechnology is concerned with the study of animals and their relationship with humans, including their role in agriculture, food production, disease transmission, and the environment. In the context of microbiology, Tropical Animals Biotechnology can help microbiologists to understand the impact of animals on the transmission and spread of microbial diseases. For example, many zoonotic diseases, such as avian influenza and Lyme disease are transmitted from animals to humans through microorganisms.

By studying the ecology of animal populations and their interactions with microorganisms, microbiologists can gain insights into the emergence and spread of infectious diseases. Tropical Animals Biotechnology can also provide insights into the use of animals in biotechnology and the production of microbial products. For example, certain animals, such as insects and marine organisms, are sources of unique and valuable microorganisms that have potential applications in biotechnology, including drug discovery and industrial production.

Objectives

The course will have the following objectives, to:

1. Outline the ecological and epidemiological factors that contribute to the emergence and spread of zoonotic diseases.
2. Identify strategies for their control and prevention.
3. Characterize and discuss microorganisms that have potential applications in biotechnology, medicine, and other fields
4. Develop methods for their isolation, cultivation, and production.
5. Explain the impact of animal husbandry practices on microbial ecosystems
6. Analyze the economic and social costs and benefits of animal-microbe interactions in different contexts, including agriculture, food production, and disease control.
7. Discuss policies and management strategies that promote sustainable and equitable outcomes

Learning outcomes

Course Contents

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

1. Discuss the ecological and epidemiological factors that contribute to the emergence and spread of zoonotic diseases, and the role of animals in their transmission.
2. Identify and characterize microorganisms that have potential applications in biotechnology, medicine, and other fields
3. Explain the methods for their isolation, cultivation, and production.
4. Analyze the effects of animal husbandry practices on the composition and activity of microbial communities associated with animals.
5. Evaluate the potential of sustainable and environmentally friendly approaches to animal production.
6. Evaluate the economic and social costs and benefits of animal-microbe interactions in different contexts, including agriculture, food production, and disease control.
7. Analyze strategies for promoting sustainable and equitable outcomes

Course outline

Introduction to tropical animal biotechnology. Principles and applications of genetic engineering in tropical animal research. Applications of zoological knowledge for benefits of mankind. Culturing of animals for mass production for human use. Control or eradication of animals that are injurious to man directly or indirectly, aquaculture techniques. Molecular biology techniques used in tropical animal research. Regulation of gene expression in tropical animals. Functional genomics techniques to study the roles of genes and proteins in tropical animal physiology and behavior. Principles and applications of proteomics in tropical animal research. Principles and applications of metabolomics in tropical animal research. Introductory bioinformatics tools and databases to analyze and interpret large-scale genomic and proteomic data sets. Bioremediation and its application in the management of environmental pollutants in tropical animal habitats. Principles and applications of biopharmaceuticals in tropical animal research. Applications of nanobiotechnology in tropical animal research. Use of biotechnology in the conservation of endangered tropical animal species. Ethical and regulatory considerations in biotechnology research involving tropical animals, including the responsible use of animals in research and the regulation of genetically modified organisms

Minimum Academic Standards requirements and equipment

As are present in the 70% CCMAS.

Course Contents

GOU-BIO 223: Bioremediation of Polluted Aquatic Ecosystems (2Units; Compulsory; LH = 15; PH = 45)

Senate-Approved Relevance

This course is designed to produce graduates that are knowledgeable and highly skilled in environmental pollution and bioremediation. The pollutants in the ecosystem are usually cleaned but the environment remains unproductive. There are many cleaning programs that have been carried out in Niger delta regions. The same will be replicated in Enugu. This is in agreement with the visions of Godfrey Okoye University to be a center of academic excellence by utilizing the available resources in the environment for teaching, research, community service and sustainable economic development. The relevance of environmental pollution and bioremediation is crucial for protecting the environment, preserving biodiversity, and ensuring human health and well-being.

Overview

Aquatic health of the water ecosystem determines its productivity. The aquatic health is altered by pollutants and must be restored. Restoration is not done by use of chemicals as the oil companies are fond of pumping into the aquatic ecosystem like the surfactants. Water is subject to serious perturbation especially the fresh water aquatic ecosystems. Use of appropriate bacteria and input of specific carbon source as energy input encourages proliferation of extant bacteria that degrade and remove the toxicants in aquatic ecosystems.

Aquatic health can be restored and fish thrive again and food chain will be restored. Anthropogenic activities ends up in the fresh water and man and animal s including fishes depend upon the same fresh water. This course is designed to equip students to understand the dynamics of biological and chemical oxygen demand and the implications.

Objectives

The objectives of the course are to:

1. Explain the complexities of pollutants in aquatic ecosystem and how to handle cases.
2. Identify bacteria and use them in the restoration of polluted aquatic ecosystems.
3. Explain the use of biostimulation and bioaugmentation in aquatic ecosystem.
4. Identify the different types of bacteria used in the control of pollution in aquatic ecosystem.
5. Identify the effects of different substrates on the water chemistry and water dynamics
6. Explain the deleterious effects of acid rain on aquatic organism and the aquatic ecosystem in general
7. Demonstrate the effectiveness of biological treatment as against chemical treatment in pollution control and restoration of aquatic health.

Learning Outcomes

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

Course Contents

- a. Identify different types bacteria used in pollution control and restoration of chemical damaged sites
- b. Differentiate types of treatments like bioaugmentation, biostimulation and bio remediation in the aquatic ecosystem.
- c. Classify point source and diffuse pollution.
- d. Differentiate the effects of acid rain from that of sooth rain in the aquatic ecosystem.
- e. Identify polluted and restored aquatic ecosystem from polluted and cleaned but not restored aquatic ecosystem.
- f. Classify the different types of aquatic ecosystem based on pollution types and pollutants.
- g. Explain how deleterious acid rain is on the productivity of aquatic ecosystem and on the culture of fish.
- h. Explain Effects of water chemistry on productivity of inland water, why some fishes are found in some water and not in other water.

Course Contents

Biological oxygen demand and effects on the water productivity. Lentic water oxygenation. Lotic water oxygenation. Effects on water productivity. Chemical oxygen demand in aquatic ecosystems. Stress factors in aquatic ecosystems. Effects of toxicants on macro and micro invertebrates. Bioremediation and methods. Acid rain and effects on aquatic ecosystem. Sooth rain synergy with acid rain. Effects on gastropods and ostracods shell formation. Aquatic microbiology. Use of Bukholderia and other bacteria in pollution control. Pollutants in aquatic ecosystem. Nutrient pollution (contamination from any source). Types of nutrient. Effects of sediments and substrate on nutrients. Monitoring of nitrates and phosphorus. Algal bloom.

Minimum Academic Standards requirements and equipment

As are contained in the 70% CCMAS.

GOU-BIO 244: Environmental Impact Assessment (2 Units; Compulsory; LH = 30; PH = 0)

Senate-Approved Relevance

In agreement with Godfrey Okoye University's mission to produce graduates that are not only employers of labour but also consultants to many business organizations., the course Environmental Impact Assessment is designed to produce graduates that are knowledgeable and highly skilled in environmental impact assessment of ecosystems. There is rampant construction of roads, bridges, culverts and dams. Most of the time little consideration is given to the welfare of the animal in the ecosystem. If a feasibility report was carried out before the road construction, proper care would be taken and the welfare of animal like fishes that use the construction area for breeding and nesting ground would be considered.

Overview

Environmental Impact Assessment (EIA) is a study that evaluates the potential environmental impacts of proposed development projects, policies, or plans. It is a process that involves

Course Contents

identifying, predicting, and evaluating the potential impacts of a project or plan on the environment, and providing recommendations to mitigate these impacts. Students of biology will learn about the different biological components that make up an ecosystem and how they are interconnected. EIA provides a framework for assessing how development projects may affect these components and their interactions, allowing application of the knowledge of biology to real-world scenarios.

The EIA process typically involves several steps, including scoping, baseline studies, impact analysis, mitigation, and monitoring. These steps allow the EIA team to identify potential impacts of a proposed project, evaluate their significance, and propose measures to minimize or avoid them. Students may be involved in impact analysis, where they assess how the project may affect various biological components of the ecosystem, such as species, habitats, or ecosystem functions. Through EIA, students can use their understanding of biology to help identify potential environmental risks and recommend measures to protect the environment.

Objectives

The objectives of the course includes;

1. Identify potential environmental impacts.
2. Evaluate potential environmental impacts that may result from a proposed development project, policy, or plan.
3. Explain decisions about proposed projects, taking into account potential environmental impacts.
4. Identify ways to avoid or minimize environmental impacts.
5. Explain to stakeholders, including local communities, in the decision-making process by providing opportunities for public participation and feedback.
6. Outline alternative options to a proposed project.
7. Outline measures to enhance positive impacts and minimize negative ones.
8. Evaluate the effectiveness of mitigation measures.

Learning outcome

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

1. Identify the potential environmental impacts of a proposed project or development.
2. Assess the impact on air, water, soil, biodiversity, and other environmental factors.
3. Evaluate the significance of identified environmental impacts.
4. Identify alternative options, reducing or eliminating impacts, and implementing measures to compensate for unavoidable impacts.
5. Identify concerns and issues raised by stakeholders and incorporating their feedback into the decision-making process.
6. Explain the potential environmental impacts of a project or development.
7. Outline necessary information to make informed decisions about whether to approve, modify or reject a proposed project or development.
8. Assess adaptive management by monitoring and evaluating the effectiveness of mitigation measures and adjusting them as needed.

Course Contents

Introduction to EIA. Practices of EIA in Nigeria. Laws and regulation and decrees. Relevance of EIA. EIA impacts on target organisms in aquatic ecosystem. Water policy management.

Course Contents

Nigeria water policy. Steps to carry out EIA. EIA statement and interpretation. Guidelines to EIA. Key notes and interpretation of EIA statement. Role of EIA in dredging. Oil rig establishments. Dam constructions. EIA statements. Current EIA legislation in Nigeria. EIA legislation in developed countries.

Minimum Academic Standards

As are contained in the CCMAS.

Course Contents

GOU-BIO 256: Fresh Water Ecology (2 Units; Compulsory; LH = 15; PH = 45)

Senate-Approved Relevance

The course provides a theoretical understanding and practical implications of the ecology and restoration of freshwater habitats. This is in line with the vision and mission of Godfrey Okoye University whose three-armed dialogues – cultural, religious and epistemic – are aimed at the wellbeing of human beings and the environment. The university is committed to effectively harness the available resources in the environment for teaching, research, community service, and sustainable economic development.

Overview

The course provides theoretical understanding and practical implications of the ecology and restoration of freshwater habitats. It distinguishes habitats of lakes, wetlands, streams and rivers by varying circulation types, nutrient cycles and food webs. To do this, the university will leverage on the natural lakes in its main campus.

Complementary practicals will be conducted in order to provide skills for the identification of algae, zooplankton and water plants as well as for monitoring, assessment and management of drinking water reservoirs, urban and floodplain wetlands, and rivers.

Objectives

The learning goals in this course are to:

1. Describe the physical, chemical, biological, geographical and geological factors of inland waters and how these affect the distribution of organisms.
2. Demonstrate proficiency in limnological field techniques.
3. Identify aquatic organisms and knowledge of their relationships.
4. Describe water resource issues on local, regional and global levels.
5. Describe the structures and functioning of freshwater systems under changing environmental and climate conditions.
6. Analyze aquatic communities and water quality to implement informed management and restoration of freshwater systems.
7. Assess and model the water quality, aquatic biodiversity and ecosystem integrity.

Learning outcomes

1. Describe structures and functioning of freshwater systems under changing environmental and climate conditions.
2. Describe habitat requirements of aquatic communities and water quality to implement informed management and restoration of freshwater systems.
3. Monitor, assess and model water quality, aquatic biodiversity and ecosystem integrity.
4. Conceptualize, document and report research questions, data and findings, taking international research in this field into account.
5. Work in a team environment.

Course Contents

Course contents

The importance of freshwater ecosystems. Geomorphology, hydrology & structure of freshwater ecosystems. Diversity of life in freshwater. Aquatic food webs and trophic cascades. Factors affecting primary productivity in different freshwater habitats. Description of lakes and ponds. Temperature Cycles & Lake Stratification Nutrient sources. Habitat differentiation and ecological niches. Physical and chemical characteristics of freshwater. Fresh water ecosystem. Lake Ecosystem, Stream ecosystem, River ecosystem. Lentic and lotic. Water Difference between lentic and lotic. Water shed. Introduction to Freshwater Macroinvertebrates, Population/Community Ecology. Watersheds and Physical/Chemical properties of Freshwater. Pathogenic organisms in fresh water. Importance of water.

Minimum Academic Standards

As are contained in the CCMAS.

300 Level

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 organisations, 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 and geo-political conflicts. Structural conflict theory, realist theory of conflict and frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers' phenomenon, boundaries/boarder 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 and many more. peace building, management of conflicts and security, peace & human development. Approaches to peace & conflict management: (religious, government, community leaders and many more.). Elements of peace studies and conflict resolution, conflict dynamics assessment scales: constructive & destructive. Justice and legal framework and concepts of social justice. The Nigeria legal system. Insurgency and terrorism. Peace Mediation and Peace Keeping.

Peace and security council (international, national and local levels). Agents of conflict resolution: conventions, treaties, community policing, evolution and imperatives.

Alternative dispute resolution (ADR): a). dialogue b). arbitration c). negotiation d).

collaboration and many more Roles of international organizations in conflict resolution:

Course Contents

(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/Crises: refugees. internally displaced persons (IDPs). The role of NGOs in post-conflict situations/Crises.

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 3. location;
4. state how original products, ideas and concepts are developed;
5. develop business concept for further incubation or pitching for funding;
6. identify key sources of entrepreneurial finance;
7. implement the requirements for establishing and managing micro and small enterprises;
8. conduct entrepreneurial marketing and e-commerce;
9. apply a wide variety of emerging technological solutions to entrepreneurship; and
10. 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 and market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organisations 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, ecommerce business models and successful e-commerce companies,). Small business management/family business, leadership & management, basic bookkeeping, 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 and 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 (IoTs), Blockchain, Cloud Computing, Renewable Energy and many more Digital Business and ECommerce Strategies).

BIO 301: Genetics II

(2 Units C: LH 30; PH 45)

Learning Outcomes

Course Contents

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

1. summarize various aspects of human genetics and pedigree analysis;
2. discuss various aspects of gene interactions, biochemical mutants;
3. describe the types and functions of nucleic acids and nucleotides;
4. explain DNA replication and mutation;
5. discuss proteins and regulation of gene expression; and
6. describe the importance and processes involved in DNA technology and how it influences genetic engineering.

Course Contents

Aspects of human genetics and pedigree analysis. Further consideration of various deviations from basic principles. Gene interactions including biochemical mutants. nucleic acids and nucleotides. DNA replication. mutation of DNA. proteins and regulation of gene expression. DNA technology and genetic engineering.

BIO 302: Population Biology and Evolution

(2 Units C: LH 30)

Learning Outcomes

At the end of the lectures in Population genetic, students should be able to:

1. explain the concept of natural selection;
2. summarize evolution of some organisms;
3. discuss how organisms adapt to their environment;
4. apply mathematical formulae and models to genetic variations and predictions in population; and
5. describe factors responsible for population changes.

Course Contents

Biological properties of species. natural selection. variations, isolation mechanisms (including their breakdown resulting in hybridization, adaptation, origin of life, origin of species and adaptive radiation, evolution of selected groups of plants and animals, including humans). Population dynamics. factors affecting population growth.

BIO 303: Biogeography and Soil Biology

(2 Units C: LH 30)

Learning Outcomes

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

1. explain the theories related to Gondwanaland, continental drift and land bridges;
2. outline the world key flora and fauna groups and reasons for their distribution;
3. explain succession, colonisation and dispersal of plants and animals;
4. describe the concept of endemism, refugia and Island biogeography;
5. discuss physical and chemical nature of soil;
6. summarise the cycling of minerals and nutrients;
7. explain soil and animal soil water relationship; and
8. outline the causes of soil erosion and alleviation methods.

Course Contents

Course Contents

Gondwanaland and theory of continental drift. theory of land bridges. distribution of world key floral and faunal groups including factors affecting distribution. phyto- and zoogeographical regions of the world. Relationships between plants and animal distributions (emphasising local examples). Concept of succession, colonisation and dispersal in terrestrial plants and animals. Concept of endemism and refugia. Island biogeography.

Physical and chemical nature of soil. Detritus organisms. Cycling of minerals and nutrient pools. Plant and animal soil water relationship. soil sampling techniques. Causes of soil erosion and alleviation methods/techniques.

BIO 304: Nigerian Fauna and Flora

(2 Units C: LH 30)

Learning Outcomes

At the end of the lectures in Nigerian Fauna and Flora, students should be able to:

1. identify Nigerian plants and animals, and associate them with habitats;
2. confirm identified plants and animals with Herbarium and Museum specimens respectively;
3. describe the life histories strategies of selected plants and animals; and
4. discuss the prospects, problems and problem alleviation strategies of protected areas in Nigeria.

Course Contents

Field identification of Nigerian plants and animals. plant and animal indicators of Nigerian biomes (i.e. association of habitats with specific plants and animals). Identification of plants through preserved herbarium specimens and keys. identification of animals through signs left by them e.g. footprints, trails, scats, runways. museum specimens. life history strategies of selected Nigerian plants and animals. Nigerian protected area system, their prospects, problems and problem alleviation strategies.

BIO 306: Systemic Biology

(2 Units C: LH 15; PH 45)

Learning Outcomes

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

1. describe the re-Linnaean, Linnaean and Darwinian taxonomic concepts of species;
2. explain the binomial system of nomenclature;
3. classify organisms based on the binomial system of nomenclature; and
4. explain the concept of keys and keying and their applications.

Course Contents

Historical background, pre-Linnaean, Linnaean and Darwinian taxonomic hierarchies. species concept, categories below species and categories above species. biological nomenclature, new systematics; numerical and binomial taxonomy. keys and keying.

BIO 307: Field Course I

(1 Units C: PH 45)

Learning Outcomes

Course Contents

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

1. conduct basic field sampling techniques in terrestrial, aquatic and aerial environment;
2. collect plant and animal materials for identification, classification and preservation in the Herbarium and Museum respectively; and
3. explain the importance of the institutes and industries visited to Biology.

Course Contents

Sampling techniques in local habitats (i.e., not more than 20 km radius of the university). Also involve visits to research institutes, industries and many more. This should cover several areas of specialisation in Biology. Assessment by examination (objectives, short answer questions, fill in the gaps) in addition to group report.

BIO 300: SIWES

(3 Units C: PH 135)

Learning Outcomes

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

1. describe their place of industrial attachment;
2. know the industrial processes and production;
3. provide technical knowledge and principle of major tools equipment used; and
4. be able to relate their industrial experiences to the study of Biology.

Course Contents

Industrial field experience in any one of the following:

Aquatic Pollution (3CU). Pest Control (3CU). Public Health (3CU). Zoological gardens. Wildlife parks. Fish farms. Integrated farms. Biotechnology centres. Abattoirs. Sewage treatment plants. Laboratories.

GOU-MCB 301: Coal Microbiology and Biotechnology (3 Units; Compulsory; LH = 15; PH = 45)

Senate-Approved Relevance

Coal biotechnology can be relevant to students by providing opportunities for career development, research, and innovation, while also contributing to environmental sustainability and energy security. The course aims to produce competent and knowledgeable graduates who can effectively explore the potential of biotechnology to reduce the environmental impact of coal utilization and contribute to a more sustainable energy future. This also includes transformation of coal into different viable products. The ultimate goal is in line with Godfrey Okoye University's vision to become a center of academic excellence by effectively harnessing the available resources in the environment for teaching, research, community service, and sustainable economic development. This is particularly crucial in Enugu State, which is home to the largest coal mine in Nigeria.

Overview

Course Contents

Coal is an indigenous resource in Enugu State, located in southeastern Nigeria. It is a fossil fuel that was formed millions of years ago from the remains of plants that lived and died in the area. Enugu State is home to the largest coal mine in Nigeria, which is located in the town of Enugu. The coal reserves in Enugu State have played a significant role in the development of the state's economy. The mining and utilization of coal have provided employment opportunities, stimulated the growth of other industries, and been used for electricity generation and other domestic purposes, such as cooking and heating, as well as for industrial and energy production purposes.

In recent years, the country has shifted its focus to other sources of energy such as natural gas, solar, and wind energy. The coal industry in Enugu State has also faced some challenges, including environmental degradation, health hazards for miners, and the decline in the demand for coal. Despite these challenges, Enugu State's coal reserves still holds significant potential for the state's economic development. This course investigates the benefits and negative impacts of coal utilization and explore cleaner coal technologies and alternative uses of the resource that are more sustainable and environmentally friendly.

Objectives

The objectives of the course are to:

1. Describe the structure of coal, its physical and chemical properties, composition and reactivity
2. Explain the various characteristics of microorganisms present in coal and how they interact with their environment and other bacteria and fungi in the environment, as well as their individual and joint application in conversion of coal into useful products.
3. Evaluate the environmental impact assessment (EIA) of coal conversion processes on air and water quality, soil health, and the release of greenhouse gases.
4. Describe and demonstrate the biotechnological skills, knowledge, process conditions and potential applications of coal biotechnology which includes the production of biochemicals, bioplastics biofuel and selection of Plant growth-promoting bacteria (PGPB) which are used as biofertilizers).
5. Describe the various techniques (bioconversion, bioleaching, and bioprocessing) for converting coal into useful products.
6. Name and list the challenges associated with the commercialization of coal biotechnology products.

Learning outcomes

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

1. Describe the structure of coal and its properties.
2. Explain the metabolism, growth, reproduction, and other characteristics of microorganisms.
3. Discuss the environmental implications of coal biotechnology.
4. Demonstrate biotechnological skills and knowledge on the process conditions and potential applications of coal biotechnology.
6. Describe the various techniques for converting coal into useful products.
7. Itemize the challenges associated with the commercialization of coal biotechnology products.

Course contents

Overview of coal biotechnology. History of coal utilization. Importance of coal in the energy industry. Types of microorganisms found in coal. Characterization of microbial communities

Course Contents

in coal. Microbial metabolism in coal environments. Microbial interactions in coal ecosystems. Bioconversion of Coal to Fuels and Chemicals. Microbial production of chemicals from coal. Challenges and opportunities in coal bioconversion. Overview of coal contamination. Microbial remediation of coal-contaminated Air, water and soil (pollution). Phytoremediation of coal-contaminated sites. Integrated approaches for bioremediation of coal-contaminated sites. Biotechnology for Coal Mining and Processing. Environmental Impact Assessment (EIA). Microbial groups in surface and subsurface coal environments; coal mine areas, drainages, spoil heaps, and coal beds. Techniques for estimation of microbial populations in water, air and soil. Case Studies in Coal Biotechnology (Biotechnology for coal mining and processing). Current research trends in coal biotechnology, Potential future developments in coal biotechnology.

Minimum Academic Standards requirements and equipment

As are contained in the 70% CCMAS.

GOU-BIO 308: Agro Waste and Industrial Pollution Management (2 Units; Compulsory; LH = 15; PH = 45)

Senate-Approved Relevance

Agro Waste and Industrial Pollution Management are highly relevant in biology as they play a critical role in preserving and maintaining the health of ecosystems and the biodiversity of the planet. This is particularly important in Enugu state. In accordance with Godfrey Okoye University's commitment to utilize the available resources in the environment for teaching, research, community service and sustainable economic development. The excessive accumulation of agro waste and industrial pollution can lead to environmental degradation and pose serious health risks to living organisms, including humans.

Overview

There are different types of water bodies. The water bodies face different types of pollutants. These pollutants must be managed. For instance, in major towns, people farm vegetables along the water ways. Farmers use fertilizers in large quantities and these end up in water. Farmers use herbicides and pesticides and these end up in water and must be managed. In abattoir they use burnt tire in cleaning animal hairs, Waste from tires enter the water and get it polluted.

Therefore, the management of agro waste and industrial pollution has impact on the production of food and other natural resources. This course explains why and how proper disposal of agro waste and pollution can help in preventing soil degradation, water pollution, and other forms of environmental damage that can negatively affect the growth and productivity of crops and other natural resources. Therefore, effective management of agro waste and industrial pollution is essential for maintaining the balance and sustainability of our ecosystems, and ensuring the continued health and well-being of all living organisms on earth.

Objectives

The objectives of the course are to:

1. Outline the amount of agro waste generated in other to promote sustainable agricultural practices by minimizing the environmental impact.

Course Contents

2. List effective strategies for the management of industrial waste to reduce pollution and minimize negative effects on the environment.
3. Explain eco-friendly technologies and practices in industries to reduce the generation of harmful pollutants and waste.
4. List effective waste management systems for the safe disposal and treatment of agro waste and industrial waste.
5. Assess the impact of agro waste and industrial pollution on ecosystems, human health, and biodiversity.
6. Develop and implement policies and regulations that encourage sustainable waste management practices in agriculture and industry.
7. Explain to stakeholders the importance of agro waste and industrial pollution management for environmental sustainability and human health.

Learning outcomes

After learning students are expected to:

1. Identify pollutants from point source.
2. Differentiate detect point source from diffuse pollutants.
3. Describe integrated farming system.
4. Assess the environmental impacts of agro waste and industrial pollution.
5. Evaluate sustainable solutions for agro waste and industrial pollution management.
6. Analyze the role of government policies and regulations in agro waste and industrial pollution management.
8. Outline the principles of waste treatment and pollution control technologies.

Course content

Introduction to Agro Waste and Industrial Pollution Management. Definition and sources of agro waste and industrial pollution. Environmental and health impacts of agro waste and industrial pollution. Need for agro waste and industrial pollution management. Agro Waste Management. Types of agro waste. Generation and disposal of agro waste. Techniques for agro waste management. Composting. Vermicomposting. Anaerobic digestion. Biochar production. Case studies on successful agro waste management practices. Industrial Pollution Management a. Types of industrial pollution-air, water, and soil pollution. Sources of industrial pollution. Manufacturing processes. Transportation. Waste disposal. Techniques for industrial pollution management. Pollution prevention. Waste minimization. Treatment and disposal. Case studies on successful industrial pollution management practices. Advantages and challenges of integrated waste management. Strategies for implementing integrated waste management. Case studies on successful integrated waste management practices. Policy and Regulations for Agro Waste and Industrial Pollution Management.

Minimum Academic Standards requirements and equipment

As are contained in the 70% CCMAS.

Course Contents

GOU-BIO 315: Basic Techniques in Microbial Cell Culture Systems & Kinetics (2 Units; Compulsory; LH = 15; PH = 45)

Senate approved relevance

Training of highly qualified biotechnologists who are adequately skilled and knowledgeable in microbial culture is in line with the mission and vision of Godfrey Okoye University. The university has found this course relevant because the knowledge gained will be useful in diagnosing infection, genetic manipulation, and epidemiological study, development of vaccines and therapeutics, food and beverage production as well as detecting food contaminants. This will help to enhance the understanding of the microbial physiology, their interaction with other living organisms as well as their application for human use.

Overview

Cell culture is a technique that involves the isolation and maintenance in vitro of cells isolated from tissues or whole organs derived from animals, microbes or plants. In general, animal cells have more complex nutritional requirements and usually need more stringent conditions for growth and maintenance unlike in microorganisms.

The course will expose the methodologies which mostly involve techniques for culturing, identification, isolation, staining, and engineering these tiny organisms.

Objectives

The objective of this course is to students should be able to:

1. List the techniques for culturing microorganisms.
2. Identifying microorganisms through various techniques.
3. Describe techniques involved in microbial cell isolation and staining
4. Explain the techniques engineering these microbial cells.
5. Explain aseptic technique in the field of microbes.
6. Identify contaminated cultures from undesirable microbes in the laboratory.
7. Describe subculture (transfer cultures from one media by inoculating into another media)
8. Investigate the biology, biochemistry, physiology (e.g., aging) and metabolism of wild-type cells and diseased cells.

Learning outcomes

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

1. List and explain microbial cell culture concepts and their application in diverse areas such as medical, industrial, environment, genetics, agriculture, food and others.
2. Outline basic practical skills/competencies in working with cell cultures.
3. Identify use in the laboratory as well as outside, including the use of good microbiological practices.
4. Experiment model systems in basic and medical sciences.

Course Contents

5. Explain the physiological requirements for certain microbial cell types.
6. Describe microbial cell development and differentiation.

Course Content

Microorganisms as biological agents in Biotechnology. Screening and selection of microorganisms. Media formation, carbon, and nitrogen sources, mineral salts and vitamins. Cell growth. Measurement of cell growth factors affecting cell growth (temperature, dissolved oxygen concentration, pH, nutrients etc). Culture preservation. Unit operations in cell cultivation. Media preparation and sterilization. Sterilization of culture vessels. Cell inoculation. Stock and seed cultures, main cultures and control of culture parameters. (Temperature, dissolved oxygen DO, foaming, pH etc). Cell cultivation systems. Batch cultivation of microorganisms. Growth phases, growth kinetics, Monod equation. Estimation of kinetic parameters. Mathematical models for cell growth. Substrate utilization and product formation in batch cultures. Growth inhibition kinetics. Fed-batch, continuous (chemostat and turbidostat), and cell recycling cultivation systems. Cell immobilization. Co-immobilized cells. Mixed cultures and mixed substrate metabolism. Membrane reactors.

Minimum Academic Standard

As is in line with 70% CCMAS.

GOU-BIO 328: Introductory Immunology (2 Units; Elective; LH = 15; PH = 45)

Senate approved relevance

Immunology is highly a relevant to biology majors because it is a fundamental part of understanding how organisms defend themselves against pathogens and diseases. As such, it is crucial knowledge for anyone interested in studying the biology of infectious diseases, microbiology, medical research, or biotechnology. In accordance with its mission, Godfrey Okoye University encourages the utilization of available resources in the environment for teaching, research, community service and sustainable economic development. The study of Immunology will produce a strong graduate through giving students a foundation in immunological disorders, autoimmune diseases, and the development of vaccines and other therapeutic treatments.

Overview

Basic immunology is the study of the immune system, which is the body's defense mechanism against harmful pathogens such as viruses, bacteria, and parasites. The immune system is composed of various cells, tissues, and organs that work together to recognize and eliminate foreign invaders. Basic immunology covers topics such as the different types of immune cells

Course Contents

and their functions, the mechanisms of immune responses, and the processes involved in the development of immunity.

The course includes the fundamental concepts in basic immunology, which focuses on the distinction between the innate and adaptive immune systems. The innate immune system provides a rapid, non-specific response to infections, while the adaptive immune system is slower but more specific and can generate long-lasting immunity. Understanding the basic mechanisms of immune responses is essential for the development of effective treatments for infectious diseases and autoimmune disorders.

Objectives

The course will meet the following objectives, to:

1. Explain the basic concept of immunology.
2. Discuss the key component of innate and adaptive immune response.
3. Explain the concepts of antigen and antibody.
4. Explain the immune response mechanism in parasitic infection.
5. List the most significant discoveries and theories through the historical progress of vaccine development and their impact in medicine.

Learning Outcomes

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

1. Define the concept of immunology.
2. Discuss the key component of innate and adaptive immune response.
3. Discuss the concepts of antigen and antibody
4. Discuss the immune response mechanism in parasitic infection
5. Discuss the most significant discoveries and theories through the historical progress of vaccine development and their impact in medicine.

Course Contents

Introduction to Immunology. Historical perspectives. Basic principles. Key terminologies. Innate Immunity. Overview of the innate immune system, including phagocytes, complement, and natural killer cells. Adaptive Immunity. Overview of the adaptive immune system, including B and T cells, antigen presentation, and cytokines. Antibodies. Structure and function of antibodies. Complement System. Antibody diversity, and antibody-mediated effector functions. T Cell Immunity. Activation, differentiation, and function of CD4+ and CD8+ T cells. Helper and cytotoxic T Cells. Major Histocompatibility Complex (MHC). Immunological Memory. Immune Responses to Pathogens. Autoimmunity. Immune Deficiencies. Immunotherapy. Hypersensitivity. Immunological anomalies. Diagnostic immunology, Vaccines, effector systems of parasite killing and nature of resistance in plants. Applications of immunology in biotechnology.

Minimum Academic Standard

As is in line with 70% CCMAS.

Course Contents

GOU-BIO 355 Oceanography (3 Units; Compulsory; LH = 30; PH = 45)

Senate approved relevance

This course is relevant to the vision and aspiration of Godfrey Okoye University. Through it, students will be able to understand Ocean dynamics and principles and applications. This is in tandem with the vision of Godfrey Okoye University to give biology graduates a broad and in-depth knowledge in the field of oceanography.

Overview

Oceanography also known as Oceanology studies the entirety of the ocean and their interactions. It is designed to provide a comprehensive introduction to all branches of Oceanography, which are Physical Oceanography, Biological Oceanography, chemical Oceanography and Geological Oceanography.

While introducing the basic principles, the course also aims to provide a solid foundation for marine aspects of advanced courses in environmental sciences, geography, sedimentology, marine geology, ecology and meteorology.

Objectives

The objectives of the course are to:

1. Explain the dynamics of ocean currents and sources.
2. Describe different life forms in the ocean.
3. Define the economic exclusive zones and contingency zone of the country.
4. Explain the biogeochemical cycles of the ocean.
5. Explain reasons for saltiness of the ocean and the sustaining factors.
6. List the biodiversity of the ocean.
7. Identify tidal timetable used in marine companies and oil companies.
8. Assess the wealth of the sea and continental shelf and coral reef.
9. Describe how changes in the ocean control the climate of the earth.

Learning outcomes

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

1. Explain ocean currents, both wind-driven surface currents and deep ocean currents.

Course Contents

2. Describe how the oceans play an important part transporting heat from low to high latitudes to maintain a balance in the global heat budget.
3. Differentiate life forms found in the oceans.
4. Outline the issues relating to biological productivity and biological diversity.
5. Explain adaptation of life forms.
6. Differentiate between various marine ecosystems.
7. Describe the water chemistry of oceans.
8. List the properties of water, the chemical make-up of salt, the distribution of dissolved gases and nutrients in the ocean.
9. Explain how ocean function and can be able to predicts events at the sea by tidal time table.
10. Explain ocean self-regulating system and its maintenance of earth's hospitable climate.

Course content:

Introduction to oceanography. Branches of oceanography. History of oceans. Ocean basins. Types of ocean basins. Hypsometric curve. Ocean basin profiles. Earth's crust. Isostasy. Sedimentation. Sources and smoothing of sedimentation. Convection. Conduction. Lithospheric plates. The global ocean-atmosphere heat budget. Solar heating. Surface radiation. Evaporation and precipitation. Winds and transporting heat and water vapour in the atmosphere. Effect of continents. Latitudinal imbalance. Ocean circulation. Wind-driven circulation. Thermo-haline circulation. Wind stress. Buoyancy. Temperature. Salinity. Coriolis force and friction. Transporting heat and salinity. Turbulence and diffusive mixing. Water masses. Boundary layers. Profiles for temperature, salinity, density, light and oxygen concentration. Waves and Tides. Interaction with the coast. Tide-generating forces. Introduction to marine Biology. Introduction to the different habitats of the ocean and their inhabitants. Classification of marine life. Primary productivity. Marine ecology. Generalities on phytoplankton. Phytoplankton Distribution patterns of marine primary productivity. Physical controls on the distribution of phytoplankton. Distribution patterns of zooplankton, seasonal change and migration of copepods and euphausiids. Recycling and energy flow in marine ecosystems. Food chains in the open ocean. Continental shelves and upwelling regions. Sediments. General principles, processes and products of modern marine sedimentation. Ocean circulation and sea water composition. Biogenic Sediments. Estuaries. Estuarine environment, their formation, water circulation and various biogeochemical processes unique to estuaries.

Minimum academic standard

As are present in the 70% CCMAS.

400 Level

BIO 400: Research Orientation and Project

(6 Units C: PH 270)

Learning Outcomes

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

1. appreciate the fundamentals of research and its application to the society;
2. acquire technical and procedural skills related to the project;

Course Contents

3. maintain accurate and comprehensive record of methods observation and data;
4. acquire ability to generate, analyse and interpret data;
5. write a coherent and logical scientific report;
6. acquire ability to communicate with appropriate content, structure and visual aids using power points; and
7. respond professionally and scientifically to any question on the project.

Course Contents

Each final year student is required to carry out an original research project under the supervision of an academic staff member. The findings of the research are presented by the student at a departmental seminar. A project report is prepared, bound and submitted by the student for evaluation by the department and is defended in a viva voce before an external examiner.

BIO 402: Principles of Plant and Animal Breeding

(2 Units C: LH 30)

Learning Outcomes

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

1. explain principles of plant and animal breeding;
2. enumerate the importance of heterosis, sterility and inbreeding consequences;
3. state management strategies for pests and diseases;
4. possess ability to conduct breeding exercises in plants and animals;
5. develop appropriate management practices required for plant and animal breeding; and
6. keep adequate farm records.

Course Contents

Importance of plant and animal breeding with examples. Cytogenetic principles of breeding. Heterosis. inbreeding consequences. incompatibility mechanisms. Sterility. breeding methods. disease and pest resistance and their management. major domestic plants and animals' breeding practices and desired traits used to sustain their qualities. General management and farm record keeping.

BIO 403: Wildlife Conservation and Management

(2 Units C: LH 30)

Learning Outcomes

At the end of the lectures in population genetic, students should be able to:

1. state the principles/glossaries of wildlife management;
2. outline wildlife diseases;
3. identify problems and prospects in wildlife resources;
4. outline conservation policies related to wildlife; and
5. explain the impact of climate change on wildlife resources.

Course Contents

General principles/glossaries of ecosystem management. Biological gardens. Wildlife diseases. principles of wildlife management. Wildlife in Nigeria: conservation policies.

Course Contents

problems and prospects. World wildlife resources and their protection. Conflicts related to wildlife resources. climate change and wildlife resources. International and national laws related to wildlife resources. Fire as tool in terrestrial wildlife management.

BIO 404: Nigerian Plants and Animals in Prophylactics and Therapeutics (2 Units C: LH 30; PH 45)

Learning Outcomes

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

1. explain the historical development of plants and animals in prophylactics and therapeutics (Pharmacognosy);
2. define some terminologies used in pharmacognosy;
3. appreciate the classification and uses of plants and animals in prophylactics and therapeutics in Nigeria;
4. explain crude traditional methods of preparation and uses;
5. identify and describe modern methods of preparation and uses of plants and animals as prophylactics and therapeutics; and
6. account for the evaluation and adulteration of crude drugs, and the need for quality control

Course Contents

Historical development and scope of plants and animals in prophylactics and therapeutics (Pharmacognosy). Some terminologies used in pharmacognosy. Classification and uses of plants and animals in prophylactics and therapeutics in Nigeria. Crude traditional methods of preparation and uses. Modern methods of preparation and uses of plants and animals as prophylactics and therapeutics. Evaluation and adulteration of crude drugs (extraction methods, identification of phytochemicals, proximate analysis, minerals, organoleptic, microscopic, physical, chemical and biological). Deterioration and adulteration of crude drugs. Quality control.

BIO 414: Molecular Biology

(2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of the lectures in this course, students shall be able to:

1. describe the structure and roles of DNA and RNA;
2. discuss Gene regulation, DNA replication, genetic transformation and recombinant DNA technology;
3. summarize the roles of Nucleic acids and proteins in the cell division, growth and development; and
4. list the importance and application of Molecular Biology in food production, medicine and genetic engineering.

Course Contents

Structure and role of DNA. Structure and role of RNA.

Course Contents

Describe gene regulation, DNA replication, genetic transformation and recombinant DNA technology. Describe biological systems at the molecular level. Nucleic acids and proteins and how they interactively regulate cell division, growth and development. Evolution of genomes. Practical applications of the knowledge of molecular Biology (in alleviation of food shortages, plant breeding, disease resistant crops, animal breeding, marriage, medicine, genetic engineering and many more).

BIO 406: Principles of Pest Management

(2 Units C: LH 30)

Learning Outcomes

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

1. state the characteristics of pests;
2. summarize the methods commonly used in assessing the population of plant and animal pests;
3. explain the effect of plant pest on crop and animal production;
4. describe control methods and strategies for plant and animal pests; and 5. provide the consequences related to different control methods.

Course Contents

A survey of plant and animal pests. The characteristics of pest species. Methods of assessing population of plants and animal pest. the estimation of crop and animal losses from pest, assessment and damage. Plant and animal pest control by exclusion, eradication and control (to include use of pesticides, biological control etc.). The general consequences of pest control (resistance and breeding resistant varieties).

BIO 407: Field Course II

(1 Unit C: PH 45)

Learning Outcomes

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

1. explain the various field aspects of biology;
2. demonstrate ability to plan and conduct a series of simple field experiments and collection of data;
3. develop the ability, to record, summarize, classify and preserve specimens collected from the field;
4. develop thin working and individual skills, learn to manage time effectively; and
5. write biological and field reports with appropriate presentation.

Course Contents

Course Contents

Field trips should be conducted to meet the requirements of various aspects of biology taught in the classroom. The field course should add to and fulfil other practical aspects of ecology, hydrobiology, wildlife and forestry, taxonomy and systematics.

Guided field visits by students to observe plants and animals, learn sampling techniques as related to plants and animals, collect samples, classify, preserve in herbarium and museum accordingly. Conduct field researches, collect data and analyse. Visit to industries, wildlife parks, zoological gardens, afforestation fields/woodlot parks, reservoirs /dams, farms, environmental control establishments and sites and other areas of biological importance. Field projects (individual or grouped), report writing and examination.

BIO 408: Applied Biotechnology

(2 Units C: LH 15; PH 45)

Learning Outcomes

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

1. conduct DNA extraction from different tissues;
2. quantify DNA and proteins;
3. outline the types of chromatography;
4. describe DNA amplification;
5. apply the knowledge of biotechnology to protein engineering, medicine, food and forensic science; and
6. incorporate the knowledge of biotechnology in the treatment of wastes.

Course Contents

Extraction of DNA and proteins from various tissues, quantification of DNA and proteins.

Molecular biology techniques including chromatography (paper and thin layer).

Electrophoresis. amplification of DNA using polymerase chain reaction. Identification and genomic sequencing. Introduction of DNA IUTA and cloning in cell. Application of biotechnology in protein engineering and production, medicine and forensic science, bio-industrial production of genetically engineered medicinal and food products using living factories. Environmental protection and cleansing through biotechnological treatment of solid, liquid, chemical and nuclear waste.

BIO 410: Bio-Entrepreneurial Options

(2 Unit C: LH 30)

Learning Outcomes

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

1. explain the background, appropriate theory and methods relating to any of the chosen topics;
2. appraise and discuss how knowledge acquired can be used to become an independent entrepreneur;
3. discuss project cycle, financial sourcing and management; and
4. design and plan how any of the products can be produced on a large scale for national and international markets.

Course Contents

Course Contents

Students are required to take 2 Units of direct studies in any one of the areas listed below. Availability of each area depends on staff on the ground. Examples of these options include but not limited to Mushroom farming. Tissue culture. Apiculture. Weed management and control. Introduction to ornithology/poultry production. Environmental impact assessment. Horticulture/Applied horticulture and landscape ecology. Orchards / Production of vegetables. Herpetology. Introduction to Vaccine and anti-venom production. Heliciculture. Techniques in disease diagnosis. Production of slides and Photomicrography. Production and management of ruminants/monogastric animals.

BIO 413: Bioinformatics

(2 Units C: LH 30)

Learning Outcomes

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

1. explain the history of bioinformatics;
2. identify basic instruments required in bioinformatics; 3. Outline DNA and protein databases; and 4. describe genomics and proteomics.

Course Contents

Introduction to computer based analyses and management applications of molecular biological data. history of bioinformatics. Instrumentation: PC applications, resources, introduction to DNA and protein databases. data storage. file formats and information retrieval. genomics and proteomics.

GOU-BIO 405: Principles and Practice of Streams, Lakes and Rivers Monitoring (2 Units; Compulsory; LH = 15; PH = 45)

Senate Approved Relevance

This course is proposed in line with the mission of Godfrey Okoye University to utilize available resources in the environment for teaching, research, community service and sustainable economic development. The principles and practice of streams, lakes, and rivers monitoring are highly relevant to students of biology because it is essential for them to understand the ecological principles that govern freshwater systems. By learning about the monitoring of freshwater systems, students of biology can gain insights into how human activities affect the health and sustainability of aquatic ecosystems, including the impacts of pollution, climate change, and habitat destruction.

Overview

The aquatic ecosystem is subject to anthropogenic activities and must be monitored. Nigeria water ways are not monitored and have been left with much depletion of the water shed and the diversion of water. These diversions and destruction of water shed have led to destruction of natural covers of water. The Federal government has set up National water shed management authority and the staff trained specially to work in such establishment are yet to demonstrate their efficiency.

When rivers and streams get exposed, they lose their riparian and verge vegetation; they lose their filtrations system and are exposed to evaporation. Such rivers and streams eventually fissile away and die due to over silting, diversion, agriculture and road construction. Municipal authorities do not control dumping of sewages. The sewage companies dump sewage in streams

Course Contents

and rivers because nobody monitors. This course discusses these challenges and makes positive proposals for a better use and protection of waters and rivers.

Objectives

The objectives of the course are to;

1. Describe environmental protection of the aquatic ecosystem.
2. State the attributes that quality ambient freshwater or marine water.
3. Explain water quality objectives for its community values and assigned level of protection.
4. Outline water quality objectives.
5. Assess the loads of materials entering the water body from the catchment (export studies).
6. Outline steps in monitoring of municipal waters.
7. Outline the importance of water shed and the implication of loss of water shed to aquatic life.
8. Differentiate between eutrophic, mesotrophic and dystrophic lakes and humic lakes.
9. Assess deleterious chemicals like batteries, petroleum products, organochlorine, carbide and insecticides and herbicides which are not freely discharged into the municipal water bodies.

Learning outcome

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

1. Identify the implications of environmental perturbation to aquatic wild life.
2. Evaluate environmentally friendly behaviour and deleterious anthropogenic actions.
3. Recognize what to allow and what not to allow to enter the municipal water.
4. Describe the water shed and its preservation of the aquatic ecosystem.
5. Differentiate between different water shed and link the destruction of water shed with shrinking and eventual death of lakes and aquatic ecosystem.
6. Identify breeding ground in riparian vegetation and preserve such for sustainability and conservation.

Course contents

Principles of aquatic bodies monitoring. Monitoring pH at abattoir. Saw mills and auto repair shops linked with fresh water. Monitoring dissolved Oxygen in earthen ponds. Concrete ponds. Streams, Rivers and lakes. Monitoring Turbidity at Dredging Sites. Measuring conductivity in polluted water site. Monitoring Dissolved Oxygen at Hydropower Facilities. Monitoring Scour at Bridges and Offshore Structure. Temperature profiling in Lakes. Phosphorous profiling in constantly visited water bodies. Inland Lake monitoring and riparian vegetation control and implications. Phosphorous dynamics of fresh water. Stream and River monitoring. Flood

Course Contents

warning Systems. Riparian vegetation, Verge vegetation. Submerged vegetation emergent vegetation. Relation between aquatic plants and fish species.

Minimum academic standard

As are present in the 70% CCMAS.

GOU-BIO 415: Aquapreneurship (2 Units; Compulsory; LH = 15; PH = 45)

Senate-Approved Relevance

Fisheries is a business course and student should graduate to be job creators not job seekers. This is in accordance with Godfrey Okoye University's mission to produce graduates that are not only employers of labour but also consultants to many business organizations. This mission can be achieved when the students are exposed beforehand to the fundamentals of entrepreneurship in Fisheries and Aquaculture. The fish value chain includes smoking, breeding, feed production and extension services.

Overview

Aquapreneurship is a concept that combines entrepreneurship with water-based industries such as fisheries, aquaculture, and marine tourism. This field has emerged as a response to the growing challenges that the water-based industries face, including overfishing, pollution, and climate change. Aquapreneurship involves identifying and creating sustainable business opportunities that have a positive impact on the environment, social well-being, and economic growth. It requires a multidisciplinary approach that involves scientific knowledge, technical skills, and entrepreneurial mindset.

One of the key advantages of aquapreneurship is its potential to address both environmental and social challenges, such as poverty and unemployment. It can help to improve the livelihoods of coastal communities and promote sustainable use of aquatic resources. Aquapreneurship can also contribute to the development of new technologies, products, and services that benefit the environment and society. Additionally, it can foster innovation and creativity, as entrepreneurs are encouraged to develop novel solutions to address the unique challenges of water-based industries.

Objectives

The objectives of the course are to;

1. Identify and discuss business opportunities that do not compromise the long-term health and productivity of marine ecosystems.
2. Describe economic growth and development in coastal communities through the development of sustainable businesses that provide employment and income opportunities.
3. Outline innovation and entrepreneurship steps in the water-based industries.
4. Explain ways to optimize opportunities through fish farming.
5. Explain book keeping and the importance of record keeping in business.

Course Contents

6. Identify businesses that can withstand environmental shocks and provide solutions to environmental problems.
7. List steps in fish feed production.
8. Describe fish breeding and commercialization of the business of breeding

Learning outcomes

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

1. Explain fish production value chain.
2. Describe and list step for fish feed production.
3. Explain integrated farming of fish, pig and poultry.
4. Identify middle men for buying and distributing farmed fish.
5. Outline steps for productive fish smoking businesses.

Course content

Introduction to Aquapreneuship. Principles of Aquapreneuship. Book keeping in Fisheries and aquaculture business. Feasibility report writing. Feasibility report interpretation. Fingerling production and enterprise. Fingerling sales. Feed production and sales. Ornamental fish production and aquarium enterprise. Fish processing business and Marketing. Fish vacuum packaging business. Value addition of fisheries products and marketing. Feed ingredient production and sale enterprises. Feed ingredient sourcing and whole sale marketing. Pollution control and management. Farm designs and aquaculture system production and marketing. Aquaponic enterprises and management.

Minimum academic standard

As is in line with 70% CCMAS.

GOU-BIO 416: Use of Equipment and Techniques in Hydrobiology & Limnology (2 Units Compulsory; LH = 15; PH = 45)

Senate approved relevance

This course is in line with the vision and mission of Godfrey Okoye University to produce students who excel in academics and moral character. Students will be trained on the use of equipment used in the professional area of hydrobiology and limnology. Students should be able to measure the oxygen content of water and operate the equipment for conductivity and measurement of acidity.

Overview

The knowledge of how to use scientific equipment in Limnology is very important. Students will take this as both lab and field course and involves equipment of all types.

Course Contents

Students can be employed in oil companies or environmental companies where they should know how to measure different ecological and laboratory equipment. This course is pioneer and very important. As of now there is no such course and most students do not know how to use anything in limnology.

Objectives

The objectives of the course are to:

1. List and illustrate the use of instruments like Conductance Bridge, Oxygen meter, pH meters, water flow rate meters, telemeters etc
2. Operate instrument and carry out calibration of equipment.
3. Analyze markets as field staff due to their ability to use the equipment in the field of limnology.
4. Operate laboratory equipment like ion detectors, shakers, centrifuge and vibrators.
5. Operate gas chromatography and ionizing detectors.
6. Demonstrate the use of pit tags and other tagging system in limnology research.

Learning outcome

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

1. Analyse limnological equipment.
2. Interpret all data and calibrate the equipment.
3. Justify site work without supervision.
4. Analyse temperature in the field.
5. Analyse ammonia and nitrate fluxes in aquatic ecosystem.
6. Evaluate the conductivities of water.
7. Justify tagging system in limnology researches.
8. Analyse telemetry and water meters in studying flow rate and movement in aquatic ecosystem.

Course Contents

Introduction. Definition of Limnology. Instruments for Limnology. The Aquatic Ecosystem. Use of electronic balance in micro-measurement. The use of oxygen meters and pH meters. Use of Conductance Bridge. Analysis of conductivity. Use of micro mhos and Siemens. Use of thermometers. Temperature profiling in rivers and streams. Introduction to the use of gas chromatography. Use of shakers and die. Die numbers. Use of water flow gauge and meters. Tagging system in fish. Pit tags. Floy tags. Telemetry.

Minimum Academic Standard

As is in line with 70% CCMAS.

Course Contents

GOU-BIO 419: Embryology (3 Units; Compulsory; LH = 30; PH = 45)

Senate-Approved Relevance

Embryology deals with the early development and developmental stages of animals. It is a course that would serve as background for Biology students to understand the embryogenesis of organism and their similarities from early life stages. Training of highly qualified biologists who are adequately skilled and knowledgeable in embryology is in line with the mission and vision of Godfrey Okoye University to produce graduates who excel in academics and moral character and who are equipped to contribute to the society.

Overview

Embryology studies the different developmental stages of animal from fertilization to birth. The knowledge of embryology is important to understand the reproductive physiology and biology of animal. Embryology is also important in understanding genetics and genetic engineering. It is imperative that students of biology will know what happens after fertilization and the cleavages and stages of cleavages.

This course is pivotal to the understanding of ploidy, monosex production, cryobiology and all application of genetic engineering application to animals. With a good knowledge of embryology, students will know when to manipulate the cell division of animals, when to harvest stem cells and when to apply pressure or heat shock. The knowledge of embryology will help students to understand the intricacies of placentation in animals.

Objectives

The objectives of the course are to:

1. Describe the development of different animal and what they look like at each stage.
2. Outline the stages of cleavages and when they cleavages occur.
3. Identify when to harvest embryonic stem cells from animal.
4. Identify monosex production of animal and to know when and how to make transgenic animals.
6. Describe cryopreservation of th sperm of any animal.
7. Explain life within the womb and factors that affect it.
8. Study genetics by exposing the replicating cells and when they are doing so.

Learning outcome

After this course the students should be able to;

Course Contents

1. Define embryogenesis and the stages in it.
2. Describe fertilization, both internal and external. The spermatozoa, the oocytes and the fusion and production of diploid cells from the haploid cells.
3. Differentiate cleavages, the morula, the blastula and blastomere.
4. Describe gastrulation, notochord formation, neurulation.
5. Differentiate organism look and their differences at embryology stages.
6. Differentiate harvest stem cells and carry out studies with it.
7. Identify stages of development based on study of slides and histology.

Course Contents

Formation of embryonic structures/organs. Embryogenesis. Cell proliferation (& selective cell death). Cell differentiation. Cell differentiation results. Activation/suppression of selective genes Proteins / peptides of different cell types. Cell's genetic history (commitment to a cell line). Cell's progression and the cell's environment. Intercellular communication. Chemical gradients. Embryonic Period: from fertilization to initial organ formation. The Fetal Period. Fertilization. Spermatozoa (sperm) and Oocyte. Fertilization sequence. Cleavages. Gastrulation. Notochord formation. Somites formation. Pharyngeal arches. Cardiovascular systems.

Minimum Academic Standard

As is in line with 70% CCMAS.

GOU BIO 420: Hydroponics, Aquaponics and Alageculture (3 Units; Compulsory; LH = 30; PH = 45)

Senate-Approved Relevance

Hydroponics is a very practical course and a very important course at a time like this. The course involved production of fish and important crops like tomatoes, onions, cucumber and many other local products. Training of highly qualified graduates of biology who are adequately skilled and knowledgeable in aqua culture is in line with the mission and vision of Godfrey Okoye University. The university has found this course relevant because the knowledge gained will be useful in making graduates of the university employers of labor.

Overview

Aquaculture is known to cause environmental pollution when the culture water is discharged to municipal water or on the ground. The culture water is known to be very rich in nutrients and this nutrients can be harnessed for production of crops. Consequently aquaculture can be producing both plant and animal protein together. The system is a novel technology and symbiotic between the fish and the plant. The plant would utilize the nutrient load emanating from the fish culture system and utilize it in growing. The plant would remove the wastes and

Course Contents

send clean oxygenated water back to the fish culture system. Aquaponic system and hydroponic system is very ideal for tropical aquaculture.

Students who graduate from this course will become great entrepreneurs and employers of labor.

Objectives

The objectives of this course are to:

1. Explain different hydroponic systems.
2. Discuss the differences between hydroponic and aquaponics system of production.
3. Explain the selection of appropriate media for specified hydroponic and aquaponic crops.
4. Identify and describe different equipment used in hydroponic and aquaponic systems.
5. Discuss the physiochemical parameters of hydroponic systems.
6. Determine the management of nutrition in hydroponic systems.
7. Discuss the management of a greenhouse in the production of a hydroponic crop.
8. Illustrate the planning and establishment of hydroponic facility to satisfy specified criteria, both commercial and cultural.
9. Present a management plan for a hydroponic facility.

Learning outcome

In achieving the learning outcomes, student should be able to:

1. Describe essential components of single-pass and recirculating hydroponic systems.
2. Evaluate the importance of water quality, dissolved oxygen, salinity, and pH management for hydroponic production.
3. Select hydroponic systems for production of leafy greens, herbs, solanaceous crops, and woody ornamentals.
4. Apply solution chemistry knowledge and plant biology concepts to manage hydroponic systems.
5. Compare different substrates and hydroponic system designs.
6. Interpret water quality analysis results and recommend corrections.
7. Create nutrient solutions, using salts or mixed fertilizers.

Course Contents

Principles of aquaponic, Principles of hydroponics. Waste water management in fish culture. Recirculation system in aquaculture. Chemistry of waste fish culture water. Nutrient load of culture water. The construction of aquaponic system. The construction of hydroponic fish culture systems. Types of plants used in aquaponic and hydroponics. Cultural practices and water conservation. Water sampling. Electrical conductivity. Toxic elements. Biological contaminants. Advantages and disadvantages of hydroponics. Uses of hydroponic systems. Hydroponic crops. Construction and operation of hydroponics.

Course Contents

Minimum Academic Standard

As is in line with 70% CCMAS.

GOU-BIO 428: Fish Biology and Physiology (2 Units; Compulsory; LH = 15; PH = 45)

Senate-Approved Relevance

There are different types of fishes. The success and failure of rearing fishes depend on good knowledge or ignorance of the biology and physiology. There can be no identification of culturable species and wild species without knowledge of the fish biology. The breeding seasons and nutritional biochemistry of fishes are all covered under the biology. The course is developed in consonance with Godfrey Okoye University's mission to produce graduates who are equipped to contribute to the growth of the society and who become employers of labor in the society.

Overview

This course gives an introduction to the life-styles of fishes, with an emphasis on anatomy and physiological adaptations to different aquatic habitats. The following themes are covered: fish diversity and distributions, swimming, osmoregulation, respiration, feeding and digestion, reproduction and larval development, and life-histories. The biology of fish cover all areas of fish interactions with their ecosystems and their life cycle. Fishes are of different types. There are salt water fish and fresh water fish. There are benthic fish and pelagic fishes. There are temperate fishes and tropical fishes. Moreover there are differences in nutrition and ecology of the fishes. While some fishes are carnivorous some are herbivorous and other omnivorous. These differences affects the industrial production of feed for culturing of these species of fishes. The breeding of the fish and their seasons of reproduction vary. The course helps to unravel the mysteries behind biological clocks of fishes and other aquatic organisms. In addition, fish biology studies also the taxonomy and functions of fish body and their histological analysis.

Objectives

The objectives of the course are to:

1. Explain the nutrition and nutritional physiology of fishes.
2. Discuss the period of spawning and breeding season and habits of fishes.
3. Explain the food and feeding habit of fishes.
4. Analyze the classification of fishes and the differences in their ecological niches.
5. Discuss the injection of hormone and boosters hormone for artificial insemination and vitellogenesis.
6. Discuss typed of feeds according to fish species.
7. Explain the oxygen demand of the fish in captivity and in the wild.
8. Discuss the intricacies of polyculture and species that can or cannot be polycultured.

Learning Outcomes

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

Course Contents

1. Identify different types of fishes with key identification tools.
2. Describe structure of all organ systems in the most important groups of fish (cyclostomata, cartilaginous fish and teleost.
3. Identify fish to the level of order.
4. Analyze the strategies for fish behavior throughout the life cycle.
5. Describe the food and feeding habit of fishes.
6. Identify breed fish and carry out larviculture of culturable species.
7. Identify different organs in the fishes and their uses.

Course content

Introduction. The osteichthyes bony fish. Agnatha - jawless fish. Chondrichthyes - cartilaginous fish. Osteichthyes - Ray finned group. Lobe finned group Catfish. Classification of the Siluriformes and differences. Specific differences of the family Clariidae. Morphological differences. Food and feeding habits of family Clariidae. The Characteristic of Osteichthyes. Lungfish. Eels. Carps. Lizardfish. Bony Fish: Silversides and Salmon. Catfishes etc. The anatomy of fish: skin, skeleton, respiration, digestion, blood vessel system, swim bladder, urogenital, nervous system, sensory organs and endocrine organs. Respiration in fishes. Nutrition in fishes. Reproduction in fishes. Reproductive physiology. Comparative fish nutrition and nutrition. Nutritional adaptations. Mimicry and reproductive adaptations.

Minimum Academic Standard

As is in line with 70%CCMAS

Minimum Academic Standards

Equipment

1. Skeletal System
2. Muscular System
3. Brain and Nervous System
4. Circulatory System
5. Digestive System
6. Eye and Vision
7. Skin and Excretory Organs
8. GB 28 Concealing and Warning Adaptations
9. Ice Cube Maker
10. Incubator/Sterilizer
11. Embedding Bath
12. Micrometer
13. Water Baths
14. Autoclaves
15. Weighing Balances
16. Hot Plates

Course Contents

17. Incubators
18. Field Binoculars
19. Binocular Microscopes
20. Field Cameras
21. Stereo Microscopes
22. Refrigerators
23. Shakers
24. pH Meters
25. PCR Thermocyclers
26. Gel Photo Documentation Equipment
27. Gel Electrophoresis Systems
28. ELISA Kits
29. Sahli's Hemoglobinometer
30. Distillers (All Glass)
31. R. Humidity with Thermometer
32. Embedding Oven
33. Ovens
34. Thermostatic Incubator
35. Microtome
36. Veneer Callipers
37. Retort Stand
38. Automatic Tissue Processor
39. Tissue Embedding Centre
40. Air Pumps (Diaphragm)
41. Vacuum Pumps
42. Tissue Grinder Glass
43. Photometer and Atometer
44. Shadon Unit Kit No. 1
45. Barothermograph
46. Kymograph Muscle
47. Spirometer
48. Colorimeter
49. Lamina flow
50. Glucometer
51. Digital Blood Pressure Monitor
52. Insect Light Traps
53. Insect Boxes
54. Slide Projector
55. Over-head Projector
56. Bench Centrifuges
57. Micro Refrigerated Centrifuges
58. Steel Frame Aquaria
59. Auxanometer
60. Oxygen Meter

Course Contents

61. Glass Wares/Micropipettes

Additional Facilities for B.Sc. Biology

Museum
Herbarium
Biological Garden

Staffing

Academic Staff

The guidelines on academic staff/student ratio of 1:20 for Science Programmes shall apply. To start any programme in science, there should be a minimum of six academic staff. There is need to have a reasonable number of staff with Ph.D degrees accounting for at least 70% of the total number and having adequate teaching experience for every programme in the discipline.

Administrative Support Staff

The services of the administrative support staff are indispensable in the proper administration of departments and faculty offices. It is important to recruit very competent and computer literate senior staff.

Technical Support Personnel

The services of technical support staff, which are indispensable in the proper running of laboratories and workshops, are required. It is important to recruit very competent senior technical staff to maintain teaching and research equipment. They are also to undergo regular training to keep them abreast of developments in equipment operation and maintenance.

Classrooms, Laboratories, Workshops and Office Space The NUC recommends the following physical space requirements:

Description		Size m²
Professor's Office	-	18.50
Head of Department's Office	-	18.50
Tutorial Teaching Staff's Office	-	13.50
Other Teaching Staff Space	-	7.00
Technical Staff Space	-	7.00
Secretarial Space	-	7.00
Research Laboratory	-	16.50
Seminar Space/per student	-	1.85
Laboratory Space per FTE	-	7.50
Conference Room	-	37.0

Course Contents

Library

Universities should leverage on available technology to put in place rich databases and other electronic/digital library and information resources. In addition, well stock and current hardcopies of reference and other textual materials should be provided centrally at the level of the faculty. A well network digital library should serve the entire university community. Availability of wireless facilities (Wifi) with adequate bandwidth should enhance access to these electronic resources. In any case, there should be internet ready workstations available in the library for least 25% of the total student enrolled in each academic programme. The funding of the library should be in line with NUC guidelines.