SCIENCES

Ayandiran Daniel AINA

DEAN

Omotola I. OKE

School Officer

DEPARTMENT OF MICROBIOLOGY

Cajethan Onyebuchi EZEAMAGU

Head of Department

STAFF LIST

S/N	NAME OF LECTURERS	QUALIFICATIONS	DESIGNATION	AREAS OF SPECIALIZATION
1.	Oluwafumiso O. OLAJUYIGBE	B.Sc., M.Sc., Ph.D.	Professor	Medical/Pharmaceutical Microbiology
2.	Chibundu N. EZEKIEL	B.Sc., M.Sc., Ph.D.	Professor	Food Microbiology and Mycotoxicology/Mycology
3.	Daniel A. AINA	B.Tech., M.Sc., Ph.D.	Professor	Industrial Microbiology
4.	Cajethan O. EZEAMAGU	B.Sc., M.Sc., Ph.D.	Associate Professor	Medical/ Molecular Microbiology
5.	Martins A. ADEFISOYE	B.Sc., M.Sc., Ph.D.	Senior Lecturer	Environmental Microbiology
6.	Oluwakemi A. THONDA	B.Sc., M.Sc., Ph.D.	Senior Lecturer	Medical Microbiology
7.	Morenike O. ADEOYE-ISIJOLA	B.Sc., M.Sc., Ph.D.	Senior Lecturer	Medical Microbiology
8.	Grace O. MENSAH-AGYEI	B.Sc., M.Sc. (Ph.D. in view)	Lecturer I	Medical Microbiology
9.	Kolawole I. AYENI	B.Sc., M.Sc., Ph.D.	Lecturer II	Food and Industrial Microbiology
10.	Samuel AMODU	B.Sc., M.Sc., Ph.D.	Lecturer II	Medical Microbiology
11.	Kehinde O. FAGBEMI	B.Tech., M.Sc., Ph.D.	Lecturer II	Food Microbiology
12.	Oluwawapelumi, A. OYEDELE	B.Sc., M.Sc., Ph.D.	Lecturer II	Food Microbiology
13.	Chinweizu O. ONUMAEGBU	B.Sc., M.Sc. (Ph.D. in view)	Assistant Lecturer	Food Microbiology
	ADJUNCT STAFF			
14.	Hansel M. FLETCHER	B.Sc., M.Sc., Ph.D.	Professor	Microbial Pathogenesis
15.	Segun G. JONATHAN	B.Sc., M.Sc., Ph.D.	Professor	Applied Microbiology/Mycology and Biotechnology

16.	Adewale O. OBADINA	B.Sc., M.Sc., Ph.D.	Professor	Food Science
17.	Olumide A. ODEYEMI	B.Sc., M.Sc., Ph.D.	Senior Lecturer	Food Microbiology
18.	Adekemi T. DAHUNSI	B.Sc., M.Sc., Ph.D.	Senior Lecturer	Food Microbiology
	TECHNICAL STAFF			
19.	Elizabeth T. OYEWOLE	OND,HND, PGD, M.Sc.	Senior Laboratory Technologist	Microbiology
20.	Esther O. **A**DETILORO	OND, B.Sc. M.Sc./MPH	Senior Laboratory Technologist	Microbiology
21.	Emmanuel O.ADEDIJI	B. Tech, M.sc	Laboratory Technologist	Food Science
	ADMINISTRATIVE STAFF			
22.	Damilola V. POPOOLA	B.Sc.Ed.	Admin Asst.	Chemistry

Department of Microbiology

B.Sc. Microbiology

Overview

The programme has been designed to provide a sound understanding of the concepts of microbiology in relation to mankind and the environment. The programme will elaborate the importance of microorganisms and their products in industry (alcoholic beverages, petroleum and petrochemicals), health, food, agriculture, pharmacy and environmental sectors of the society. The Microbiology programmes will also emphasize the linkage between microbiology and biotechnology.

Philosophy

The philosophy is to train microbiology graduates who will apply microbiological procedures and techniques to solving developmental needs of the society.

Objectives

The objectives of the programme are to:

1. broadly train students for positions in the industry, health sector, research institutes;

2. prepare them for graduate and professional studies in applied areas of microbiology; and

3. develop their business skills in various aspects of Applied Microbiology.

Unique Features of the Programme

The programme includes a wider range and modern aspects (food, industrial, medical, systematics, pharmaceutical, environmental, petroleum, waste management, agricultural, biotechnology including genetic engineering and entrepreneurial) of microbiology.

Employability Skills

A graduate with degree in microbiology can provide opportunities in sectors such as private and government hospitals, technicians in private laboratories, forensic science laboratories, pharmaceutical industry, environmental management organisations, petroleum and petrochemical companies, agriculture, educational institutions, food processing industry, dairy industry, alcohol production, brewery industry, government regulatory agencies and non-governmental organisations (NGOs).

A degree in microbiology should equip the individual with technical, laboratory, scientific analytical and writing capacities with excellent interpersonal and communication skills. To ensure success the individual should have meticulous attention to detail and display a keen interest in treating and preventing diseases that are harmful to humans, proffer measures to

monitor food quality, control food and material biodeterioration and enhance environmental quality.

21st Century Skills

1. critical thinking and problem solving
2. reasoning, analysis and interpretation
3. synthesising information
4. research skills and practices
5. problem solving,
6. interrogation and questioning.

Finally, other skills emphasized are creativity, artistry, curiosity, imagination, innovation, personal expression perseverance, self-direction, planning, self-discipline, adaptability and initiative.

Admission and Graduation Requirements

Admission Requirements

Indirect entry

The entry requirements shall be at least credit level passes in five subjects including English language, mathematics, biology, chemistry, and physics at the senior secondary certificate (SSC) or its equivalent. In addition, an acceptable pass in the unified tertiary matriculation examination (UTME) is required for admission into 100-level.

Direct entry

Candidates with at least two A level passes GCE/IJMB/ JUPEB in two relevant subjects (biology, botany, chemistry, geography, mathematics and physics) may be admitted into 200-level, provided they satisfy the 'O' Level requirement.

Graduation Requirements

To be eligible for the award of a bachelor's degree in microbiology, a student must pass a minimum 151 units for those admitted through UTME and 113 units for direct entry.

B.Sc. Microbiology

LEVEL	1ST SEMESTER	2ND SEMESTER	TOTAL
100	19	19	38
200	20	20	40
300	16	19	35
400	18(20)	17(19)	35-39
TOTAL	**76-78**	**75-77**	**151-155**

100 Level

Course Code	Course Title	1st semester	2nd semester
BU-GST 011	Citizenship Orientation	**0**	
BU-GST 012	Citizenship Orientation		**0**
	Core courses		
BU-GST 105	Use of Library and study skills	2	
BU-GST 120	ICT Fundamentals and Office Productivity Management	1	
GST 111	Communication In English	2	-
GST 112	Nigerian Peoples and Culture	-	2
MTH 101	Elementary Mathematics I	2	-
MTH 102	Elementary Mathematics II	-	2
COS 101	Introduction to Computing Sciences	3	-
BIO 101	General Biology I	3	-
BIO 107	General Biology Practical I	1	-
CHM 101	General Chemistry I	2	-
CHM 107	General Chemistry Practical I	1	-

PHY 101	General Physics I	2	-
PHY 107	General Physics Practical I	1	-
BIO 102	General Biology II	-	2
BIO 108	General Biology Practical II	-	1
CHM 102	General Chemistry II	-	2
CHM 108	General Chemistry Practical II	-	1
PHY 102	General Physics II	-	2
PHY 108	General Physics Practical II	-	1
BU-MCB 102	Biblical Foundations in Microbiology	-	2
BU-GST 112	Health Principles	-	1
BU-GST 126	Life and Teaching of Christ the Messiah	-	3
	Total (39 Credits)	**20**	**19**

200 Level

Course Code	**Course Title**	**1st semester**	**2nd semester**
BU-GST 021	**Citizenship Orientation**	**0**	
BU-GST 022	**Citizenship Orientation**		**0**
	Core courses		
GST 212	Philosophy, Logic and Human Existence	-	2
ENT 211	Entrepreneurship and Innovation	2	-
	Core courses		
MCB 221	General Microbiology	2	-

MCB 231	Basic Techniques in Microbiology	2	-
BU-MCB 201	Aquatic Microbiology	3	-
BU-MCB 202	Introduction to Veterinary Microbiology	-	3
BU-MCB 203	Microbiological Analysis and Quality Control	2	-
BU-MCB 204	Soil Microbiology	-	3
BU-MCB 205	Introduction to Food Safety	2	-
BU-MCB 206	Biodeterioration	-	2
BU-MCB 212	Fundamentals of Bacteriology		2
BU-MCB 208	Waste Management Microbiology	-	3
BU-MCB 200	Bioethics and patent law in Microbiology	-	3
BU-GST 290	Introduction to Data Analytics	1	-
BU-GST 200	Communication in French	-	1
BU-GST-221	Introduction to Agriculture	1	-
BU-GST 215	Adventist Heritage	3	-
BU-GST 220	Origins and Science	-	1
BCH 201	General Biochemistry 1	2	-
	Total: 40 Credits	**20**	**20**

300 Level

Course Code	**Course Title**	**1st semester**	**2nd semester**
BU-GST 031	**Citizenship Orientation**	**0**	
BU-GST 032	**Citizenship Orientation**		**0**
	Core courses		
GST 312	Peace and Conflict Resolutions	-	2
ENT 312	Venture Creation	-	2
BU-MCB 301	Introduction to Pharmaceutical Microbiology and Nanobiotechnology	3	-
BU-MCB 311	Microbial Enzyme Biotechnology	3	
BU–MCB 303	Molecular Microbiology Techniques	3	-
MCB 398	Entrepreneurship and Microbiology	-	1
MCB 305	Fungi of Medical, Food and Industrial Importance	2	-
MCB 307	Immunology	3	-
MCB 350	Industrial Attachment II (24 Weeks)	-	6
MCB 309	Food Microbiology	2	-
BU-GST 310	Data Analysis using Advanced Excel, SPSS, Bitableau	-	1

BU-GST 312	Family Life	,	1
BU-GST 317	Fundamentals of Christian Faith	3	-
MCB 321	Bacterial Diversity	3	
MCB 324	Microbial Ecology	-	3
	Total: 38 Credits	**22**	**16**

400 Level

Course Code	**Course Title**	**1st semester**	**2nd semester**
BU-GST 041	**Citizenship Orientation**	**0**	
BU-GST 042	**Citizenship Orientation**		**0**
BU-GST 440	E-Project Management and Simulation	1	
BU-GST 400	Religion and Social Ethics	-	3
	Core courses		
BU-MCB 401	Computational Microbiology and Drug Design	3	-
MCB 405	Principles of Epidemiology and Public Health Management	2	-
MCB 407	Pathogenic Microbiology	3	
MCB 431	Petroleum Microbiology	3	
MCB 412	Microbial Genetics	-	3
MCB 423	Industrial Microbiology	3	-
MCB 424	Microbial Physiology & Metabolism	-	3
MCB 425	Environmental	3	-

	Microbiology		
MCB 482	Virology & Tissue Culture	-	2
MCB 490	Research Project	-	6
	Total: (35 Credits)	**18**	**17**

100 Level

BU- GST 105 Use of Library and Study Skills (1 Units; Core; LH =15; PH 0)

Learning Outcomes

Upon completion of this course, students would have learnt to:

1. Explain the origin of three writing materials from the ancient to information age
2. Explain four types of libraries
3. Explain six importance of libraries in the educational and learning process
4. Explain five importance of Libraries and Information in the Educational and Learning Process
5. Discuss five Sections in the Library and functions performed
6. Explain two Classification Scheme & Library Catalogues
7. Explain four Information Search Tools
8. State four social issues relating to Libraries and rules for users
9. Explain two reference styles

Course Contents

Ancient period to Information age. Evolution of writing Materials. Concept of library. Types of library and information centers. Sections in the library. Parts of book. Electronic Information Resources. Bibliographic entries. Bibliographic control. Library Catalogue. Filling Shelving. Shelve reading. Library automation. Library software applications. Information networking and sharing. How to study. The brain. Memory retention mechanism. Search tools. Information retrieval tools. Reference styles. Social issues relating to Libraries and Information centers. Preparation for academic success.

Minimum Academic Standard

Library

BU-GST 120 ICT Fundamentals & Office Productivity Management (2 units, C: LH 15, PH 45)

Learning Outcome

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

1. creating text documents
2. editing and formatting the existing documents
3. making a text document interactive with different features and tools
4. graphical documents, comprising images
5. used by Authors and Researchers
6. detect grammatical errors in a text document.
7. perform data entry and storage
8. collection and Verification of business data
9. administrative and managerial duties
10. accounting and budgeting
11. data Analysis
12. reporting + Visualizations
13. forecasting
14. create presentations from scratch or a template
15. add text, images, art, and videos
16. select a professional design with PowerPoint Designer.

COURSE CONTENT

Getting started with word. Adding tables. Controlling page appearance. Formatting text and paragraphs. Inserting graphic objects. Managing lists. Preparing to publish. Working more efficiently. Controlling the follow of a document. Customizing formats using styles and themes. Inserting content using quick parts. Organizing content using tables and charts. Simplifying and managing long documents. Using mail merge. Using templates to automate document formatting. Getting started with PowerPoint. Preparing a PowerPoint presentation. Performing advanced text editing operations. Adding graphical elements to your presentation. Modifying objects in your presentation. Adding tables to your presentation. Adding charts to your presentation. Preparing to deliver your presentation. Adding SmartArt math equations to a presentation. Collaborating on a presentation. Customizing a slide show. Customizing design templates. Modifying the PowerPoint environment. Securing and distributing a presentation. Working with media and animations. Getting started with excel. Formatting a worksheet. Managing workbooks. Modifying a worksheet. Performing calculations.

Minimum Academic Standard: Computer studio and simulation Laboratory with NUC-MAS requirement facilities.

GST 111: Communication in English (2 Units C: LH 30; 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; classify word formation processes; construct simple and fairly complex sentences in English;
3. apply logical and critical reasoning skills for meaningful presentations;
4. demonstrate an appreciable level of the art of public speaking and listening; and
5. write simple and technical reports.

Course Contents

Sound patterns in English language (vowels and consonants, phonetics and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple and complex). Grammar and Usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and Critical Thinking and Reasoning Methods (Logic and Syllogism, Inductive and Deductive Argument and Reasoning Methods, Analogy, Generalisation and Explanations). Ethical considerations, Copyright Rules and Infringements. Writing Activities: (pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making etc. mechanics of writing). Comprehension Strategies: (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

GST 112: Nigeria Peoples and Culture (2 Units C: LH 30)

Learning Outcomes

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

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

Course Contents

Nigerian history; culture and art up to 1800 (yoruba, hausa and igbo peoples and culture, peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria, colonial administration of Nigeria). Evolution of Nigeria as a political

unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria. Nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics, Nigerian Civil War). Concept of trade and economics of self-reliance (indigenous trade and market system; indigenous apprenticeship system among Nigeria people; trade, skill acquisition and selfreliance). 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 and 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, subsets, 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, Venn diagrams. Real numbers, integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers, algebra of complex numbers, the Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

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

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

1. identify the types of rules 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. Integration as an inverse of differentiation. Methods of integration. Definite integrals. Application to areas, 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.

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 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;
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.**

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

CHM 107: General Chemistry Practical I (1 Unit C: PH 45)

Learning Outcomes

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

1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify the differences between primary and secondary standards;
5. perform redox titration;
6. record observations and measurements in the laboratory notebooks; and
7. analyse the data to arrive at scientific conclusions.

Course Contents

Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation

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

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

1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems on the basis of the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum; describe the laws governing motion under gravity; and
7. 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, 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 107: General Practical Physics (1 Unit C: PH 45)

Learning Outcomes
On completion of the course, the student should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs**;** and
5. draw conclusions from numerical and graphical analysis of data

Course Contents
This introductory course emphasizes quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc., covered in PHY 101. However,

emphasis is placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

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 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 fruits 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 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 their 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 in nanotubules, nanostructures, nanochemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The Chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements.

CHM 108: General Chemistry Practical II (1 Unit C: PH 45)

Learning Outcomes

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

1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiments;
3. identify the basic glassware and equipment in the laboratory;
4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds;

5. perform solubility tests on known and unknown organic compounds;
6. conduct elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic / basic / neutral organic compounds.

Course Contents

Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods

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

Learning Outcomes

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

1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;
5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws;
6. explain the basic physical 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

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

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

Learning Outcomes

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

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs;
5. draw conclusions from numerical and graphical analysis of data;
6. prepare and present practical reports.

Course Contents

This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements, the treatment of measurement errors, and graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

BU-MCB 102: **Biblical Foundations in Microbiology** (1 Units; Core; LH=30; PH=Nil)

Learning Outcomes

1. State three (3) characteristics of microorganisms and how they impact the environment, and human.
2. List three (3) microorganisms recorded in the Bible, their effects and how they can be controlled.
3. Enumerate three (3) microorganisms that benefit human and the environment in Biblical and contemporary times.
4. Identify two (2) major ethical issues in Microbiology and suggest recommendations for their resolution.
5. Explain two ways (2) each in which stewardship and creation account can be applied to microbiological practices that benefit the environment and public health.

Course Contents

Definition of Microbiology. Historical overview of Microbiology. Importance of Microbiology in society. Biblical Foundations. Creation and the Order of the Universe. The Principle of Stewardship and the Environment. Health and Hygiene in the Bible. Microbial morphology and diversity. Microbial physiology and metabolism. Ecosystems and microbial diversity. Microbial interactions and symbiosis. Environmental Microbiology. Microorganisms and Human Health. Microbial pathogens and infectious diseases. Global health and Epidemics. Host-microbe

interactions. Microbial therapeutics. Integration of Faith and Science. Ethical considerations in microbiology. Biblical perspectives on Science and Technology.

Minimum Academic Standards

None

BU-GST 112: Health Principles (2 Units; Core; LH = 30)

Learning Outcomes

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

1. Define health according to World Health Organisation
2. State five (5) components and the human body and their function
3. Describe at least three (3) determinants of health and well-being
4. List five (5) factors that mental health
5. Explain two (2) current health trends

Course Contents

Meaning of health. Ecology of human disease. Biblical foundation health. Determinants of health. Basic human anatomy and physiology. Body defense mechanism. Element of nutrition. Health implication of nutrition for health. Personal and environment hygiene. Environmental pollution. Substance Abuse. Health implication of substance abuse. Mental health and well-being. Stress coping mechanism. Body pH and Health. Current trends in Health. Sport health and physical activity.

Minimum Academic Standards

None

BU-GST 126: Life and Teachings of Christ (3 Units; C; LH 45)

Learning outcomes

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

1. Assess the historicity of Jesus Christ, using at least five (5) biblical and extant literature;
2. Explore five (5) religio-political and socio-economic events in Palestine during Jesus' time.
3. Enumerate five (5) evidences that Jesus Christ came at the fullness of time;
4. Identify at least three (3) theological implications of the Incarnation;
5. Contrast between Jewish and Jesus' views of the Kingdom;
6. Enumerate any seven (7) teachings of Jesus Christ;

7. Describe any five (5) events leading to Jesus' arrest and crucifixion;

8. Enumerate any five (5) theological implications of Jesus' death and resurrection;

Course Contents

The world which Jesus met and worked in. God with Us. Historicity of Jesus Christ. The fullness of Time. Childhood and Youth of Jesus. The Baptism of Jesus. The temptation of Jesus. The Gospel of the kingdom. The Ministry Jesus Christ. The Mission of Jesus Christ. Jesus' Teaching Methods. The Sermon on the Mount. The last days of Christ earthly life. Gethsemane Experience. Jesus' Arrest. Judgement of Jesus. The Crucifixion. Burial and Resurrection. Jesus' Appearances. Theological implications of Jesus Resurrection and teachings.

Minimum Academic Standards

Standard University Library

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;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents

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

ENT 211: Entrepreneurship and Innovation (2 Units C: LH15; 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 state the characteristics of an entrepreneur
2. analyse the importance of micro and small businesses in wealth creation, employment, and financial independence engage in entrepreneurial thinking;
3. identify key elements in innovation; describe stages in enterprise formation, partnership and networking including business planning;
4. describe contemporary entrepreneurial issues in Nigeria, Africa and the rest of the world; and
5. 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, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation); enterprise formation, partnership and networking (basics of business plan, forms of business ownership, business registration and forming alliances and join 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.

MCB 221: General Microbiology (2 Units C: LH 15; PH 45)

Learning Outcomes

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

1. explain the basic concepts and scope of microbiology;

2. describe the layout of a microbiology laboratory, equipment and reagents in a microbiology laboratory; and
3. discuss the theory behind basic protocols in a microbiology laboratory.

Course Contents

History of the Science of Microbiology. Classification of organisms into prokaryotes and eukaryotes. Classification of prokaryotes into archaea and eubacteria. Anatomy and cytochemistry of bacteria and fungi; shapes, groupings and colonial morphology of bacteria and fungi. Structure of viruses. Sterilization and disinfection. Structure, ecology and reproduction of representative microbial genera. Culture of micro-organisms. Isolation of micro-organisms. Isolation of bacteria, viruses fungi (yeasts and moulds, nutrition and biochemical activities of micro-organisms. Antigens and antibodies. Identification and economic importance of selected microbial groups. Microbial variation and heredity. Study of laboratory equipment. Introduction to microbiology of air food, milk, dairy products, water and soil. Staining techniques, antibiotic sensitivity tests, serological tests, antimicrobial agents.

MCB 231: Basic Techniques in Microbiology (2 Units C: PH 90)

Learning Outcomes

At the end of the course, students will be exposed to

1. the following techniques for the isolation of bacteria from soil, water, food and air;
2. process for obtaining pure cultures of bacteria and fungi;
3. techniques for the characterization and identification of bacterial isolates;
4. methods of bacteria enumeration; and
5. methods for the preservation of isolates and methods for culturing anaerobic bacteria

Course Contents

Culturing of micro-organisms. Preparation of media for microbial growth. Isolation of pure culture. Streaking, pour plates etc. Subculturing procedures. Staining techniques for differentiation of micro-organisms. Enumeration of micro-organisms, direct and indirect procedures. Identification of micro-organisms to include colonial and cellular morphology and biochemical procedures. Identification of bacteria should also include the use of serological techniques, antibiotic sensitivity discs and agar-in well methods. The use of anaerobic jar for growth of anaerobic organisms. Methods of preservation (agar slants, frequent subculturing, refrigeration and use of deep freezers, lyophilisation, storage in liquid nitrogen) of microbial cultures.

Minimum Academic Standards

BU-MCB 201: Aquatic Microbiology (3 Units; Core; LH=45; PH=Nil)

Learning Outcomes

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

1. Explain the ecology and diversity of microorganisms in aquatic environments.
2. Enumerate the roles of microorganisms in the cycling of elements in aquatic environments.
3. Discuss the relationship between aquatic microorganisms and aquatic plants.
4. Explain the relationship between aquatic microorganisms and aquatic animals.
5. List the various factors that influence microbial associations in aquatic environments.
6. Describe management approaches to polluted aquatic environments.

Course Contents

Sources or types of water. Physico-chemical properties of water. Biological properties of water. Colonization of microorganisms in water. Microbial ecology of water. Microbial diversity of water. Aquatic ecosystem. Ecological relationships/associations amongst aquatic organisms. Microbiological examination of water. Water quality standards. Fate of chemicals in aquatic ecosystem. Quorum sensing. Sources of water pollution. Control of water pollution. Roles of microorganisms in water. Water treatments. Sewage treatments and disposal. Testing of water quality. Disease associated and transmitted by water. Economic significance of aquatic microorganisms. Visits to water treatments plants and sewage plants.

Minimum Academic Standards

BU – MCB-202: Introduction to Veterinary Microbiology (2 Units; Core; LH=30; PH=Nil)

Learning Outcomes

On completion of the, the student should be able to

1. Identify at least one (1) example each of bacterial, viral, fungal and parasitic diseases in animals.
2. Explain the morphology, physiology, pathogenesis at least two (2) diagnosis techniques and treatments of infective agents.
3. List at least three (3) stages of viral replication.
4. Differentiate between innate and adaptive immune responses in animals with at least one (1) example each.
5. Enumerate at least two (2) drivers of zoonotic diseases.
6. Mention five (5) food -borne illnesses in animals and humans.
7. Highlight four (4) control measures of zoonotic diseases

Course Contents

Introduction to veterinary microbiology. Morphology, physiology and classification of bacteria. Pathogenesis and treatment of bacterial infection in animals. Morphology and classification of virus. Replication of viruses. Pathogenesis and treatment of viral infections in animals. Morphological and physiological classification of fungi. Pathogenesis and treatment of fungal infections in animals. Classification and morphology of parasites. Pathogenesis and treatment of parasitic infections in animals. Innate and adaptive immune responses in animals. Immunological techniques used in veterinary microbiology. Food -borne illnesses in animals and humans. Antimicrobial agents and resistance. The role of vaccination in preventing animal diseases and the principles of vaccine development. Epidemiology and control of zoonotic diseases. Public health and biosecurity in veterinary microbiology. Emerging infectious animal diseases. Current research topics in veterinary microbiology.

Minimum Academic Standard

BU-MCB 203: Microbiological Analysis and Quality Control (2 Units; Core; LH=15; PH=45)

Learning Outcomes

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

1. Describe the basics of microbiology and identify three (3) types of microorganisms present in food product.

2. Explain the concept of culturing and staining technique.
3. Enumerate three (3) methods used to control microbial growth.
4. State five (5) importance of quality control and assurance procedure in the food industry.
5. Evaluate a microbiological data and state the reasons for an informed decision about food safety and quality in a case study.
6. Identify three (3) regulatory requirements for a microbiological analysis and quality control in the food industry.

Course Contents

Introduction to microbiology and its importance in quality control. Microbial growth and metabolism. Microbial taxonomy and classification. Microbial diversity and ecology. Microbial control methods. Sterilization techniques. Aseptic techniques. Microbial enumeration methods. Microbial identification techniques. Microbial spoilage and food preservation. Microbial foodborne illness and food safety regulations. Microbial quality control in the pharmaceutical industry. Environmental microbiology and water quality control. Industrial microbiology and fermentation processes. Microbial biofilms and their control. Microbial assay and bioassay techniques. Ethics and regulations in food industry.

Minimum Academic Standard

BU-MCB 204: Soil Microbiology (3 Units; Core; LH=45; PH=Nil)

Learning Outcomes

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

1. List the factors three factors that affect the distribution and activities of microorganisms in the soil.
2. Highlight eight (8) ecological relationship among soil pathogens
3. State at least four (4) importance of microorganisms in agriculture
4. List four (4) roles of microorganisms in biogeochemical cycles
5. Highlight four (4) environmental influences which affects microbial distribution, growth, and activity in soil ecosystems.

6. List three (3) effects of pesticides on soil microorganisms

Course Contents

The characteristics of soil environment. Microbial flora and fauna of soil. Soil as a microbial habitat. Microbial activities in soil. Factors affecting distribution, activity and population of soil microorganisms. Importance of microbiology in agriculture. Mineral transformation by micro-organisms. Ecological relationship among soil pathogens. Biodegradation and bioremediation. Role of microbes in soil fertility and crop production. Biogeochemical cycling of elements (Carbon, Nitrogen, Phosphorus and Sulphur cycles). Biological Nitrogen Fixation- symbiotic, associative and aysmbiotic. Biopesticides. Effect of pesticides on soil micro-organisms. Biofuels generation. Biofertilizers. Microbiology of the rhizosphere. Pesticides degradation by microorganisms.

Minimum Academic Standards

BU-MCB 205: Food Safety Microbiology: (2 Units; Core; LH=30; PH=45)

Learning Outcomes

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

1. Identify four (4) different types of microorganisms that can contaminate food and describe their unique characteristics.
2. Describe three (3) principles of microbial growth and metabolism and their application in the food industry.
3. List four (4) methods used to control microbial growth in food.
4. Describe three (3) food safety control strategies and their effectiveness
5. Interpret three (3) food safety regulations to ensure the safety of the food supply.
6. Identify four (4) foodborne illness and the principles of risk assessment.

Course Contents

Definition and importance of food safety. Types of microorganisms that contaminate food. Sources of microbial contamination. Principles of microbial growth and metabolism. Factors affecting microbial growth. Microbial spoilage and foodborne illness. Control of Microbial Growth in Food. Principles of food preservation. Physical and chemical control methods. Biological control methods. Factors affecting efficacy of control methods. Principles of food safety risk assessment. Hazard identification and risk characterization. Control strategies. Common foodborne pathogens and characteristics. Symptoms and diagnosis of foodborne illnesses. Treatment. Epidemiology and outbreak investigation. Food safety regulations and safety of food supply. Compliance. Food Regulatory Agencies in Nigeria and overseas. Principles of food safety quality assurance. Hazard Analysis and Critical Control Points (HACCP) and application to food safety. Emerging issues and microbial threats. Current Research and Developments. Case studies and practical applications.

Minimum Academic Standards

BU-MCB 206: Biodeterioration (2 Units; Core; LH=30; PH=Nil)

Learning Outcomes

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

1. Explain the mechanism involved in biodeterioration.
2. Enumerate five (5) organisms involved in biodeterioration process and their characteristic properties.
3. Highlight four (4) impacts of biodeterioration on natural and man-made materials.
4. State three (3) factors that influence the onset and progression of biodeterioration.
5. Describe three (3) strategies for the prevention and mitigation of biodeterioration.
6. Identify two (2) regulatory, environmental and safety issues in biodeterioration.

Course Contents

Definition and Importance of Biodeterioration. Microbial Diversity and Biodeterioration. Biodegradation and Bio-corrosion Processes. Biodeterioration of Buildings and Infrastructure. Biodeterioration of Wood and Wood Products. Biodeterioration of Paper and Paper Products. Biodeterioration of Textiles and Leather. Biodeterioration of Metals and Alloys. Biodeterioration

of Plastics and Polymers. Biodeterioration of Petroleum and Petrochemicals. Biodeterioration of Food and Beverages. Biodeterioration of Pharmaceuticals and Medical Devices. Biodeterioration of Cultural Heritage Materials. Prevention and Control of Biodeterioration. Preservation Techniques for Cultural Heritage Materials. Biocorrosion Monitoring and Detection. Microbial Biofilms and Biodeterioration. Biodeterioration in Aquatic Environments. Applications and Limitations in Biodeterioration Control.

Minimum Academic Standard

BU-MCB 212: Fundamentals of Bacteriology (2 Units; Core; LH=30; PH=Nil)

Learning Outcomes

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

1. Evaluate three (3) techniques and application of bacteriology.
2. Identify a bacterial species in a culture media.
3. Describe a technique used in the study of bacterial.
4. Enumerate four (4) roles of bacteria in various ecosystem.
5. Explain the mechanism of antibiotic resistance of a named bacterial.
6. State five (5) importance of bacterial control measures.

Course Contents

History and scope of bacteriology. Bacterial morphology and structure. Bacterial growth and reproduction. Nutritional requirements and metabolism of bacteria. Genetics and molecular biology of bacteria. Bacterial classification and identification. Bacterial diversity and ecology. Bacterial pathogenesis and virulence factors. Bacterial immunity and host response. Antibiotics and mechanisms of bacterial resistance. Control and prevention of bacterial infections. Microbial interactions in communities. Microbial biofilms and their significance. Bioremediation and biodegradation by bacteria. Industrial applications of bacteria. Food microbiology and safety. Environmental microbiology. Bacterial bioinformatics. Laboratory techniques in bacteriology

Minimum Academic Standard

BU-MCB 208: Waste Management Microbiology (3 Units; Core; LH=45; PH=Nil)

Learning outcomes

At the end of this course students should be able to

1. Identify the historical background of waste management.
2. Explain at least one (1) principles of waste management practices.
3. List different types of waste management techniques.
4. outline five (5) sources of waste.
5. Explain microbiological principle and three (3) methods of waste management.
6. List four (4) importance of waste management.

Course Contents

Definition of waste management. Historical background of waste management. Principles of waste management. Introduction to the waste management and environmental system. The E-waste. Hazardous waste and materials handling. Microbiology of wastewater treatment. Role of microbes in wastewater treatment. Introduction to pollution. Types of pollution and control. Introduction to environmental engineering. Role of responsible personnel and stakeholders in the waste sector. General waste disposal and treatment methods. Green technology in waste management. Digital technology in waste management. Recycling technology and waste management entrepreneurship. Street cleaning & disposal of refuse.

Minimum Academic Standards

BU-MCB 200: Bioethics and Patent Law in Microbiology (3 Units; Core; LH=45; PH=Nil)

Learning Outcomes

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

1. Outline four (4) basic concepts of microbiology and patent law

2. Analyze four (4) ethical issues related to microbiology and patent law.

3. Interpret three (3) ways by which intellectual property law promotes innovation in Microbiology

4. Identify two (2) different ethical frameworks and apply them to issues in patent law and Microbiology

5. Evaluate three (3) selected patent claims and applications.

6. Interpret two (2) patent law cases related to microbiology

7. Formulate ethical decisions in the context of patent law and microbiology from two case studies you have reviewed.

Course Contents

Review the basics of Microbiology. Bioethics and human welfare. Morals and ethics. Informed consent and Confidentiality. Introduction to Patent and Patents' law. Types of Patents. Fundamentals of intellectual property law in Microbiology. Bioethics and Biotechnology. Ethical issues in gene editing and stem cell research. Patenting life or living organisms. Legal and ethical controversies in Microbiology and Biotechnology. Patent disputes. Access to treatments using emerging biotechnologies like gene editing. Patents regulations in Nigeria. Case Studies. Future of Microbiology and patent law. Implications for ethical and legal issues in the scientific community. Ethical and legal considerations involved in scientific research and innovation in Microbiology.

Minimum Academic Standards

BU-GST 290 Introduction to Data Analytics (2 units. C: LH 15. PH 45)

Course Overview

In this complex, digital world, clients want help to understand their data to drive greater insight, improved performance and competitiveness. The course will introduce students to the important techniques and methods to become more efficient in delivering their daily objectives and also improve their work ethics.

This course presents you with a gentle introduction to Data Analysis, the role of a Data Analyst, and the tools used in this job. Students will learn about the skills and responsibilities of a data analyst and explore from several datasets & advice to start a career. This course will help students to differentiate between the roles of Data Analysts, Data Scientists, and Data Engineers.

Learning Outcome

On completion of the course. Students should be able to do:

1. uncertainty analysis
2. data fitting
3. feed-forward neural networks
4. probability density functions
5. correlation functions
6. fourier analysis and FFT procedures
7. spectral analysis
8. digital filtering
9. hilbert transforms.

Course Contents

Connecting to data. Simplifying and sorting data. Organizing data. Posing a question. Wrangling data into a format. fixing data problems. exploring the data. finding patterns. building intuition. comparing measures. Statistics and forecasting. Dashboards and stories.

Lab Work: Students will undertake the following tasks in the practical classes; learn how to analyze data to understand data through natural language queries that allows to ask questions about data without having to write complicated formulas. In addition, students will learn how to analyze data to provide high-level visual summaries, trends, and patterns.

Minimum Academic Standard: Computer studio and simulation Laboratory with a NUC-MAS requirement.

BU-GST 200 – Communication in French (2 Units; Core; LH = 20; PH = 45)

Learning Outcomes

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

1. Abilities to greet
2. Knowing how to express time.
3.knowledge of counting up 1000
4. Conjugaison of Etre and Avoir and be able to form sentences with the auxiliaries
5. Use pronoun instead of names
6. Make sentences in present tense with the verbs
7. Presentation of oneself in French Language.
8. Essay writing.

Course Contents

Alphabet. Salutation. L'heure. Le nombre. Le pronom personnel et l'auxiliaire Avoir et Être Les trois groupe verbes au présent de l'indicatif, premier groupe verbe, Deuxième groupe verbe, Troisième groupe verbe) Adjective possessive, Adjective Démonstratif etc et présentation

Minimum Academic Standards

BU-GST 221 Introduction to Agriculture (1 Unit; Core; LH = 15; PH = 45)

Learning Outcomes

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

1. Recall the definition and discuss at least three (3) of the branches of agriculture.
2. Critique five important agricultural policies in Nigeria.
3. Discuss the objectives of Soil Science.

4. Discuss 5 physical properties of soil.
5. Discuss the characteristics of different soil types.
6. Discuss the reasons for losses of agricultural soil
7. Discuss different types of agricultural systems and practices with relevant examples in Nigeria
8. Describe the different types of crops with examples from across Nigeria
9. Discuss the problems facing livestock producers across Nigeria
10. Describe 3 common management practices in poultry/livestock production.

Course Contents

Introduction to Agriculture, its origin, branches and importance; Definition, scope and objectives & review of Agricultural policies; Introduction to soil science, its aims and objectives; Soil formation and soil physical properties; Erosion; Introduction to Crop Science (Agricultural systems/practices); Livestock production (importance & problems of livestock industry); Production practices of some selected ruminants, monogastric & non-ruminant herbivores; Non-conventional livestock production practices

Minimum Academic Standards

Field experimental plots

BU-GST 215 Adventist Heritage, (2 Units; C; LH 45)

Learning Outcomes

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

1. Explain the history of the Seventh-day Adventist Church.
2. Illustrate the systematic development of the Seventh-day Adventist Church.
3. State the contributions of at least five (5) pioneers of the Seventh-day Adventist Church.
4. Explain the seven (7) pillars of the Seventh-day Adventist church doctrine.
5. Describe the Seventh-day Adventists' concepts of holistic education, health reforms, and publishing ministries.

6. Identify at least eight (8) major contributions of Adventist education, health reforms, and publishing ministries.
7. Enumerate at least (7) areas in which the prophetic gift has shaped the mission of the Seventh-day Adventist Church.
8. Explain the meaning of Adventism and the aim of Adventist mission.
9. Describe the dynamics involved in the origin and growth of Seventh-day Adventism in Africa.
10. List at least eight (8) major contributions of the Seventh-day Adventism in Africa, with specific focus on national growth and development.

Course Contents

The historical and prophetic origin of the Seventh-day Adventist Church. Millerite roots, before 1844. The 1844 experiences. The development and organization of the Seventh-day Adventist Church. The era of doctrinal and organizational development (**1844 – 1863).** The era of institutional and lifestyle development (1863ff). The era of revival, reform, and expansion (**1888 – 1900**). The era of reorganization and Crisis (**1901 - 1910**). The era of worldwide growth (**1910 – 1955**). The challenges and possibilities of maturity (**1955).** The contributions of the pioneers and founders of the Seventh-day Adventist Church. The Pillars of Adventism. Adventists' concepts of holistic education. Healthcare and reforms. Publishing ministries. The prophetic gift in the Seventh-day Adventist Church. Significance of prophetic gift to the Adventist Mission. The purpose of Adventism. Adventist concept of mission. The origin, exploits and challenges of Seventh-day Adventism in Africa. Contributions of the Seventh-day Adventism in Africa.

Minimum Academic Standards

The presence of Ellen G. White Research Center, which contains ancient manuscripts.

BU-GST 220: Origin and Science (1 Units; C; LH 15)

Course Learning Outcomes:

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

1. List and explain three scientific evidences for creation and the challenges posed by evolutionary theory.
2. Discuss the harmony between science and religion.
3. List three leading hypotheses about the origin of life and their supporting evidence.
4. Describe three chemical and physical processes involved in the emergence of life.
5. Apply critical thinking skills to evaluate scientific and biblical claims about the origin of life.
6. Apply knowledge of the origin of life to related fields, e.g. astrobiology and synthetic biology.
7. Argue what types of fossils provide the best evidence for the origin of life and why?
8. Articulate the account of creation and its implications for our understanding of life.
9. Analyze and interpret scientific data related to the origin of life
10. Evaluate scientific arguments related to the origin of life.

Course Content

Introduction to the Origin of Life, Historical perspectives on the origin of life; the definition and importance of the origin of life, The theories and hypotheses surrounding the origin of life, such as the RNA world hypothesis, the panspermia hypothesis, and the hydrothermal vent hypothesis.

The challenges and limitations of studying the origin of life; the historical development of the origin of life research, The Scientific Evidence for Creation, The complexity of life, The evidence from genetics and molecular biology, The fossil record, The problems with evolutionary theory, The Biblical Account of Creation, Science, and Creationism, The relationship between science and religion. Stanley miller experiment and the origin of life. The current state of research in the field of origin of life and the challenges associated with this topic.

Minimum Academic Standards

Classroom with projector and other teaching aids in line NUC-MAS requirement facilities

BCH 201: General Biochemistry I (2 Units C: LH 30)

Learning Outcomes

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

1. explain the structure of different macromolecules in biological system;

2. identify types of chemical reactions involving these macromolecules;

3. explain the various methods of isolation of these macromolecules;

4. estimate the effects of acids and alkalis on the macromolecules;

5. describe purification of macromolecules; and

6. discuss quantification of the various macromolecules.

Course Contents

Introductory chemistry of amino acids, their properties, reactions and biological functions. Classification of amino acids: neutral, basic and acidic; polar and non-polar; essential and non-essential amino acids. Peptides. Introductory chemistry and classification of proteins. Biological functions of proteins. Methods of their isolation, purification and identification. Primary, secondary, tertiary and quaternary structures of proteins. Basic principles of tests for proteins and amino acids. Introductory chemistry of carbohydrates, lipids and nucleic acids. Nomenclature of nucleosides and nucleotides, effects of acid and alkali on hydrolysis of nucleic acids.

300 Level

GST 312: Peace and Conflict Resolution (2Units 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: (a). The United Nations (UN) and its conflict resolution organs. (b). The African Union & Peace Security Council (c). ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees. internally displaced persons (IDPs). The role of NGOs in post-conflict situations/crisis.

ENT312: Venture Creation (2 Units C: LH 30; 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; spot opportunities in problems and in high potential sectors regardless of geographical location;
2. state how original products, ideas, and concepts are developed;
3. develop business concept for further incubation or pitching for funding;
4. identify key sources of entrepreneurial finance;
5. implement the requirements for establishing and managing micro and small enterprises;
6. conduct entrepreneurial marketing and e-commerce;
7. apply a wide variety of emerging technological solutions to entrepreneurship; and
8. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions and technology adoption gap). New business development (business planning, market research); entrepreneurial finance (venture capital, equity finance, Micro finance, Personal savings, small business investment organizations and Business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, Ecommerce business models and successful E-commerce companies,). Small business management/family business. Leadership & management. Basic book keeping. Nature of family business and family business growth model. Negotiation and business communication (Strategy and tactics of negotiation/bargaining. Traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological Solutions (the concept of market/customer solution, customer solution and emerging technologies. Business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoTs), Blockchain, Cloud Computing, Renewable Energy etc. Digital Business and E-Commerce Strategies).

BU- MCB 301: Introduction to Pharmaceutical Microbiology and Nanobiotechnology

(3 Units; Core; LH=45; PH=Nil)

Learning Outcomes

The completion of this course will enable the students to:

1. List at least three (3) roles of microbiology in pharmaceutical and Nano biotechnology
2. Enumerate three steps (3) in green synthesis.
3. Highlight five (5) microorganisms commonly encountered in pharmaceuticals.
4. Explain interaction, toxicity and biocompatibility in Nano technology.
5. Validate the efficacy of pharmaceuticals and offer protocols and techniques.
6. Outline at least four (4) regulatory guideline for good manufacturing practices.

Course Contents

Overview of the pharmaceutical microbiology and Nanobiotechnology. Role of microbiology in drug development. Concepts of microbial growth and metabolism. Production and synthesis of antibiotics and anti-microbial agents. Quality control of pharmaceutical products. The chemistry of synthetic chemotherapeutic agents and antibiotics. The mode of action and assay of anti-microbial agents. Concepts of antibiotic sensitivity and resistance. Sources of microbial contamination and spoilage of pharmaceuticals. Microbial safety and risk assessment in drug development and manufacturing. Sterilization and disinfection. Medicinal plants. Introduction to Nano biotechnology and its applications in biology. Green synthesis and characterization of nanoparticle and nanostructures. Application of pharmaceutical microbiology and Nano biotechnology. Nanoscale biosensors and diagnostic tools. Ethical and safety issues in Nano biotechnology research and development.

Minimum Academic Standard

BU-MCB 311: Microbial Enzyme Biotechnology (3 Units; Core; LH=45; PH=Nil)

Learning Outcomes

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

1. Explain the basics of microbial enzyme biotechnology
2. Identify three (3) different fields where microbial enzyme is applicable.
3. State five (5) functions of an enzyme.
4. Evaluate four (4) factors affecting enzyme activity.
5. Enumerate three (3) mechanisms of enzyme regulation.
6. List four (4) roles of enzymes in biotechnology.
7. Discuss three (3) enzyme immobilization techniques.
8. Describe three (3) uses of enzymes in an industrial process.

Course Contents

Introduction to microbial enzyme biotechnology. Microbial diversity and the importance of enzymes in microbial metabolism. Enzyme classification and nomenclature. Enzyme kinetics and factors affecting enzyme activity. Techniques for enzyme isolation and purification. Enzyme assays and measurement of enzyme activity. Enzyme immobilization techniques and their applications. Enzyme engineering and optimization. Enzyme stability and storage. Industrial enzymes and their applications in food and other industries. Enzymes in bioremediation and environmental applications. Enzymes in pharmaceuticals and medical applications. Microbial fermentation processes and enzyme production. Genetic engineering of microbial enzymes for improved performance. Enzyme discovery and screening techniques. Bioinformatics tools for enzyme analysis and design. Enzyme kinetics modeling and simulation. Ethical and safety considerations in enzyme biotechnology.

Minimum Academic Standard

BU-MCB 303: Molecular Microbiological Techniques (3 Units; Core; LH=45; PH=Nil)

Learning Outcomes

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

1. Differentiate between molecular microbiology and traditional microbiology.
2. Describe four (4) basic techniques used in molecular microbiology.
3. Provide answer to a research question from a molecular microbiology experiment.
4. Explain three (3) applications of molecular microbiology techniques in agriculture.
5. Explain equipment handling and procedures in molecular microbiology laboratory.
6. State three (3) ethical consideration associated with molecular microbiology researches.

Course Contents

Introduction to molecular microbiology. DNA extraction techniques. PCR (polymerase chain reaction) principles and applications. Gel electrophoresis. Quantitative PCR. DNA sequencing. Cloning techniques. Expression vectors. Genetic engineering and gene editing techniques. Genome analysis. Metagenomics. Microbial community analysis. Microbial evolution and phylogeny. Microbial identification and classification. Microbial pathogenesis. Antibiotic resistance and susceptibility testing. Microbial genomics and bioinformatics. Microbial biotechnology. Microbial ecology. Industrial applications of molecular microbiology.

Minimum Academic Standard

MCB 398: Entrepreneurship for Microbiology (2 Units C: LH 30)

Learning Outcomes

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

1. identify basic concepts of entrepreneurship in Microbiology;
2. demonstrate basic business skills;
3. identify areas in Microbiology that they can develop into small scale businesses; and
4. identify areas in microbiology for self-employment.

Course Contents

Identification of the basic concepts of entrepreneurship and Business skills. Scope of various aspects of Applied Microbiology- Medical Microbiology, Public health Microbiology, Immunology, Agricultural Microbiology, Food and Dairy Microbiology, Industrial Microbiology, Microbial Ecology, Petroleum Microbiology, Microbial Genetics and Molecular Biology, Genetic Engineering, Impact Assessment, Health Safety and Environment. Students will be exposed to employment opportunities in these aspects. Students will be introduced to various self – employment opportunities in these aspects of Microbiology. Students will be assisted in designing businesses of their choice within these aspects. The designed business may be validated by a professional entrepreneur educator and a professional in the field of study that relates to the business in question so as to assess the workability of the business as a small scale business, the financial cost of the business, market outlet of the business, economic gain of the business and its sustainability. Team (5 to 7 students) work will be encouraged so as to prevent repeated business design by single individuals, reduce financial cost of setting individual businesses and strengthen the manpower capacity of the business. Success stories of business entrepreneurs would be included in the curriculum especially in the student field of study so as to motivate the student to develop interest towards self – employment and self-productivity Students with best business design would be given recognition.

MCB 305: Fungi of Medical, Food and Industrial Importance
(2 Units C: LH 30)

Learning Outcomes

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

1. discuss the structure, physiology and classification of fungi;
2. explain pathogenicity, immunity, epidemiology, treatment and incidence of fungi of medical importance; and
3. describe physiology and metabolites of fungi used in food and industrial microbiology.

Course Contents

Structure, life cycles, physiology and classification of fungi. Fungi of medical, food and industrial Importance, fungal pathogenicity, immunity epidemiology, incidence treatment-Superficial mycoses (ringworm, superficial candidosis, pityriasis),

subcutaneous mycoses (Mycetoma, Histoplasmosis, Phaeohyphomycosis). Systemic mycoses coccidomycoses, blastomycose, Paracocidio-domycosis, aspergillosis, cryptococcosis). Fungi of food and industrial importance (Aspergillus niger, Saccharomyces cerevisiae importance. Metabolites of fungi, industrial uses of fungi. Fungi in medicine.

MCB 307: Immunology (3 Units: C LH 30; PH 45)

Learning Outcomes

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

1. explain the basic concepts of immunology and diagnostic immunology;
2. describe the types of immunity;
3. elucidate the structure of antibodies(immunoglobulins) and antigens,
4. explain the origin of the B and T cells;
5. discuss the role of immunity in protection against diseases;
6. describe the harmful effects of immunological responses;
7. identify the types of vaccines; and
8. describe animal and human vaccine production

Course Contents

Introduction; historical background. Innate and acquired immunity. Antigens, antibodies, cellular immunity. Immunological tolerance and suppression. Surgical grafting. Complement system. Hypersensitivity. Immunological anomalies. Diagnostic immunology. Vaccines, effect or systems of parasite killing and nature of resistance in plants. Animal and human vaccine production.

MCB 350: Industrial Attachment II (12 Weeks) (3 Units C)

Learning Outcomes

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

1. identify the needs of industry; and
2. recognise the role of a microbiologist in an industry.

Course Contents

Students will be posted to industrial establishments such as food processing, brewing, distillery, pharmaceutical, research institutes, petroleum companies, petrochemical

companies, government regulatory agencies, medical and health institutions. A report is submitted for grading.

MCB 309: Food Microbiology (2 Units C: LH 30; PH 45)

Learning Outcomes

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

1. identify the factors responsible for food spoilage and food quality enhancement;
2. state the microorganisms involved in food spoilage;
3. explain the microbial indices of food quality; methods for food quality assessment;
4. describe the international microbiological standards for food quality assessment;
5. discuss the traditional and rapid methods for estimating microbial populations in foods quality; and
6. identify novel food production processes.

Course Contents

The distribution, role and significance of micro-organisms in food. Examples of international and national fermented foods. Intrinsic and extrinsic parameters of foods that affect microbial growth. Food spoilage and food borne diseases. Microbial indices of food sanitary quality international and national microbiology standards for food quality. Diseases of animal transmittable to man via food products. Rapid methods for assessing microbiological quality of foods. Traditional and modern methods for food preservation. Ecology, taxonomy, biochemistry and analytical technology of bacteria, yeasts, fungi and viruses associated with food spoilage, food-borne diseases and fermentations. Emphasis on new developments in food microbiology. Economic consequences of micro-organisms in food. Exploitation of micro-organisms in novel processes for the production of food ingredients.

BU-GST 310 Data Analysis Using ADVANCED EXCEL | SPSS | POWER BI | TABLEAU (2 units. C: LH 15. PH 45)

Learning Outcome

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

1. use pivot tables and pivot charts
2. use conditional formatting
3. remove duplicates

4. use XLOOKUP
5. prepare datasets for use in Power BI Desktop or Power BI Service
6. ii. learn to manage big data prep using systems like Power Query
7. iii. create visualizations within a Power BI Dashboard
8. read-in, enter, organize, and save data in a suitable way.
9. calculate/recode variables and prepare data for analysis.
10. conduct descriptive and basic inferential statistics.
11. be familiar with SPSS presentation of statistical output.
12. create and edit graphical displays of data.

COURSE CONTENT

Connecting to data. Simplifying and sorting data. Organizing data. Slicing data by date. Using multiple measures in a view. Showing the relationship between numerical values. Mapping data geographically. Get Started with Microsoft Data Analytics. Prepare Data in Power BI. Clean. Transform. Load Data in Power BI. Design a Data Model in Power BI. Create Measures using DAX in Power BI. Introduction to Tableau - Introduction. Visual Analysis. Visual Perception. Tableau Product Family. Connecting to Data. Data Terminology. Getting Dirty with Your Data-Introduction. Introduction to IBM SPSS Statistics. Reading Data. Defining Variable Properties. Working with the Data Editor. Modifying Data Values: Recode. Summarizing Individual Variables. Relationships between Variables. Selecting Cases for Analyses. Creating and Editing Charts. Working in the Viewer. Syntax Basics. Menus and the Help System. Project Work.

Lab Work: Students will undertake the following tasks in the practical classes; Learn how to use excel to analyze data to understand data through natural language queries that allows to ask questions about data without having to write complicated formulas. In addition, students will learn how to use excel to analyze data to provide high-level visual summaries, trends, and patterns.

Minimum Academic Standard: Computer studio and simulation Laboratory with NUC-MAS requirement facilities.

BU-GST 312: Family Life (1 Units; C; LH 15)

LEARNING OUTCOME

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

1. Describe the Biblical foundation of family
2. Explain and appreciate the foundations of marriage
3. Identify the different marital relationships.
4. Develop a personal philosophy of family that encompasses personal, cultural and spiritual values.
5. Develop skills for successful marital and other interpersonal relationships and ways of
6. handling different marital conflicts
7. Effectively and positively apply the knowledge and skills acquired now and in the future
8. in the students' own family and
9. Help individuals, couples or families in making their marital relationships more enjoyable and less crises ridden.

COURSE CONTENT

Introduction, Definition of family, types of families, Definition of marriage, biblical foundations of marriage, purpose of marriage, characteristics of marriage, processes/stages of marriage Dating, Courtship &; Engagement, Good and wrong reasons for dating, Enumerate the benefits of dating, factors to consider during courtship, practices to be avoided during courtship, factors to consider in readiness for marriage. Marriage as a major life decision, foundations of successful marriage, strategies for mate selection, Qualities to look for in a prospective wife, Qualities to look for in a prospective husband, Relevance of domestic training in marriage, Inter-ethnic and inter-racial marriages, Marriage ceremonies and their characteristics, Forbidden marriages, Significance of bride price in African Culture, Honeymoon, Marital Adjustment: Sexual Behavior in marriage, Expected sexual behavior in marriage, Sexual dysfunctions,- Extra-marital affairs, causes, effects and control ,Marital Adjustment: Financial management in marriage and In-laws, Handling financial issues , Family finance and budgeting, Dealing with in-laws,- Siblings relationship in marriage, Establishing a New Home,- Building and furnishing the Home ,Family Roles and Responsibilities role of the father, mother, children Child bearing and child rearing, Family planning methods,- Biblical perspectives on parenting and child rearing, The four parenting styles, Conflict and conflict resolution, Causes of marital conflict, Basic steps on conflict resolution, Divorce in marriage, Causes, effect, control, Domestic Violence.

Minimum Academic Standard

BU-GST 317 Fundamentals of Christian Faith (3 Units; C; LH 45)

Overview

Questions on the origin, authenticity, and certain claims of the Bible on matters of individual and communal faith and practice have been common parlance among theologians. Amidst various theological divides, the Bible provides accurate information and foundation requisite for personal

and corporate faith formation, spirituality, and Christian practices. In the course of the growth of the church from the apostolic age, the Church fathers, and to the middle age cum the Reformation era, the basic teachings of Christian faith have undergone various doctrinal forms and perspectives.

The religious, political, social and scientific development of the world has influenced an interpretative conundrum for the understanding of the scriptures. The emergence of postmodernism and an ever-increasing influence of secularization has polluted the understanding and has put to question the God-inspired interpretation of the teachings of the Bible. An understanding of selected biblical teachings which provides a doctrinal framework for the development of the early Christian Church exposes the postmodern readers to the fundamentals of Christian faith.

Learning outcomes

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

1. Assess the history and development of the Old Testament and the New Testament Scripture;
2. Enumerate at least five (5) attributes of God;
3. Identify any seven (7) characteristic features of the Holy Spirit;
4. Assess any five (5) interconnectedness between the Law and grace;
5. Enumerate at least five (5) evidences of the biblical Sabbath;
6. Identify the symbolism and interpretation of the Daniel 2.
7. Assess at least four (4) signs of Christ's Second Coming;
8. Explain at least three (3) of the biblical ordinances in the scriptures
9. Describe any three (3) of the Christian lifestyles

Course Contents

Nature of Inspiration. God's Word. Authenticity of the Bible. Theology of God: His Names & Attributes. The Holy Spirit. Creation. Origin of Sin. Fall of Man. The Flood. Jesus' Incarnation and Ministry of Intercession. Law and Grace. The Sabbath. The Church and its Mission. Prophecy of Daniel 2. Second Coming. The Signs of the Second Coming. Manner of Jesus' Second Coming. Millennium and the New Earth. Biblical Ordinances. Christian Lifestyles. Prophetic Gift and the Church.

Minimum Academic Standards
Standard Modern library.

MCB 322: Bacterial Diversity **(3 Units C: LH 30; PH 45)**

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

1. explain the morphology, life cycle and biochemical characteristics of bacteria; 2. discuss bacterial systematics and other prokaryotes; and

3. describe the identification and isolation of bacteria.

Course Contents
The morphology, life cycle and biochemical characteristics of bacteria. Systematic study of bacteria (autotrophic- photoautotrops, chemoautotrophs and heterotrophic-enterobacteriaceae, pseudomonadaceae, bacillaceae) and other prokaryotes (Mycoplasma, Clamydia), their nature, characteristics, habitats, identification and isolation.

MCB 324: Microbial Ecology (3 Units C: LH 30; PH 45)

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

1. describe microbial interactions between microbial populations;
2. explain microbial interactions between plants and animals;
3. identify microbial community dynamics;
4. elucidate transfer of matter and energy between trophic levels in an ecosystem; and
5. explain biotechnological aspects of microbial ecology (metal recovery, hydrocarbon recovery, biofuel generation)

Course Contents
Microbes and ecological theory. Microbial evolution (chemical and cellular evolution) and biodiversity, phylogeny, physiological, morphological and genetic adaptations of micro-organisms to their environment. Microbial interactions (interactions among microbial populations, interaction between microorganisms and plants interactions between microorganisms and animals). Microorganisms in natural ecosystems. The life of micro-organisms in air, springs, rivers, lakes and seas. Biogeochemical cycling of elements in water, soil and sediments (including methanogenesis, methylotrophy transformations involving carbon, nitrogen, sulphur, phosphorus and manganese etc.). Microbial community dynamics (include genetic/molecular diversity indices, species diversity indices). Biotechnology aspects of microbial ecology (e.g. global warming, microbial enhanced oil recovery, liquid waste treatment, recovery of metals and biofuel generation). Aeromicrobiology.

400 level

BU-GST 440: E-Project Management & Simulation (1 Units; C; LH 15)

Learning Outcomes

Upon completion of the course. students should be able to:

1. explain the project management processes
2. discuss the project management knowledge areas
3. demonstrate the formulas. charts. and theories of project management
4. calculate float for complex project network diagrams
5. memorize the formulas for earned value management
6. compare and contrast processes. knowledge areas. theories. and project management best practices

Course Content

Defining Project Management Fundamentals. Initiating the Project. Planning the Project. Preparing to Develop the Project Schedule. Developing the Project Schedule. Planning Project Costs. Planning Human Resources and Quality Management. Communicating During the Project. Planning for Risk. Planning Project Procurements. Planning for Change and Transitions. Executing the Project. Executing the Procurement Plan. Monitoring and Controlling Project Performance. Monitoring and Controlling Project Constraints. Monitoring and Controlling Project Risks. Monitoring and Controlling Procurements. Closing the Project.

Lab Work: Students will undertake the following tasks in the practical classes; work on stakeholders requirements. Create a risk response team. Create a detailed work plan. Develop communication effective plan. Develop both leadership and technical competencies. Monitor and track progress regularly. Look out for potential risks.

Minimum Academic Standard: Computer studio and simulation Laboratory with NUC-MAS requirement facilities.

BU- MCB 401: Computational Microbiology and Drug Design (3 Units; Core; LH=30 PH=45)

Learning Outcomes

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

1. Describe bioinformatics with examples of at least four (4) databases.
2. Enumerate computer-bases technology and three (3) areas of applications.
3. Demonstrate virtual screening with examples.

4. List at least two (2) steps during library design and docking scoring.
5. Identify five (5) drug targets and validate them.
6. Optimize at least one (1) drug target and conduct preclinical tests.

Course Contents

Introduction to bioinformatics. Software and Databases with areas of applications. Ligand identification and retrieval. Reverse docking. Protein structure prediction. Target drug-ability. Tool compound design. Library design. Docking scoring. De novo design. Pharmacophore. Target flexibility. Quantitative structure-activity relationship (QSAR) and 3D-QSAR. Structure-based optimization. *In silico* ADMET prediction. Physiologically pharmacokinetics stimulations. Virtual screening.

Minimum Academic Standards

Computer Laboratory.

MCB 405: Principles of Epidemiology & Public Health Microbiology
(2 Units C: LH 30)
Learning Outcomes
At the end of the course, students will be able to:

1. explain epidemiological concepts (distribution, frequency, determinants, population, pattern) indices;
2. explain herd immunity and its importance;
3. describe epidemiological field investigation methodologies;
4. illustrate mode of viral replication, episomes, virallatency(episomal latency and proviral latency); immunization, transmission of diseases by direct and indirect methods; and 5. explain schedules and zoonotic infections

Course Contents
Epidemiology and epidemiological concepts and types of epidemiology. Statistical applications to epidemiology. Nature of epidemiological investigations. Spectrum of infections. Herd immunity. Latency of infections. Multifactorial systems in epidemics. Zoonoses. Antigenic drifts. Biological products for immunization. Schedules for international control of infectious diseases. Transmission routes and infectious doses

(airborne, waterborne, urogenital transmissions, arthropod borne, direct contact). Controlling epidemics (reducing or eliminating reservoirs, breaking transmission routes, reducing number of susceptible individuals, quarantine). Epidemiological investigations and surveillance. Disease surveillance. Emergency preparedness and global early warning System.

MCB 407: Pathogenic Microbiology (3 Units C: LH 45)

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

1. describe the pathogenesis (virulence factors) of common bacterial and viral pathogens; epidemiology;
2. explain mode of infections; and
3. describe laboratory diagnosis and treatment of specific bacterial and viral pathogens.

Course Contents
Study of some bacterial and viral pathogens of plants, animals and man with emphasis on those prevalent in Nigeria. The geographical distribution, isolation, identification, morphology, life cycle, source of infection, transmission and the host. Ecology and clinical manifestations and treatment of specific bacterial, viral and fungal pathogens of man.

MCB 412: Microbial Genetics (3 Units C: LH 45)

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

1. describe mutations and mutagens;
2. explain DNA transfer in bacteria, fungi and viruses;
3. describe Plasmids, Phages, Cosmids; and
4. list procedure for the transfer of the gene in Recombinant DNA Technology and procedures for recognition of transformed cell

Course Contents
Principles of genetic analysis; plasmids (conjugative and non-conjugative plasmids). Plasmid nomenclature, and transposable genetic elements, mutagenesis and DNA repairs, bacteriophages genetics and genetics of nitrogen fixation. Mechanism and

nature of mutation, induction, isolation and characterization of mutants and mutagens. Genetic recombination in prokaryotes including transformation, transduction, conjugation, proptoplast fusion, site directed mutation, genetic engineering (recombinant DNA technology), DNA splicing, Restriction endonucleases and methylases DNA ligases, their nomenclature phage conversion (cosmids) and transfection. Recent techniques in microbial genetics. Chemical coding and expression of genetic information. Fungal genetics. Principles and applications of genetic engineering.

MCB 423: Industrial Microbiology (3 Units C: LH 30; PH 45)

Learning Outcomes

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

1. explain the scope of industrial microbiology and biotechnology;
2. identify industrial media composition, preparation and sources, commonly used microorganisms in industrial microbiology;
3. describe primary and secondary metabolites production and gene regulation;
4. identify sources and methods of strain improvements;
5. describe culture collection centers and preservation methods; and
6. explain fermentor design and operation

Course Contents

Microorganisms used in industrial microbiology. Screening for productive strains. Strain improvement. Fermentation systems. Design and use of fermenters. Micro-organisms of industrial importance. Patent and intellectual property rights. Classification of microbial products by use. Relationship between primary and secondary metabolism. Characteristics, sources and strain improvement of industrial micro-organisms. Microbial preservation of industrial organisms. Culture collections. Microbial growth and product formation in industrial processes. Media for industrial fermentations. Foaming, Major products of Industrial Microbiology. Enzyme production and immobilization. Production of vitamins, amino acids, antibiotics, organic acids, beer and wine.

MCB 424: Microbial Physiology & Metabolism (3 Units C: LH 45)

Learning Outcomes

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

1. explain the growth dynamics of bacterial cultures;
2. discuss the effect of physical and chemical factors affecting bacterial growth;
3. identify energy and carbon sources for autotrophic and heterotrophic bacteria;

4. describe metabolic pathways for biosynthesis of industrial microbiology;
5. elucidate anabolic and catabolic reactions,
6. explain gibbs free energy, entropy, enthalpy and their relationships; and
7. discuss energy of catabolic reactions and anabolic reactions and enzymes and activation energy.

Course Contents

Review of bacterial anatomy and cytochemistry. Dynamics of growth (batch and continuous culture). Nutrition and energy metabolism of micro-organisms. Effect of physical and chemical factors on growth; biochemistry of various microbial processes such as transport, regulation and respiration. Biosynthesis of microbial products. Bioenergetics, autotrophic (photoautotrophs and chemoautotrophs) metabolism, catabolism and anabolic reactions, activation energy and Enzyme action and control Buffer preparation and standardization. Basic separation techniques in microbiology, dialysis, salting out, gel filtration, electrophoresis etc. Assay techniques for various metabolites including microbial enzymes, acids etc.

MCB 425: Environmental Microbiology (3 Units C: LH 30; PH 45)

Learning Outcomes

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

1. explain the various definitions of environmental pollution;
2. identify types of environmental pollution;
3. discuss inorganic, organic and biological indices of pollution;
4. identify regulatory agencies involved in Pollution monitoring in Nigeria;
5. discuss the impact of urbanization on pollution;
6. explain impact assessment (Environmental Impact Assessment, Environmental Evaluation Studies, Post Impact Assessment) and Microbiological aspects of impact assessment;
7. elucidate bioaccumulation (bioconcentration, biomagnification and depuration)
8. identify methods of sewage treatment;
9. explain membrane filtration and Multiple tube fermentation methods for estimating bacterial populations in water; and
10. describe biochemical and Chemical Oxygen Demand, Waterborne diseases and transmission, Total and Faecal Coliforms.

Course Contents

Impact Assessment (IA) of microbial contamination of soil, surface water, ground water and air in relation to the deterioration of the environment. Legal frame work for impact assessment; environmental impact assessment (EIA); post impact assessment (PIA); environmental evaluation studies(EES). Environmental audits, environmental compliance monitoring reports; soil, air and water pollution. Organic, inorganic

pollutants in the environment; microbiology of aquatic, terrestrial environments. Carbon trading; acute toxicity testing, bioaccumulation (bioconcentration and biomagnification). Waste disposal (physical, chemical and biological methods) and management (cradle to grave). Microbial indicators for inorganic and organic pollution in water, methods of water and sewage treatment with emphasis on specific microorganisms involved. Techniques for estimation of microbial populations in water (Membrane filtration and multiple tube fermentation techniques). Total and faecal coliform; disease transmission by water. Biochemical and chemical oxygen demand.

MCB 482: Virology & Tissue Culture (2 Units C: LH 30)

Learning Outcomes

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

1. identify virus classification;
2. describe replication and cytopathic effects;
3. discuss isolation, cultivation, purification and assay of viruses;
4. explain culture of viruses in egg yolk, egg white, chicken embryo, monoclonal antibodies; and 5. describe maintenance of plant and animal cells in-vivo**.**

Course Contents

Structure, properties and classification of viruses. Principles of isolation, cultivation and maintenance of plant and animal cells in vivo. Application of cell culture technique in virology; viruses as agents of diseases in animals. General characteristics of plant, animal and bacterial viruses. Viral replication, spread and cytopathic effects. Virus classification, purification and assay.

Regulation of lytic development and maintenance of the lysogenic state in bacteriophages lambda, P2 and 14 single stranded DNA and RNA phageviroids as pathogens.

MCB 431: Petroleum Microbiology (2 Units C: LH 30)

Learning Outcomes

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

1. identify petroleum biogenesis and chemical composition;
2. discuss upstream, midstream and downstream activities in the petroleum industry in Nigeria;
3. explain management of wastes from activities in the petroleum industry;
4. describe petroleum prospecting and recovery of hydrocarbon fluids; microbial oil recovery procedures; microbial influenced corrosion of surface and subsurface assets and control;

5. elucidate reservoir souring, Sulphate Reducing Bacteria and Seawater reinjection challenges; and
6. explain oil spill countermeasures, chemical surfactants and biosurfactants.

Course Contents

Definition of petroleum, types of petroleum and origin of petroleum. Geological formations (types of reservoirs). Exploration and production activities (upstream, mid-stream and downstream activities). Surface assets, subsurface assets, offshore and onshore operations. Drilling wastes, production wastes, management of these wastes. Sanitary water, hydrotest water, produced water, formation water, Injection water, drilling fluids chemical composition, drill cuttings (top hole and bottom hole). Environmental considerations in the discharge of wastes onshore and offshore, cutting reinjection technology and thermo desorption units (TDU). Biogenesis of fossil fuels with emphasis on the role of micro-organisms. Petroleum prospecting; primary recovery. Secondary recovery and tertiary recovery. Microbial corrosion of pipes and equipment. Methanogenesis and methanotrophy. Effects of oil spill on microbial activities in aquatic and terrestrial ecosystems. Biodeterioration and biotransformation of hydrocarbons. Biodegradation of organics. Factors affecting persistence/recalcitrance of organics. Biodegradability testing, bioremediation strategies (In-situ and ex-situ techniques, biostimulation and bioaugumentation) reservoir souring, sulphate reducing bacteria, seawater reinjection challenges. Bacterial desulfurisation and denitrogenisation of crude oil, oil spill countermeasures, surfactants and biosurfactants. Emusification and demulsification.

MCB 491 (490): Research Project (6 Units C: PH 270)

Learning Outcomes

Students will be able to

1. carryout independent research;
2. review relevant literature;
3. arrange data in a scientific manner;
4. make scientific presentations; and
5. identify methods of citing and acknowledging appropriate sources of literature.

Course Contents

A research project to be undertaken on any area of microbiological and/or biotechnological interest. The project should be such that students could complete it (production of final report) within a period of not more than five months.

Minimum Academic Standards