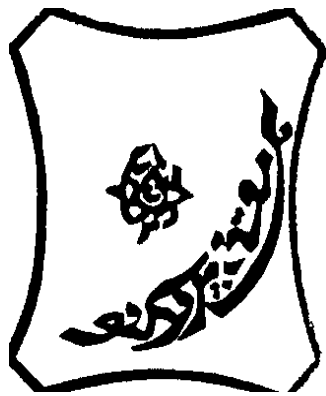


**DEPARTMENT OF MICROBIOLOGY  
BAYERO UNIVERSITY, KANO**



**STUDENTS HANDBOOK**

**PROF. M. YUSHAU**  
**HEAD OF DEPARTMENT**

**MESSAGE FROM THE HEAD OF DEPARTMENT**

On behalf of all the members of the Department of Microbiology, it is my pleasure to welcome you all to Bayero University, Kano and in particular to the Department of Microbiology.

This student handbook has been compiled with the sole objective of providing students with some basic information about the Department, their programme of study and other vital information that will make them law abiding and pursue their studies without much hitches. Often, students are victims of avoidable mistakes and lapses that could be avoided if properly guided by easy access to the necessary information.

This handbook therefore provides some basic information on relevant issues history of the Department, courses offered and their contents, graduation requirements, principal officers of the Department, areas of specialization in Microbiology and career opportunities for graduates of microbiology.

I wish to advice students to show maturity and good character during their stay in the Department, as degrees are awarded to students only after being found worthy both in character and learning.

I want to use this opportunity to encourage you to take all the necessary measures to live a happy, healthy and successful life as prospective microbiology graduates.

I wish you the best of luck in your studies

**Thank you**

**Prof. Muhammad Yusha' u**

**PRINCIPAL OFFICERS OF THE UNIVERSITY**

**VICE CHANCELLOR**

Prof. Sagir Adamu Abbas

**DEPUTY VICE CHANCELLOR (ACADEMICS)**

Prof. Muhammad Sani Gumel

**DEPUTY VICE CHANCELLOR (ADMINISTRATION)**

Prof. Mahmud Sani

**Ag. REGISTRAR**

Prof. Muhammad Sani Gumel

**BURSAR**

Prof. Muhammad Sani Gumel

**LIBRARIAN**

Dr.

**DEAN STUDENT AFFAIRS**

Prof. Shamsuddeen Umar

**PROVOST, COLLEGE OF NATURAL AND PHARMACEUTICAL SCIENCES**

Prof. Tijjani Hassan Darma

**DEAN, FACULTY OF LIFE SCIENCES**

Prof. Usman Aliyu Dutsinma

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## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.2 Historical Background of Microbiology Department

Bayero University, Kano came into existence in 1976, following the Federal Government Policy of creating seven (7) new Second Generation Universities. In the same year, 1976, the Faculty of Science was established. The Faculty of Science started with Departments of Biological Sciences, Chemistry, Mathematics and Physics, with Prof. G.G. Parffit as the foundation Dean. The foundation Head of Biological Sciences Department was Prof. R.A. Shorter and the Department graduated its first set of ten (10) students with B.Sc. Biology, B.Sc. Zoology and B.Sc. Botany in 1980/1981 academic session, with one of the graduates having a First Class Honours degree. The others obtained Second Class Lower Division and Third Class Honours degree. Microbiology as a degree was started in 1988 under the Department of Biological Sciences and the first set graduated in 1991. From that time to date, the Department retained graduants that distinguished themselves as staff members. Microbiology was under Biological Sciences as a Unit until 2011 when it was created as a full pledge Department with Dr. Nasir Tukur Dabo as the Pioneer Head of Department. In 2015, the Faculty of Science was splitted into two (2) new Faculties (Faculty of Life Sciences and Faculty of Physical Sciences) under the umbrella of the newly-created College of Natural and Pharmaceutical Sciences. Thus, the Department of Microbiology is presently under the Faculty of Life Sciences of the College. The Department was run under the Headship of the following staff during the periods indicated against their names (Table 1):

**Table 1: List of Heads of Department of Microbiology (2011 – Date)**

S/Number	Name	Year
1.	Dr. Nasir Tukur Dabo	2011 – 2014
2.	Dr. Abdulkadir Magaji Magashi	2014 – 2018
3.	Prof. Abdullahi Hassan Kawo	2018 – 2023
4	Prof. Muhammad Yusha' u	2023 – Date

#### 1.2 Microbiology Programme

Microbiology is the scientific study of different kinds of microorganisms. It is perhaps the most vibrant area of current research. Not only has the understanding of bacteria and virus led to the eradication of many diseases, microorganisms are now manipulated and persuaded to serve as agents in biotechnology and industries and to improve agricultural yield through biological control. The B.Sc. Microbiology Programme is designed to produce competent Microbiologists who are professionally equipped to meet the current and future medical, pharmaceutical, agricultural, industrial and environmental needs of the Nigerian and international societies.

#### 1.3 Structure of the Programme

The B.Sc. Microbiology Programme places emphasis on formal lectures and laboratory sessions with the University. A UTME student needs a minimum of four (4) academic sessions and a Direct Entry student, a minimum, of three (3) academic sessions for him/her to graduate with a degree in Microbiology. At the beginning of second semester of the third year (Level 300), a student undergoes an Industrial Attachment Programme (SIWES) of six (6) months under the joint supervision of an Institution-based and Industry-based staff. At the beginning (First Semester) of the final year (Level 400), a student is given a Review Essay (Seminar) and

Research Project (Dissertation) topics, which involve library and laboratory bench and/or field work, followed by seminar presentation and dissertation defense before the Internal and External Examiners. The syllabi emphasize on both theoretical and applied aspects of Microbiology.

## **1.4 Mission and Vision of the Microbiology Programme**

### **1.4.1 Mission of the Programme**

The mission of the Microbiology Programme focuses on the training of Microbiologists who will provide the manpower requirements for industries, self employment and employers of people through expertise in the theoretical and practical knowledge of Microbiology and Biotechnology.

### **1.4.2 Vision of the Programme**

The Department of Microbiology is basically established and therefore structured to serve as a center of academic excellence and a reference point for teaching and training high-caliber, practically-oriented, highly-motivated, self-employable and enterprising graduates for public and private organizations in Nigeria and the world at large. On the overall, the Programme is aimed at providing Microbiology education that is well grounded in both theoretical knowledge and experimental skills in the fields of Microbiology.

## **1.5 Philosophy of the Programme**

The Basic Philosophy of the Microbiology Programme in keeping with the fundamental Philosophy of the University at large is designed to encourage and promote the training of the students in all aspects of Microbiology. To meet the nation's manpower needs of Microbiologists, there is need to get the maximum out of every student's potentials. Thus, efforts are always made to develop each student's abilities and skills. Microbiology Programme is designed to train mission-oriented Microbiology experts who will, upon graduation, become competent professionals who will be able to relate their studies to practical real-life situations by promoting microbiological activities that positively respond to national aspiration and food security, job, wealth creation, affordable health care delivery and sustainable development. This is achieved by motivating the students, and having regular and frequent discussion between each student and his/her Academic Adviser/Level Coordinator. As much as possible, tutorial classes are organized during which topics discussed in the lectures are further explained and solutions to home works and exercises (assignments) are explained through interactive discussion with the students. Furthermore, we believe that there is need to maintain an optimal balance of academic excellence, morality and professionalism.

## **1.6 Objectives of the Programme**

The objectives for setting up the Programme of Microbiology are as follows:

- (a) Introduce students to the various types of microorganisms and their parasitic coexistence with man.
- (b) Groom students in the principles and theories of Microbiology.
- (c) Develop the student's skills in operating routine laboratory instrument and advanced research equipment. The graduates are trained for job opportunities in Medical Laboratories, Biotechnology, Food and Pharmaceutical Industries, Agricultural and Veterinary Establishments, Research Institutes, Environmental Protection Agencies and Educational Institutions.

- (d) The practical training both in the laboratory and industrial establishments prepare graduates to be self-employed and become employers of labour.
- (e) To undertake research in areas of Biology, Biotechnology and Microbiology equivalent to highest standard of investigation.
- (f) Provide thorough grounding chemical, biochemical and microbiological research techniques.
- (g) Inculcate in the students, an awareness of the potentials of microorganisms in Biology, Agriculture, Petroleum and Environmental researches.
- (h) Develop students' intellectual capacity to successfully pursue graduate and post-graduate studies in the various specialized fields in Microbiology. It provides a broad-based academic training upon which graduates of the Programme can build to pursue higher degrees of M.Sc., M.Phil. and PhD in Microbiology and other related science disciplines.
- (i) Prepare students for career in teaching, research and public as well as private enterprises in addition to relevant industries.
- (j) To instill in students a sense of enthusiasm for Microbiology, an appreciation of its applications in different contexts and to involve them in an intellectual stimulating and satisfying experience of learning, studying and research.

## CHAPTER TWO

### 2.0 ACADEMIC MATTERS

#### 2.2 Admission Requirements

- i. For entry into 100 Level:  
Five (5) SSCE/GCE/NECO/ O-Level credits obtained in not more than two (2) sittings including Mathematics, Physics, Chemistry, Biology and English Language.
- ii. For direct entry into 200 Level:

Minimum of five (5) subjects passed at not more than two (2) sittings with at least (two) 2 A-level and three O-Level or OND Upper Credit with minimum of three (3) O-level credits in the major subjects OR minimum of IJMB with eight (8) points with at least five (5) passes at O-Level in the relevant subjects, three (3) of which must be at credit levels.

#### 2.2 Academic Counseling/Level Coordination

Students are assigned to Academic Advisers called Level Coordinators in the Department by the Head of Department (HOD). The Academic Adviser (Level Coordinator), having acquainted himself/herself with academic matters and University requirements and regulations, closely monitors the academic performance of students assigned to him/her and guides them in their choice of courses. Academic Advisers are expected to regularly draw the attention of the Department to students that need special counseling. It is thus important for students to get proper advice and/or guidance from their assigned Academic Adviser, regarding the number and relevance of the courses to register for. The Microbiology Programme is based on the NUC BMAS guidelines. This is a system of study where courses are divided into levels and units. Students are expected to register a certain minimum number of credit units at a particular level to qualify for graduation. The system allows students to repeat failed courses at a higher level (i.e., carry over) except, when such a failed course(s) are a pre-requisite to courses at the higher levels. With this agreement, students can graduate at their pace but within the specified periods of study approved by the University. A unit is awarded to a course of 15 hours of lectures or of 45 hours of practical per semester. Table 2 below presents the minimum and maximum credits load distribution across all the levels of study for both the UTME and DE students.

**Table 2: Distribution of Credits Load According to Academic Levels of Study**

Level of Study	Minimum Credits Load	Maximum Credits Load
100	34	34
200	39 (UTME) / 43 (DE)	45 (UTME) / 49 (DE)
300	30	36
400	32	34
Spill-Over I	32	34
Spill-Over II	32	34

#### 2.3 Teaching and Assessment

##### 2.3.1 Student Class Attendance

Regular and punctual attendance of students at lectures, tutorials, laboratory and practical sessions, etc., is compulsory in order for them to achieve their potential in class and to develop desirable personal traits necessary to succeed in employment. Students' attendance at scheduled classes/tutorials is taken in every class/tutorial session(s) and counter-signed by the Lecturer-In-



Charge. Attendance Registers for every course are cross-checked by the HOD from time to time. Every student is required to meet a minimum of 75% class attendance in order to qualify to write examination in a given course.

### 2.3.2 Semester Examination and Continuous Assessment

Assessment of student work is continuous and accounts for 40% of the total assessment for the course. The Continuous Assessment (CA) consists of two (2) to four (4) test exercises (in form of tests, quizzes, practical work and reports as well as other assignments), which sums up to forty percent (40%). Every student is expected to partake in Continuous Assessment. Final examinations for courses are held at the end of the semester, which constitutes sixty percent (60%) of the total score for the course except that in purely practical courses where the final examination constitutes forty percent (40%).

## **2.4 Graduation Requirements**

To graduate, a student should have undergone three (3) or four (4) years of study depending on his/her entry point (DE or UTME respectively), including six (6) months industrial training/attachment (SIWES). Course workload must meet the graduation requirements of Bayero University, Kano, Nigeria. Each student must earn a minimum of 135 credit units for the four (4) years Programme (UTME) and 139 credits for the three (3) years Programme (DE) while the maximum stands at 149 and 153 credit units respectively (Table 2). The submission of an undergraduate Project Report (Dissertation) based on supervised research is a graduation requirement, which must not be compromised.

### CHAPTER THREE

#### 3.0 LIST OF COURSES AND THEIR DESCRIPTION

#### 3.1 List of Courses for B.Sc. Microbiology Programme

##### LEVEL 100

##### First Semester Core Courses

Course Code	Course Title	Credit Load
BIO 1201	General Biology I	2
BIO 1203	General Biology III	2
CHM 1231	Inorganic Chemistry	2
CHM 1241	Organic Chemistry	2
GSP 1201	Use of English	2
MTH 1301	Elementary Mathematics I	3
PHY 1170	Physics Practical I	1
PHY 1210	Mechanics	2
PHY 1220	Electricity and Magnetism	2
<b>Total</b>		<b>18</b>

##### Second Semester Core Courses

Course Code	Course Title	Credits Load
BIO 1202	General Biology II	2
BIO 1204	General Biology IV	2
CHM 1251	Physical Chemistry	2
CHM 1261	Chemistry Practical	2
GSP 1202	Use of Library, Study Skills and ICT	2
PHY 1180	Physics Practical II	1
PHY 1230	Behaviour of Matter	2
MTH 1303	Elementary Mathematics II	3
<b>Total</b>		<b>16</b>

##### LEVEL 200

##### First Semester Core Courses

Course Code	Course Title	Credits Load
MCB 2201	General Microbiology I	2
BIO 2201	Genetics I	2
BIO 2202	Introductory Ecology	2
BIO 2203	General Physiology	2
BCH 2301	General Biochemistry I	3
CHM 2241	Organic Chemistry	2
CHM 2251	Physical Chemistry	2
CSC 2201	Introduction to Computer Science	2
GSP 2201	Use of English	2
GSP 2206	Peace Studies and Conflict Resolution	2
<b>Total</b>		<b>21</b>

**Elective Courses**

<b>Course Code</b>	<b>Course Title</b>	<b>Credits Load</b>
BOT 2202	Seedless Plants	2
BOT 2203	Seed Plants	2
ZOO 2202	Chordata	2

**Second Semester Core Courses**

<b>Course Code</b>	<b>Course Title</b>	<b>Credits Load</b>
MCB 2202	General Microbiology II	2
BCH 2302	General Biochemistry II	3
MCB 2204	Basic Microbiological Techniques	2
BIO 2206	Biostatistics	2
MCB 2208	Molecular Biology	2
CHM 2231	Inorganic Chemistry	2
GSP 2202	Use of Library, Study Skills and ICT	2
GSP 2204	Foundation of Nigerian Culture, Government and Economy	2
GSP 2205	Logic and Philosophy	2
ZOO 2301	Invertebrata	3
<b>Total</b>		<b>22</b>

**LEVEL 300****First Semester Core Courses**

<b>Course Code</b>	<b>Course Title</b>	<b>Credits Load</b>
MCB 3102	Field Course I	1
BIO 3207	Biosystematics	2
MCB 3204	Environmental Microbiology	2
MCB 3209	Food Microbiology	2
MCB 3301	Microbial Genetics and Molecular Biology	3
MCB 3302	Pathogenic Bacteriology	3
MCB 3303	Principles of Immunology and Chemotherapy	3
MCB 3306	Microbial Physiology	3
MCB 3308	Pathogenic Mycology	3
EEP 3201	Entrepreneurship and Innovation	2
<b>Total</b>		<b>24</b>

**Elective Course**

<b>Course Code</b>	<b>Course Title</b>	<b>Credits Load</b>
ZOO 3305	Basic Entomology	3
ZOO 3301	Protozoology	3

**Second Semester Core Courses**

Course Code	Course Title	Credits Load
MCB 3699	Students' Industrial Work Experience Scheme	6

## LEVEL 400

### First Semester Core Courses

Course Code	Course Title	Credits Load
MCB 4213	Field Course II	2
MCB 4201	Review Essay (Seminar)	2
MCB 4203	Pharmaceutical Microbiology	2
MCB 4204	Analytical Microbiology and Quality Control	2
MCB 4208	Microbial Ecology	2
MCB 4305	Principles of Epidemiology and Public Health	3
MCB 4307	Industrial Microbiology	3
ZOO 4313	Parasitology	3
<b>Total</b>		<b>19</b>

### Second Semester Core Courses

Course Code	Course Title	Credits Load
BOT 4306	Plant Pathology	3
MCB 4206	Medical Virology and Tissue Culture	2
EEP 4201	Venture Creation and Growth	2
MCB 4699	Research Project (Dissertation)	6
<b>Total</b>		<b>13</b>

### Elective Course

Course Code	Course Title	Credits Load
BCH 4211	Advanced Enzymology	2

## 3.2 Course Description for B.Sc. Microbiology Programme

### LEVEL 100 Courses

#### BIO 1201 - General Biology I

Zoology as a discipline; Characteristics of animals as living things; Cell as the basic unit of life (living things - animals); Cell structure, organization, cellular organelles, tissues, organs and systems in animals; Classification of animals; General reproduction and concepts of inter-relationships in animals; Heredity and evolution; Introduction to basic concepts of animal ecology.

#### BIO 1202 - General Biology II

General survey of the Animal Kingdom; Similarities and differences in external morphology in protozoa, platyhelminthes, annelids, arthropods, fishes, amphibians, reptiles, birds and mammals; General classification (divisions) of animal taxa in the Animal Kingdom.

#### BIO 1203 - General Biology III

Botany as a discipline; Characteristics of plants as living things; Cell as the basic unit of life (living things - plants); Cell structure, organization, cellular organelles, tissues, organs and systems in plants; Classification of plants; General reproduction and concepts of inter-relationships in plants; Heredity and evolution; Introduction to basic concepts of plant ecology.

#### **BIO 1204 - General Biology IV**

General survey of the Plant Kingdom; Similarities and differences in external morphology of bacteria, viruses, algae, fungi, bryophyte, pteridophytes, gymnosperms and angiosperms; General classification (divisions) of plant taxa in the Plant Kingdom.

#### **LEVEL 200 Courses**

##### **MCB 2201 - General Microbiology I**

History of Science and Microbiology; Scope of Microbiology; General characteristics of microorganisms; Classification, growth (open and batch cultures) and reproduction of microorganisms; Morphology (basic structures) of microorganisms and their functions; Germ theory of diseases; Theory of spontaneous generation, Koch's postulates; Control of microorganisms (aseptic procedures including sterilization and disinfection; Brief survey of microbes and friends and foes (in health, environment, etc – the economic importance and industrial uses of microorganisms).

##### **MCB 2202 - General Microbiology II**

Taxonomy (systematic classification); Nomenclature and classification (biological, phylogenetics, artificial, numerical taxonomy) of algae, bacteria, fungi, protozoa and viruses; Type culture and culture collections; Molecular approaches to microbial taxonomy; Microbial variation and heredity; Specific and non-specific immunity; Roles of B-cells and T-cells in immunity; Host-parasite relationships; Normal flora (types and benefits); Biological and biochemical reactions of microorganisms; Microorganisms and biogeochemical cycles of elements in nature.

##### **MCB 2204 – Basic Microbiological Techniques**

Principles of microscopy; Microscopy and calibration of microscopes; Preparation of slides; Introduction to classification of microorganisms; Definitions of basic microbial practical concepts – specimen, sample, etc.; Culture media in biological/microbiological studies; Culture plates; Culturing of microorganisms; Preparation of media for microbial growth – colony, colony counting, stains, types and classes of stains; Isolation of pure cultures – streaking, pour-plating, etc.; Sub-culturing procedures; Staining techniques or differentiation of microorganisms; Gram's staining; Culturing of bacteria, fungi, viruses, reading of culture plates, methods of identifying microbial growth; Parasitological techniques; Photometry; Colorimetry; Enumeration of microorganisms (direct and indirect procedures); Identification of microorganisms (colonial and cellular morphology and biochemical); Principles of genetic analysis (plasmids and transposable genetic elements, mutagenesis and DNA repairs, bacteriophage genetics and genetics of nitrogen fixation); Mechanisms and nature of mutation, induction, isolation and characterization of mutants; Genetic recombination in prokaryotes including transformation, transduction, phage conversion and conjugation; Recent techniques in microbial genetics; Chemical coding and expression of genetic information; Fungal genetics.

### **MCB 2208 – Molecular Biology**

Definition and basic concepts of Molecular Biology; History and role of Molecular Biology; Microscopy (compound light microscope, bright-field microscope, dark-field microscope, phase-contrast microscope, fluorescence microscope, electron microscope, transmission-electron microscope, scanning-electron microscope); Other techniques of Molecular Biology (PCR, blotting); Autoradiography; Cell cycles; Mitosis; Cytokinesis; Introduction to Cytogenetics; Chromosome and genes, Nuclear divisions (mitosis, meiosis); Nucleic acids; DNA replication ; RNA; Protein synthesis ; Transcription; Translation; Structure, biogenesis and functions of: Cell membrane, microtubules, micro filaments, Golgi bodies, mitochondria, endoplasmic reticulum; Membrane-membrane functions (types of membrane transport, passive transport, osmosis, diffusion, facilitated diffusion, active transport, pumps); Introduction to bioenergetics and thermodynamics

### **BCH 2301 – General Biochemistry I**

Acidity and alkalinity; pH and pKa values and their effects on cellular activities; Buffers; Chemistry/structures of carbohydrates, lipids and nucleic acids; Chemistry of amino acids, proteins and their derivatives; Methods of isolation and identification; Primary, secondary, tertiary and quaternary structures of proteins; Determination and biochemical applications of the structures of proteins; Nomenclature of nucleosides and nucleotides; Effects of acid and alkali on hydrolysis of nucleic acids; Structures of DNA and RNA; Prokaryotic versus eukaryotic organisms.

### **BCH 2302 – General Biochemistry II**

Introduction to enzymes; Types, properties, classification and nomenclature of enzymes; Enzyme catalysis; Factors affecting rate of enzyme-catalyzed reactions; Biological oxidations and bioenergetics; Gibb' s equation; Chemical coupling; Phosphorylations, ATP and NADPH cycles; Metabolism; Introduction to metabolism of carbohydrates and lipids; Chemistry of nucleic acids.

### **LEVEL 300 Courses**

#### **MCB 3102 - Field Course I**

This involves short visits by members of academic staff and students to industrial establishments such as NAFDAC, food industries, health institutions, etc. Here, students carry out sampling techniques in local habitats, qualitative and quantitative study of microorganisms in terrestrial, aquatic and arboreal habitats. The students may be required to replicate or carry out what they saw in the industry in their school laboratory and a comprehensive report submitted to the Department.

#### **MCB 3301 - Microbial Genetics and Molecular Biology**

Pre-requisites: BCH 2301, BIO 2201, BIO 2202, MCB 2202, MCB 2201

A survey of the current status of Microbial Genetics (bacteria, viruses, protozoa and fungi) including discussion on methods and findings in the area of mutagenesis; Mechanisms and nature of inductions, isolation and biochemical characterization of mutants; Principles of genetic analysis (genetic recombination in prokaryotes including adaptation, transformation, transduction, phage conversion and conjugation); Plasmids and transposable genetic elements; Mutagenesis and DNA repairs; Bacteriophage genetics and genetics of nitrogen fixation; Recent

and specialized techniques in Microbial Genetics; Chemical coding and expression of genetic information; Fungal genetics and mitotic recombination in lower eukaryotes; Principles and applications of Genetic Engineering; DNA replication; Transcription and protein synthesis; Experiments with virulent phages, temperature phages and lysogenic bacteria.

### **MCB 3302 - Pathogenic Bacteriology**

The morphology, life cycle and biochemical characteristics of bacteria; Systematic study of bacteria and other prokaryotes – their structure, characteristics, identification and isolation; History of pathogenic bacteriology; Host-parasite relationships; Pathogenic microorganisms and concept of disease, virulence, spectrum and symptoms of infection, treatment and control; Koch's postulates; Mechanisms for bacterial pathogenicity; Spectrum, symptoms and virulence factors in pathogenic bacteria; Pathogenesis, epidemiology, mode of transmission, treatment, prevention and control of bacterial diseases of the upper and lower respiratory tract; Bacterial infections of the skin and wound; Nosocomial infections; Bacterial infections of the gastrointestinal tract; Sexually-transmitted diseases (treatment and control); Epidemiology of diseases; Laboratory techniques for isolation, characterization and identification of pathogenic bacteria; Serological and other diagnostic procedures; Principles and use of enrichment, selective and differential bacteriological media; Opportunistic pathogens and their relationship with the normal bacterial flora in humans.

### **MCB 3303 – Principles of Immunology and Chemotherapy**

Pre-requisites: BCH 2301, BIO 2201

Introduction, historical background and basic concepts of immunology; Structure of antigens; Antigenic determinants; Cellular response; Genetics of response to antigenic stimulation; Structure and classification of immunoglobulins and antibodies; Mechanisms of antibody formation; Antigen-antibody interactions; Role of lymphoid tissues and thymus in immune-responses; Hypersensitivity; Immuno-pathology; Auto-pathology; Auto-immunology; Tumor and transplantation immunology; Immuno-prophylaxis; Modern techniques in immunology and immunochemistry; Principles of chemotherapy; History of chemotherapy; Basic pharmacodynamics and pharmacokinetics; Chemotherapeutic agents (antibacterial, antifungal, antiviral anti-protozoan and anti-helminths); Modes of actions of antimicrobials; Chemotherapy of specific diseases; Drug bio-assays and sensitivity tests.

### **MCB 3204 - Environmental Microbiology**

Pre-requisites: BIO 2202, MCB 2201, MCB 2202

Impact of human activities on the value of natural resources; Assessment of microbial contamination of soil, water and air in relation to the deterioration of the environment; Soil, air and water pollution (sources of the pollution, indices of the pollution, physical and microbiological properties of the pollution in the different respective environments); Microorganisms and other organisms of importance in aquatic systems and disposals; Ecology of microorganisms in water; Pollution and self-purification of water; Methods of water and sewage purification/treatment with emphasis on specific microorganisms involved; Brief studies of marine microbiology; Disease transmission by water (water-borne diseases, water-related, diseases, water-associated diseases, etc); Microbiological examination of waters; Water quality standards; Microbiology and management of waste disposal (refuse and sewage); Biochemical

(biological) oxygen demand (BOD) and chemical oxygen demand (COD); Tests for sewage and water; Biodegradation of pollutants and recalcitrants.

### **MCB 3306 - Microbial Physiology and Metabolism**

Pre-requisites: BCH 2301, MCB 2201, MCB 2202

Aspects of Microbial Physiology; Review of cell structure and functions; Growth and death of microorganisms; Nutritional types of different bacteria in relation to their energy metabolism and biosynthetic activities (carbohydrates, proteins, lipids, nitrates, sulphates and carbonates); Biosynthetic pathways (glycolysis, transition reaction, Embeden-Meyerhof pathway, generation of pyruvic acid, end products – pyruvic acid, NADH and ATP, TCA cycle); Review of microbial cell structures including the cytochemistry and functions of cell organelles; Aerobic and anaerobic dissimilation; Monomer and polymer synthesis; Active transport across the cell membrane.

### **MCB 3308 - Pathogenic Mycology**

Pre-requisites: MCB 2201, MCB 2202

Detailed account of the systematic, morphology, life cycles, physiology and dissimilation of fungi with particular reference to those of economic importance in industry and agriculture; Structure, reproduction and classification of pathogenic fungi; Cutaneous, subcutaneous and systemic mycoses (aetiology/morphology, geographical distribution, clinical features, pathogenesis, epidemiology, diagnosis, immunology, treatment, prevention and control); Opportunistic mycoses (actinomycetes, dermatophytosis, candidiasis, cryptococcosis, aspergillosis.); Poisonous mushrooms and mycotoxins (aetiology/morphology, geographical distribution, clinical features, pathogenesis, epidemiology, diagnosis, immunology, treatment, prevention and control); Laboratory methods of study; pathology and immunology of superficial systemic mycoses and actinomycoses.

### **MCB 3209 - Food Microbiology**

Pre-requisites: BCH 2301, MCB 2201, MCB 2202

The distribution, role and significance of microorganisms in foods; Intrinsic and extrinsic parameters of food that affect microbial growth; Microorganisms as indices of food sanitary quality; Microbiological standards of foods; Principles and practice (methods) of food preservation and food hygiene; Microorganisms as food (concept of single-cell protein technology – SCP-T); Diseases of animals transmissible to man via animal food products; Food contamination and spoilage of various types of foods and food-borne diseases; Microbiology of specific foods, e.g., *gari*, *fufu*, *kosai*, pap (*koko*), beverages, etc; Food quality control;

### **MCB 3399 - Students' Industrial Work Experience Scheme (SIWES)**

For students in practice-oriented disciplines like Microbiology, satisfactory completion of a six (6) month period of approved industrial work experience is required for a degree. The practical experience/training should be carried out in a professorial office, a firm or industry, having relevant and capable technology facilities. Students are posted to industrial establishments such as food processing, distillery, pharmaceutical, research institutes or medical and/or health



institutions during long vacation. The purpose of the Programme is to relate theory to practice and understand its application in the reality of a demanding profession. It is essential that the student obtains a wide range of experience both in office, site work, and within the factory as applicable. To ensure this, the student must keep a record of work in the office, site or factory for assessment by the University staff. At the end of the period, the work done by the student, submitted in form of a report (technical report), would be examined jointly by the Supervisor on site/industry and an academic staff.

### **LEVEL 400 Courses**

#### **MCB 4201 - Review Essay (Seminar)**

This involves the collection of literature on contemporary issues in Microbiology from various sources and organization of same in form of a scientific report. Detailed literature search followed by presentation at a Departmental Seminar of a scientific topic in Medical, Environmental, Pharmaceutical, Food and Industrial Microbiology and Biotechnology under the supervision of an academic staff. Each student shall make an oral presentation of the write-up in class. After the oral presentation, the corrected write-up is finally bound and submitted to the Department.

#### **MCB 4213 - Field Course II**

Pre-requisite: MCB 3102

This involves short visits by members of academic staff and students to industrial establishments such as NAFDAC, food industries, health institutions, etc. Here, students carry out sampling techniques in local habitats, qualitative and quantitative study of microorganisms in terrestrial, aquatic and arboreal habitats. The students may be required to replicate or carry out what they saw in the industry in their school laboratory and a comprehensive report submitted to the Department.

#### **MCB 4203 - Pharmaceutical Microbiology**

Pre-requisites: MCB 2201, MCB 2202, BCH 2301

The chemistry, production and mode of action of synthetic chemotherapeutic agents and antibiotics; Production and synthesis of antibiotics, antimicrobial agents and antiseptics; Quality control of pharmaceutical products; Concepts of growth and death in microorganisms; The mode of action and assay of antimicrobial agents; Concepts of antibiotic sensitivity and resistance as related to microbial physiology; Relationships of antimicrobial agents to different microbial groups (Gram-positives, Gram negatives, spore-formers, etc); Mechanisms of drug resistance; Antimicrobial activity of herbs and spices; Modes of action and assay of antibiotics and antiseptics; Microbiological quality control in the Pharmaceutical industry.

#### **MCB 4204 - Analytical Microbiology and Quality Control**

Pre-requisites: MCB 2201, MCB 2202, BCH 2301

Microorganisms as agents in quantitative analysis; Selection of test organisms for assay (antibiotics, amino acids, vitamins, etc); Response of microorganisms used in assays; Obtaining and measuring responses; Preparation of assay samples; Methods of assays; Interpretation of results; Aspects of quality control; Plant and equipment sanitation; Microbiological and specifications.

### **MCB 4208 - Microbial Ecology**

Pre-requisites: MCB 3204, BIO 2202, MCB 2201, BCH 2301

Microbes and ecological theory; Physiological, morphological and genetic adaptations of microorganism to their environments; Microbial interactions; Microorganisms in natural ecosystems; The life of microorganisms in air, springs, rivers, lakes and seas; Microbial bioconversions (cycling of elements in water and sediments); Biogenesis of fossil fuels with emphasis on the role of microorganisms; Petroleum prospecting and secondary recovery; Microbial corrosion of pipes and equipments; Methanogenesis and methanotrophy; Effects of oil spill on microbial activities in aquatic and terrestrial ecosystems; Biodeterioration and biotransformation of hydrocarbons.

### **MCB 4305 - Principles of Epidemiology and Public Health Microbiology**

Pre-requisites: MCB 2201, MCB 2202, MCB 3302

Definition and general characteristics of endemic, epidemic and pandemic diseases; Statistical applications to Epidemiology; Nature of epidemiological investigations; Spectrum of infections; Hard immunity; Latency of infections; Multi-factorial systems in epidemics; Zoonoses; Antigenic drifts; Communicable diseases (types and control); Nosocomial infections; Emerging and re-emerging infections; Antimicrobial resistance and re-emergence of infectious diseases; Ecological and social factors influencing the emergence and development of diseases; Biological products for immunization; Non-communicable diseases (types and factors influencing prevalence and control).

### **MCB 4306 - Medical Virology and Tissue Culture**

Pre-requisite: MCB 2201, MCB 2202

System virology; Viruses pathogenic to man and animals (with emphasis on virulence, types of diseases caused, methods of control, prevention, diagnosis and epidemiology); Experiments with bacteriophages and representative animal viruses to demonstrate characteristics of viruses and viral virulence; Methods of viral cultivation, purification, identification and assay with special reference to tissue culture techniques, cell culture (suspension and monolayer cell culture), embryonated eggs, laboratory animals, etc; Nature of viral virulence; Regulation of lytic development and maintenance of the lysogenic state in bacteriophages lambda, P2 and 14 single-stranded DNA and RNA phage-viroids as pathogens.

### **MCB 4307 - Industrial Microbiology**

Pre-requisites: MCB 2201, MCB 2202, MCB 3306, BCH 2301

Nature/scope of Industrial Microbiology; Characteristics of microorganisms of industrial importance; Introduction to fermentation systems; Design and use of fermenters; Aspects of the biology of molds and yeasts; Actinomycetes of importance in various fermentations; Culture techniques and maintenance of selected cultures; Mutation, strain selection and development; Sources and strain improvements of industrial microorganisms; Microbial growth and product formation in industrial processes; Hybridization; Media formulation and economics; Optimization of fermentation media at laboratory scale; Perimeter design operation; Antifoams; Aspects of biochemical engineering; Patents and patent laws; Biodegradation of industrial raw materials and products; Microbiological production of dextrans, organic acids, lactic acid, gluconic acid, itaconic acid, citric acid, acetic acid, oxalic acid and vinegar; Mass cultivation of microorganisms; Manufacture of commercial baker's yeast; Production of mushroom inoculum;

Manufacture of *Rhizobium* inoculants; Viral vaccine production; Production of bacterial toxoids; Biocatalysts and their immobilization.

### **BCH 4211 - Advanced Enzymology**

Pre-requisites: BCH 2301, BCH 2302, MCB 3209, MCB 3306

Criteria for determining purity of enzymes; Enzymes assay; Chemistry of enzyme catalysis; Transient kinetic methods; Steady state enzyme kinetics; Multi-enzyme complexes; Regulatory enzymes; Molecular models for allosterism; Enzyme reconstitution; Regulations of enzyme activity and synthesis; Genetics of enzymes; Mechanisms of enzyme-catalyzed reactions; Michaelis-Menten equation, Allosteric/regulatory enzymes; Activity sites of enzymes; Estimation of kinetic parameters-enzymes activities ( $K_m$ ,  $V_{max}$ ,  $K_i$ , etc); Zymogen activation; Digestive enzymes.

### **MCB 4699 - Research Project (Dissertation)**

Pre-requisites: MCB 3102, MCB 3399, MCB 4201, MCB 4213

This involves a research project and dissertation to be undertaken on any type of microbiological and/or biotechnological interest. Each final year student is required to carry out an original research project under the supervision of an academic staff member. The findings of the research are presented by the student at a Departmental Seminar. A dissertation is prepared, bound and submitted by the student for evaluation by the Department, and is defended in a *viva voce* before an External Examiner.

## CHAPTER FOUR

### 4.0 ACADEMIC AND NON-ACADEMIC COMMUNITY OF MICROBIOLOGY DEPARTMENT

#### 4.1 Staff Profiles of the Department

The Department has thirty (30) staff (23 Academic, 03 Administrative, 02 Technologists and 02 Technical staff). They are as follows (Professor – 06, Reader – 03, Senior Lecturer – 06, Lecturer I - 03, Lecturer II – 03, Assistant Lecturer – 02, Administrative staff – 03, Technologists – 02 and Technical staff - 02). Table 3 below presents the profiles of all the academic and non-academic (administrative and technologists/technical) staff of the Department of Microbiology.

**Table 3: List of Academic and Non-Academic Staff of Microbiology Department**

Academic Staff				
S/N	NAME	HIGHEST QUALIFICATION	RANK	AREA OF SPECIALIZATION
1	Prof. Muhammad Yusha'u	PhD	Professor	Pharmaceutical Microbiology
2	Prof. Muhammad Dauda Mukhtar	PhD	Professor	Pharmaceutical/Medical Microbiology
3	Prof. Auwalu Halliru Arzai	PhD	Professor	Medical/Pharmaceutical Microbiology
4	Prof. Dalha Wada Taura	PhD	Professor	Medical Microbiology
5	Prof. Abdulkadir Magaji Magashi	PhD	Professor	Food/Molecular Industrial Microbiology
6	Prof. Nasir Tukur Dabo	PhD	Professor	Medical Microbiology/Parasitology
7	Prof. Abdullahi Hassan Kawo	PhD	Professor	Environmental Microbiology
8	Prof. Shamsuddeen Umar	PhD	Professor	Food/Industrial Microbiology
9	Prof.. Usman Aliyu Dutsinma	PhD	Professor	Medical Microbiology (Medical Virology/Parasitology)
10	Prof. Aminu Bukar	PhD	Professor	Food/Industrial Microbiology
11	Prof. Bashir Mohammed	PhD	Professor	Medical/Pharmaceutical Microbiology
12	Dr. (Mrs.) Aishatu Ibrahim Aminu	PhD	Reader	Medical Microbiology
13	Dr. (Mrs.) Binta Muhammad Aminu	PhD	Reader	Medical/Pharmaceutical Microbiology
14	Dr. Sani Yahaya	PhD	Reader	Environmental Microbiology/Environmental Biogeochemistry
15	Dr. Habibu Usman	PhD	Reade	Medical

	Abdu			Microbiology/Molecular Entomology
16	Dr. Ibrahim Yusuf	PhD	Senior Lecturer	Environmental/Medical Microbiology
17	Mal. Muhammad Rabi' u Kabir	M.Sc.	Lecturer	Environmental Microbiology/Biotechnology
18	Dr. Abdullahi Balarabe Inuwa	M.Sc.	Senior Lecturer	Environmental Microbiology
19	Dr. Aisha Kabir	M.Sc.	Senior Lecturer	Food/Industrial Microbiology
20	Dr. Ruqayya Abbas Usman	M.Sc.	Senior Lecturer	Food/Industrial Microbiology
21	Mrs. Maryam Idris Musa	M.Sc.	Lecturer II	Microbiology/Bioengineering
22	Mrs. Abida Muhammad Tukur	M.Sc.	Lecturer II	Microbiology/Biotechnology
23	Mr. Fasogbon Albert Oluwasaga	M.Sc.	Lecturer II	Pharmaceutical Microbiology
24.	Ahmad Bello Salim.	M. Sc.	Lecturer II.	Medical Microbiology
25	Mrs. Binta Lawan Musa.	M. Sc.	Assistant. Lecturer	Environmental Microbiology
<b>Technologists/Technical Staff</b>				
26	Mal. Idris Bala	M.Sc.	Principal Technologist	Microbiology
27	Mal. Umar Sani	ND/SLT	Higher Technician	Microbiology
28	Mrs. Fiddausi Ado Dandawaki	B.Sc.	Technologist II	Microbiology
29	Mal. Abba Auwalu Arzai	B.Sc.	Technologist I	Microbiology
30.	Mr. Alexander Nalfa Jangbut	B. Sc.	Technologist I.	Microbiology
<b>Administrative Staff</b>				
31	Mal. Yusuf Tafida	PGD	Senior Confidential Secretary	Information Management/General Administration
32	Mrs. Fatima Abubakar	WASC/SSCE	Senior Messenger	General Sanitation
33	Mal. Saminu Isa	WASC/SSCE	Cleaner	General Sanitation

#### 4.2 Principal Officers of the Department of Microbiology

The Departmental Community comprises of all the Principal Officers of the Department (academic and non-academic staff) and various students of the five (5) areas of specialization (Environmental Microbiology, Food Microbiology, Industrial Microbiology, Medical Microbiology and Pharmaceutical Microbiology) in the Programme. Table 4 below provides the

list of Principal Officers of the Department and their responsibilities (roles they play) in the general administration of the Department for the 2018/2019 and 2019/2020 academic sessions.

**Table 4: List of Principal Officers of Microbiology Department (2018/2019 – 2019/2020)**

<b>S/No.</b>	<b>Name of Officer</b>	<b>Responsibility</b>
1	Prof. Muhammad Yusha'u	Head of Department/Chief Examiner
2	Dr. Abdullahi Balarabe Inuwa	Departmental Examinations Officer
3	Dr. Aishatu Ibrahim Aminu	PG (M.Sc. and PhD) Coordinator
4	Dr. Habibu Usman Abdu	Assistant PG (M.Sc. and PhD) Coordinator
5	Mrs. Abidah Muhammad Tukur	Level 100 Coordinator
6	Mrs. Binta Lawan Musa	Level 200 Coordinator
7	Mal. Ahmad Bello Salim	Level 300 Coordinator/PGD Coordinator
8	Dr. (Mrs.) Rukayya Abbas Usman	Level 400 Coordinator
9	Dr. Habibu Usman Abdu	Spill-Over I Coordinator
10	Dr. Sani Yahaya	Spill-Over II Coordinator/Assistant Examinations Officer
11	Dr. Aminu Bukar	Admissions Officer
12	Dr. (Mrs.) Aisha Kabir	Field Course/SIWES Coordinator
13	Mal. Yusuf Tafida	Administrative/Senior Confidential Secretary
14	Mal. Idris Bala	Principal Senior Technologist

## CHAPTER FIVE

### 5.0 SPECIALIZATIONS AND CAREER OPPORTUNITIES IN MICROBIOLOGY

#### 5.1 Specializations in Microbiology

Modern Microbiology is a large discipline with different specialized areas. This is because the entire ecosystem depends on the activities of microorganisms and microorganism influence human society in countless ways.

#### 5.2 Basic Aspects of Microbiology

The basic branch of Microbiology is concerned with the study of the biology of microorganisms. Fields of study here include the following:

- (i) Bacteriology - This is the study of bacteria.
- (ii) Mycology - The study of fungi such as yeasts and molds.
- (iii) Algology/Phycology – This is the study of algae
- (iv) Protozoology – This is the study of protozoa; a branch of Protozoology called Parasitology deals exclusively with the parasite or disease-producing protozoa and other parasitic micro and macro organisms.
- (v) Microbial Cytology – This is the study of the structures of microbial cells.
- (vi) Microbial Physiology – This is the study of the nutrients that microorganisms require for metabolism and growth and the products that they make from nutrients.
- (vii) Microbial Genetics - This focuses on the nature of genetic information in microorganisms in microorganisms and how it regulates the development and functions of cells and organisms.
- (ix) Microbial Taxonomy - This is the study of the classification of microorganisms or the grouping of microorganisms.
- (x) Microbial Biochemistry – This deals with the discovery of microbial enzymes and the chemical reactions they carry out.

#### 5.3 Applied Aspects of Microbiology

The applied aspects of Microbiology deal with practical applications of microorganisms to solve problems related to diseases, water and waste water treatment, food spoilage, food preservation and food production. The various fields of study in Applied Microbiology include the following:

- (i) Medical Microbiology - Studies the causative agents of diseases, diagnostic procedures, diagnostic procedures for identification of the causative agents and preventive measures.
- (ii) Agricultural Microbiology - This is the study of microbial processes in the soil to promote plant growth. It involves the study of soil microorganisms which has led to the discovery of antibiotics and other important chemicals. It also deals with the methods of combating plant and animal diseases caused by microbes, methods of using microbes to

- increase soil fertility and crop yields. Currently much work is being done on using bacterial and viral insect pathogens to substitute chemical pesticides.
- (iii) Industrial Microbiology - This is the large scale growth of microorganisms for the production of medicinal products such as antibiotics and vaccines; fermented beverages; industrial chemicals; production of hormones and proteins by genetically engineered microorganism.
  - (iv) Aquatic/Marine Microbiology - This deals with microbial processes in lakes, rivers, and the oceans. It also examines issues that concerns water purification; microbiology examination; biological degradation of waste.
  - (v) Public Health Microbiology – This is closely related to Medical Microbiology. It deals with the identification and the control of the spread of communicable diseases. It involves monitoring of community food establishments and waste supplies so as to keep them safe and free from infectious agents.
  - (vi) Immunology - This deals with how the immune system protects the body from pathogens and the response of infectious agents. It also involves practical health problem such as the nature and treatment of allergies auto immune diseases like rheumatoid arthritis.
  - (vii) Food and Dairy Microbiology – This deals with the use of microbes to make foods such have cheese, yoghurt, wine and beer. It also deals with the methods of preventing microbial spoilage of food and the transmission of food-borne diseases such as botulism and salmonellosis. Microorganisms are also used as single cell protein, which is an important source of protein or nutrients to livestock and humans.
  - (viii) Aeromicrobiology – This deals with the study of advances thought in the dissemination of diseases in the air, contamination and spoilage.
  - (ix) Exomicrobiology – This deals with the study of exploration for life in outer space.
  - (x) Petroleum Microbiology – This studies the coal, mineral and gas formation; prospecting for deposits of coal, oil and gas and recovery of minerals from low-grade ores.
  - (xi) Environmental Microbiology/Microbial Ecology – This is the study of microorganisms in their natural environments. It also studies the global and local contributions to nutrients cycling. In addition, it employs microorganisms in bioremediation to reduce pollution.

#### **5.4 Career Opportunities in Microbiology**

Microbiology has a great impact on medicine, agriculture, food science, ecology, genetics, biochemistry and other fields. A graduate of Microbiology can get employed in a number of industries/establishments in Nigeria and outside, which include but not limited to the following:

- (i) Research Institutes, e.g., Medical and Agricultural Research Institutes.
- (ii) Pharmaceutical Industries, e.g., Beecham, Ugolab, ASAD, Generics, etc.
- (iii) Academic Institutions, e.g., Universities, Polytechnics, Colleges of Education, etc.
- (iv) Water Treatment Plants, e.g., Gubi Water Treatment Plant, Tamburawa Waterworks, etc.
- (v) Food and Dairy Industries, e.g., Nasco Biscuits, SWAN Table Water, Farm-Fresh Yoghurt, etc.
- (vi) Sewage Treatment Plants, e.g., Aminu Kano Teaching Hospital Sewage Treatment plant.
- (vii) Petroleum Industries, e.g., NNPC, Chevron Oil Company, SHELL Oil Company, etc.
- (viii) Waste Treatment and Disposal Industries.
- (ix) Regulatory Agencies, e.g., NAFDAC, Standard Organization of Nigeria (SON) etc
- (x) Biotechnology and Molecular Microbiology Research Centers and Laboratories.



