**GNS COURSES**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| GNS 101 | Use of English | 2 | 2 | - | - |
| GNS 102 | Introduction to Nigerian History | 1 | 1 | - | - |
| GNS 111 | Introduction to Social Problems | 1 | 1 | - | - |
| GNS 104 | Introduction to Philosophy of Science | 2 | 2 | - | - |
| GNS 105 | Introduction to French | 2 | 2 | - | - |
| GNS 106 | Introduction to Sociology | 2 | 2 | - | - |
| GNS 107 | Introduction to Psycology | 2 | 2 | - | - |
| GNS 108 | Communication in French | 2 | 2 | - | - |
| GNS 201 | Writing and Literary Appreciation | 1 | 1 | - | - |
| GNS 202 | Government and Politics | 1 | 1 | - | - |
| GNS 203 | Use of Library | 1 | 1 | - | - |
| GNS 204 | Logic and History of Science | 2 | 2 | - | - |
| GNS 206 | Peace and Conflict Resolution | 2 | 2 | - | - |

**GNS COURSE SYNOPSES**

**GNS 101: USE OF ENGLISH (2 Units)**

Awareness Raising: need assessment by examining some errors in students' scripts, examine some differences between formal and informal English; Listening Skill: develop some note-taking skills and strategies, recognising subject-matter of a lecture from the topic and distinguishing main from minor points, training of thought using lexical and structural signals match verbal clues with pictures; Speaking Skill: organs of speech, cues to minimizing and eliminating first language interference; segmental: vowel (pure and diphthongs); consonant sounds consonant cluster, identification of dark/silent letters); supra-segmental: stress, intonation tone); word Classes: emphasize correct use of nouns, verbs, adverbs, pronouns, adjectives, prepositions, conjunctions, interjections and exclamations; correct agreement in grammatical structures.; common errors and locate the sources of such errors; punctuation marks: identify different kind of punctuation marks, correct use of punctuation marks in writing; reading Skill: develop fast reading in students, enhance and improve comprehension for specific and main ideas, reference and critical interpretations; vocabulary development.; application of the above skills in

studying two prescribed texts (short prose and drama)

**GNS 102: INTRODUCTION TO NIGERIA HISTORY (1 Unit)**

Methodology of history:; sources of Nigerian history; history of non-literate societies; early Nigerian cultures and society: Nok, Igbo-Ukwu, Ife, Benin, others; Pre-colonial Societies: Sudanese Empires, Forest States, Nigeria's early contact with the world; the trans-Saharan and trans-Atlantic Slave Trade and their effects; scramble for Africa: British Internal in Nigeria, The British conquest of Nigerian, Colonial rule and its impact on Nigerian: polities, economics social decolonization Process in Nigeria: rise of nationalism , culture and political dimension, economic dimension; development in Nigeria after Independence.

**GNS 111: INTRODUCTION TO SOCIAL PROBLEMS (1 Unit)**

This course will explain what social problems are; differentiate between social problems and personal problems; identify the different types of social problems in Nigeria; assess the causes of social problems and suggest possible solutions. It will examine the sociological perspective in the explanation of social problems. The course also will expose students to the concept of culture, its types, characteristics, functions, elements and other related terms with particular attention on Nigeria.

**GNS104: INTRODUCTION TO PHILOSOPHY OF SCIENCE (2 Units)**

Genesis of science; early contributions to the development of science: the nature of first scientific activities and generated scientific ideas; modern developments in science; the centrality of rationality in the scientific enterprise; nature, structure, and methodology of science: observation, hypothesis, experimentation, and influence; some philosophical views on the nature and methodology of science including the views of the positivists, popper, feyerabend, kulon, and lakatos.

**GNS 105: INTRODUCTION TO PHILOSOPHY AND LOGIC (2 Units)**

This course focuses on the study of the conceptual and theoretical foundations of Philosophy and Logic. It also highlights the nature of philosophical problems and the kinds of solutions which have been proposed by philosophers down the centuries. Below are the course contents; Introduction to Philosophy: History of Philosophy and prominent ancient Western philosophers, such as Thales, Socrates, Plato, Aristotle, etc.; African Philosophy and the problems and issues discussed; Main branches of Philosophy: the Nature of Philosophical problems; Appearance and Reality; Truth, knowledge and belief; What is Logic?; Nature of Arguments: Deductive and Inductive Arguments; Validity and Soundness: Truth and Validity; Fallacies in Informal Logic

**GNS 106: INTRODUCTION TO SOCIOLOGY (2 Units)**

The meaning and origin of Sociology; The branches of Sociology; Subject matter and scope of Sociology; Sociology and other social science disciplines; The founding fathers of sociology; the scientism of sociology or why sociology is a science; Concepts of sociology: socialization, culture, family, marriage.

**GNS 107: INTRODUCTION TO PSYCHOLOGY (2 Units)**

Definition of Psychology; importance of Psychology ; history of psychology and scientific thought, biological basis of behavior ; key themes in the evolution of psychological ideas; the Early History of Psychology; early psychological approaches to behavior: Structuralism, Functionalism, Associationism, Behaviourism , Skinner, Pavlov and Thorndike's Experimental Analyses of Behavior, Gestalt,Cognitivism, evolutionary, Freud 's psychodynamics theory, humanistic theory, Maslow's hierarchy of needs; and mental processes: personality, memory, learning ,and perception,

**GNS 108: COMMUNICATION IN FRENCH (2 Units)**

Introduction to French, alphabets and numeracy, for effective communication (written and oral), Conjugation and simple sentence construction based on communication approach, Sentence construction, Comprehension and reading of simple texts.

**GNS 201: WRITING AND LITERARY APPRECIATION (1 Units)**

Evaluation of Common Errors in Student' Writing: To bring out student's errors and locate the sources of such errors; writing skill; organization of ideas and write good outline; awareness of order in texts-coherence; develop text with the appropriate use of transitional devices; different kind of writing as applied to students disciplines and other situation; technicalities of different forms of letter writing: formal and informal letters; report writing; bibliography and Citation in Academic Writing: citation and interpretation of graphs, tables, charts, write bibliography and other references. Literary Appreciation: historical development of literature across culture; awareness of literature: definitions and explanations; types of literary writing, classification; forms; literary terms: appreciate the three genres of literature by studying a play, a poem and a novel; application of the various acquired skills to write a project that will integrate the taught / acquired English Language skill

**GNS 202: POLITICS AND GOVERNMENT (1 Unit)**

Brief history of libraries; the origin of library from Egyptian, Greece and Roman civilizations to the present day libraries; Type of libraries; academics, national, public, special, private, school libraries and the differences between them: type of library materials: textbooks, reference materials, periodicals, document, electronic

resources etc.; Organization of literary resource: the library catalogue(Card catalogue, OPAC etc.) and how library materials are arranged according to subject class.: Using library resources; these include e-learning, e-materials, (data base resources CD-RM,ON-line etc.): Library rule and regulations regarding loans, reservation of books, theft, mutilation, library infractions etc.: Study skills: how to use books, journals and reference material for research.; Copyright and its implication: what copyright is, Nigerian Copyright Commission, authorship, plagiarism, fair use, etc.; Bibliographies and referencing; meaning and use of bibliographies, literature survey, compilation of bibliographies; citation methods; footnotes, references, etc.

**GNS 203: USE OF LIBRARY (2 Units)**

Brief history of libraries; the origin of library from Egyptian, Greece and Roman civilizations to the present day libraries; Type of libraries academics, national, public, special, private, school libraries and the differences between them: type of library materials: textbooks, reference materials, periodicals, document, electronic resources etc.; Organization of literary resource: the library catalogue(Card catalogue, OPAC etc.) and how library materials are arranged according to subject class.: Using library resources; these include e-learning, e-materials, (data base resources CD-RM,ON-line etc.): Library rule and regulations regarding loans, reservation of books, theft, mutilation, library infractions etc.: Study skills: how to use books, journals and reference material for research.; Copyright and its implication: what copyright is, Nigerian Copyright Commission, authorship, plagiarism, fair use, etc.; Bibliographies and referencing; meaning and use of bibliographies, literature survey, compilation of bibliographies; citation methods; footnotes, references, etc.

**GNS 204: LOGIC AND HISTORY OF SCIENCE (2 Units)**

Nature of argument: Deductive and inductive argument; Validity and soundness: Validity and truth. Elementary techniques of techniques of testing validity. Fallacies. The priori and the empirical problems of induction. Elements of probability. Elements of the history of science and technology. Observation, hypotheses, experiments and scientific explanation. Problems of scientific and technological development in Nigeria Science and society.

**GNS 206: PEACE AND CONFLICT RESOLUTION (2 Units)**

Meaning of conflict and peace; Defining Conflict Prevention, Management and Resolution; Stages of Conflict; Conflict Management Strategies; Alternative Dispute Resolution Mechanisms; (ADR); Mediation and Conciliation; Arbitration and Good Offices; Negotiation and Impartial Fact-Finding; Types of Negotiation; Mainstreaming Conflict Management Concepts and Strategies.

# COLLEGE OF ANIMAL SCIENCE AND LIVESTOCK PRODUCTION

**Preamble**

The College of Animal Science and Livestock Production (COLANIM), Federal University of Agriculture, Abeokuta was created in 1988 out of the then School of Technology of the old College of Science and Technology, Abeokuta. Currently, the College comprises five academic Departments as follows:

1. Department of Animal Breeding and Genetics
2. Department of Animal Nutrition
3. Department of Animal Physiology
4. Department of Animal Production and Health, and
5. Department of Pasture and Range Management

These Departments contribute courses to the B. Agric. Programme and have graduated students since the inception of the University using a curriculum that is subjected to periodic review as dictated by demands in the labour market. Students in all the departments, as for all other departments in Agric. Colleges, take common courses 100 – 300 levels as well as the Farm Practical Year programme (400 level) while more of departmental courses are taken in the final year.

**Dean's Office**

| Name | Qualification | Designation |
|---|---|---|
| O. S. Sowande | B.Agric., M. Agric., Ph.D. (Abeokuta), RAS | Professor and Dean |
| O. M. Sogunle | B. Agric., M. Agric., Ph.D. (Abeokuta), RAS | Reader and Deputy Dean |

# DEPARTMENT OF ANIMAL BREEDING AND GENETICS

The Department of Animal Breeding and Genetics was established in 1988 as an entirely new concept in the Nigerian University System at the inception of University of Agriculture, Abeokuta. It constitutes one of the five Departments currently run by the College of Animal Science and Livestock Production (COLANIM) and offers sound and accredited programme leading to the award of the degree of Bachelor of Animal Science. The Department also runs Postgraduate programmes leading to the award of Master of Science and Doctoral degrees in Animal Breeding and Genetics and in Animal Biotechnology.

The goal of the Department is to develop manpower to offset the dearth of personnel in Animal Breeding and Genetics and to produce graduates that will be self-employed and employers of labour. The Department therefore offers theoretical, on-farm and laboratory experience including the basic aspects of Biotechnology Applied to Livestock Production as components of the Bachelor of Animal Science Programme of the University.

**Philosophy and Objectives**

The primary philosophy that guides the training of students in the Department of Animal Breeding and Genetics is the production of skilled manpower that is adequately furnished with comprehensive information required for the breeding and improvement of existing livestock in an environment endowed with large populations of different livestock species. Such professional manpower has to be produced in an atmosphere with the widest possible human and material resources through the adoption of effective techniques of instruction and exposure to the actual practice of animal breeding and improvement techniques. Consequently, there are opportunities for formal training at the Undergraduate and Postgraduate levels for the acquisition of basic and higher degrees respectively. The Department mounts programmes through classroom instructions, laboratory practical, field demonstration and workshop practices.

The major objectives of the Department are as follows:

1. To assist in the attainment of self-sufficiency in the production of livestock breeds and products.
2. To enhance the rural employment opportunities and the attendant improvement of the quality of rural life.
3. To contribute to the production of raw materials to support the growth of several industries.
4. To enhance the production and processing of livestock as export products.
5. To develop new patterns of livestock structures and government policies which clearly demonstrate that livestock production is an important part of

our national economy.

6. To provide a sound experimental design and basis for good statistical inference for all animal experimentation.

**Academic Staff**

| Name | Qualification | Specialization | Designation |
|---|---|---|---|
| Martha N. Bemji | B.Sc., M.Sc. (Zaria), Ph.D. (Abeokuta), RAS | Animal Breeding and Genetics | Reader & Ag. Head of Department |
| C. O.N. Ikeobi | B.Agric (Ife), M.Sc., Ph.D. (Ibadan), RAS, FNIAS, FNSAP | Animal Breeding and Genetics | Professor |
| M. O. Ozoje | B.Sc. (Calabar), M.Sc., Ph.D. (Ibadan), AAS | Quantitative Genetics / Statistics Genetics | Professor |
| A. O. Adebambo | B.Sc. (Ibadan), M.Agric., Ph.D. (Abeokuta), RAS | Animal Breeding and Genetics | Reader |
| B. M. Ilori | B. Agric., M. Agric. (Abeokuta), Ph.D. (Nottingham) | Animal Breeding and Genetics | Lecturer I |
| M. Wheto | B.Agric., M. Agric., Ph.D. (Abeokuta), RAS | Animal Breeding and Genetics / Bioinformatics | Lecturer I |
| A. S. Adenaike | B. Agric., M. Agric., Ph.D. (Abeokuta), | Animal Breeding and Genetics /Bioinformatics | Lecturer I |
| S. O. Durosaro | B.Agric., M. Agric. (Abeokuta) | Animal Breeding and Genetics /Bioinformatics | Lecturer II |
| A. J. Sanda | B.Agric., M. Agric. (Abeokuta) | Animal Breeding and Genetics | Lecturer II |

B. Agric. (Animal Breeding and Genetics)

In addition to the general 100 – 400 level courses, the following courses must be taken and passed at 40% or higher grade by students in 500 level of ***Animal Breeding and Genetics*** option of the B. Agric. programme.

**500 Level: First Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABG 501 | Animal Experimentation and Research Techiques | 3 | 2 | 1 | - |
| ABG 503 | Animal Behavior | 2 | 2 | - | - |
| ABG 505 | Hereditary and Environment | 3 | 2 | 1 | - |
| ABG 507 | Fundamentals of Molecular Genetics | 3 | 2 | 1 | - |
| APH 503 | Animal Health and Diseases | 2 | 2 | - | - |
| ANN 501 | Nigeria Feeds and Feeding Stuffs | 2 | 1 | - | 1 |
| ANN 509 | Instrumentation in Animal Science | 3 | 2 | - | 1 |
| AGS 597 | Seminar I | 1 | - | - | 1 |
| | Elective | 2 | 1 | - | 1 |
| | **TOTAL** | **21** | **14** | **3** | **4** |
| ***Electives** | | | | | |
| ABG 509 | Livestock Genetics and Proteomics | 2 | 2 | - | - |
| ANP 511 | Basic Geonomics in Animal Physiology | 2 | 1 | - | 1 |
| ANN 503 | Ruminant Animal Nutrition | 2 | 1 | - | 1 |

**500 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABG 500 | Applied Animal Breeding and Genetics | 3 | 2 | 1 | - |
| ABG 502 | Computational Analysis and Basic Bioinformatics | 2 | 1 | - | 1 |
| ABG 504 | Biotechnology in Livestock Improvement | 2 | 1 | - | 1 |
| ABG 506 | Biochemical Genetics | 2 | 2 | - | - |
| ABG 508 | Population Genetics | 2 | 2 | - | - |
| ANP 502 | Reproductive Physiology | 3 | 2 | - | 1 |
| AGS 598 | Seminar II | 1 | - | - | 1 |
| AGP 599 | Project | 4 | - | - | 4 |
| | Elective | 2 | 1 | - | 1 |
| | **TOTAL** | **21** | **11** | **1** | **9** |
| ***Electives** | | | | | |
| ANN 506 | Monogastric Animal Nutrition | 2 | 1 | - | 1 |
| ANN 504 | Companion Animal Nutrition | 2 | 2 | - | - |

**COURSE SYNOPSES**

**AGR 203: INTRODUCTION TO BIOTECHNOLOGY (2 Units)**

Meaning of biotechnology, phases of biotechnology, scope and importance of biotechnology, Animal biotechnology, Animal cell, tissue and organ culture, manipulation of reproduction, transgenic animal, rules and regulations in biotechnology, Biosafety, Intellectual property right.

**ABG 321: PRINCIPLES OF ANIMAL GENETICS AND BREEDING (2 Units)**

History of genetics and livestock domestication, Mendelian genetics, Modifications to Mendelian inheritance/Epistasis, Chromosomes, DNA structure and expression, Pleiotropism, Additive genes, Penetrance and expressivity, Linkage and crossing over, Gene classification, Gene mapping.

Practicals: Collection and classification of indigenous poultry breeds: domestic fowls, turkeys, ducks, guinea fowls, pigeons, etc. Special incentives for finding very rare and special breeds and freaks.

**ABG 304: QUANTITATIVE HEREDITY IN ANIMAL BREEDING (2 Units)**

Heritable and non-heritable traits, Genes and chromosomes, Gene functions, Protein Synthesis, Control of gene actions, Changes in chromosome, Lethal genes and their effects, Gene interaction, Single gene interaction, Concept of multiple alleles, Genetics of sex, Chromosome anomalies, Sex ratio, Sex-linked genes and X-linked genes, Sex-limited genes, sex influence genes.

**ABG 306: BASIC ANIMAL CYTOGENETICS (2 Units)**

History of Cytogenetics, Chromosome structure: prokaryotes and eukaryotes, Karyotype analysis (normal, abnormal, and causes of abnormal karyotype), chromosome banding pattern and fine structure: Different forms of chromosomes and their functional significance. Lampbrush chromosomes, Polygene chromosomes, B chromosomes, Sex-chromosomes, artificial chromosomes. Cell cycle (cell division) and checkpoints, theories of crossing over, recombination models, cytological basis and role of synaptonemal complex. Structural variation in chromosomes and their cytogenetical consequences, chromosome abnormalities, molecular cytogenetic (DNA as genetic material), DNA replication. Practical: Preparation of important stains. Microscopy. Preparation of slides. Fixing of the materials for mitotic and meiotic analyses. Karyotype analysis.

**ABG 311: APPLIED STATISTICS AND ANIMAL EXPERIMENTATION (2 Units)**

Nature of Statistics, Data presentation, Diagrammatic representation of data, Summarization of data, Probability, Sampling Distribution, Estimation of parameter, Test of Hypothesis, Introduction to Correlation and Regression, ANOVA, Time series. Statistical inference, tests of significance, F–Test, t-Tests, Chi-square, Goodness of fit, Research objectives, Research design, field experimentation, collection and

processing of data.

**ABG 312 : COMPUTER APPLICATION IN AGRICULTURE (3 Units)**
Advantages of using computer in animal agriculture, data collection, data entry and editing with the computer, data analysis using different statistical packages, summarization of results generated using different software packages, results presentation in a readable format.

**ABG 500: APPLIED ANIMAL BREEDING AND GENETICS (3 Units)**
Variance, Co-variance, Partitioning of phenotypic variance, Heritability and Repeatability, Genotype by environment interaction, Correlation between traits, Inbreeding, Line breeding and coefficient of relationship , Crossbreeding in practice, Selection in practice, Genetic improvement for various livestock traits.

**ABG 501: ANIMAL EXPERIMENTATION AND RESEARCH TECHNIQUES (3 Units)**
Statistical method in animal experimentation, Planning of experiments, Research techniques animal science, Dairy science research, Physiological research, Applied genetics, Animal nutrition research e.g. germ free animals, Annulation, Colostomy, Methods in pasture research, Analysis, Interpretation of results and presentation of results. Techniques and procedures in animal experimentation. Basic Statistical designs in animal science research problems.

**ABG 502: COMPUTATIONAL ANALYSIS AND BASIC BIOINFORMATICS (2 Units)**
Matrices and application, Introduction to genome, Mapping of genome, Genetic/physical maps, Choice of mapping population, Use of Pubmed, BLAST and FASTA, use of some bioinformatics tools (CLUSTAL X, GENSCAN, PROSCAN, MEGA, DNASP, PROSITE, AUTOSNP, etc.), Sequence alignment and database searching, Sequence analysis, Predictive methods using DNA and protein sequences, Expressed Sequence Tags, Phylogenetic analysis.

**ABG 503: ANIMAL BEHAVIOUR (2 Units)**
Features of animal behaviour, Types of behaviour, Aggression, Dominance status, Broodiness, Reproductive behaviour, etc., causes and on-set of behaviour, Effect on animal management and productivity.

**ABG 504: BIOTECHNOLOGY IN LIVESTOCK IMPROVEMENT (2 Units)**
Nucleic acids and Genetic information; DNA structure; Chromosome and the Gene; The Hereditary material; RNA; Comparison of RNA and DNA; DNA Replication; DNA, RNA and Proteins; Transcription; PCR; RNA splicing; Protein Splicing; Restriction Enzymes; Use of Restriction Enzymes; Types of Restriction Enzymes; Molecular Basis of inheritance. Genetic Maps; Genetic Markers; Uses of Genetic Markers; Gel Electrophoresis; DNA Blotting; Amplifying DNA; Cloning Vector; The Core gene

sequence; Recombinants; Laboratory tools and Techniques; Isolating DNA and mRNA; Cell Culture. Introductory Bioinformatics; DNA Sequence Alignment; DNA Data Base; Probabilities; Bayesian Statistics.
Practicals: DNA extraction; Polymerase Chain reactions; Gel Electrophoresis.

**ABG 505: HEREDITY AND ENVIRONMENT (3 Units)**
Quantitative and Qualitative character, Variation and measures of variation, Probability, Binomial distribution, Chi-square, Variance, Standard deviation, Standard error of Means, gene interaction including modifiers genes, maternal influences, extra nuclear transmission, penetrance and pleiotropy, animal genetic resources, indigenous.

**ABG 506: BIOCHEMICAL GENETICS (2 Units)**
Immunology, Immunity, Immune Systems, Components of Immune systems, Ability to respond to Antigenic Challenges, Organs of Immune System, Antigen Presentation, Antigen Presenting Cells, Cells activation, Immunogenicity, Contribution of biological systems, Chemical Nature of Immunogens, Types of Antigens, Antigenic Determinants, The Major Histocompatibility Complex, Antigen Presentation and MHC, Haptens, Antigen Processing, Humoral Immunity, Humoral Response to infection, Cell Mediated Response, Antibodies, Immunoglobulins, Immunoglobulin domains, Antibody functions, Complement Activation, Natural Antibodies, Immunoglobulin Diversity, Domain Variability, VDJ recombination, Monoclonals, Polyclonals, Common Genetic disorders, Medical application of Immunogenetics, Disease diagnosis, Prenatal therapy, Research applications, Health care and Biotechnology.

**ABG 507: FUNDAMENTALS OF MOLECULAR GENETICS (3 Units)**
Genetic material, Nucleic acids (DNA and RNA), Structure of Nucleic acids (DNA and RNA), Central dogma of molecular genetics (i.e. DNA to RNA and to protein) with emphasis on the two processes of transcription and translation until proteins are formed. DNA replication and various form of replication, Transcription and Translation, Mutation and their types, Variation in chromosome structure and numbers.

**ABG 508: POPULATION GENETICS (2 Units)**
Population genetics, gene and genotypic frequency. Hardy-Weinberg rule, factors affecting gene frequency and composition of population, effective population size. Quantitative genetics with application to animal breeding, biological population and its parameters; statistical methods in animal science, measures of central tendency and measure of spread or variability for quantitative traits, concepts of correlation and regression. Nature and causes of variation in quantitative traits and partitioning of hereditary variance. Genetic parameters and their estimations. Genetic basis and

causes of variation. Common genetic disorders/abnormalities. Tutorials: Simple calculations on gene and genotypic frequencies in random mating populations. Class exercises on the estimation of genetic parameters manually or using some software packages.

**ABG 509: LIVESTOCK GENETICS AND PROTEOMICS (2 Units)**

Chemical and physical nature of DNA, chemical composition, building blocks (nucleotides and nucleosides), polynucleotides, RNA, concept of gene and units of a gene, cistron, recon, mutan, introns. Proteomics, relation between gene and protein, approaches for study of proteomics, types of proteomics-expression proteomics, structural proteomics and functional proteomics.

**AGS 597 SEMINAR I (1 Unit)**

This is a compulsory course for all final year students in the Department and students are to present seminars before the end of first semester.

**AGS 598 SEMINAR II (1 Unit)**

This is a compulsory course for all final year students in the Department and students are to present seminars before the end of second semester.

**AGP 599 PROJECT (4 Units)**

Compulsory for final year student(s) and student(s) is/are to defend the project at the end of second semester.

# DEPARTMENT OF ANIMAL NUTRITION

The Department of Animal Nutrition is devoted to the pursuit of scientific knowledge that is related to the feeds and feeding of all classes of farm animals (animals of agricultural importance). The major focus of livestock and research covers ruminant, non-ruminant and micro-livestock nutrition. The research interest runs the gamut from applied studies to basic exploratory animal nutrition. The Department ranked among the best in the country.

**Philosophy and Objectives**

The primary philosophy that guides the training of students in the Department of Animal Nutrition is the production of skilled manpower that is adequately furnished with the comprehensive information required, for engaging in economic agricultural production in an environment characterized by rural setting and adequate land endowment. Such knowledgeable professional manpower has to be produced in an atmosphere with the widest possible human and material resources, through the adoption of effective techniques of instruction, and exposure to the actual practice of Animal Nutrition and Feeding. Consequently, there are opportunities for formal training at the Undergraduate and Postgraduate levels for the acquisition of basic and higher degrees in Non-ruminant, Ruminant and Micro-livestock Animal Nutrition respectively. These training programmes are mounted through classroom instruction, laboratory practical, feedmill/farm demonstration, and workshop practice.

Objectives of the programme are:

i. To assist in the attainment of self-sufficiency in the production of basic food;
ii. To contribute to the achievement of the goal of marked increase in the production of agricultural raw-materials to support the growth of several industries;
iii. To enhance the production and processing of export produce; With emphasis on relevant, appropriate and manageable technology modernize agricultural production, processing, storage, preservation and distribution;
iv. To enhance the rural employment opportunities and the attendant improvement of the quality of rural life;
v. To evolve effective ways of protecting agricultural land resources from ecology degradation such as erosion, pollution, etc.
vi. To develop new patterns of agricultural structures and government policies which clearly demonstrate that agriculture is an important part of our national economy.

**Academic Staff**

| Name | Qualification | Specialization | Designation |
|---|---|---|---|
| A. O. Oso | B. Agric., M. Agric., Ph.D. (Abeokuta), RAS | Monogastric Animal Nutrition | Senior Lecturer & Ag. Head of Department |
| C. F. I. Onwuka | B.Sc., M.Sc., Ph.D. (Ibadan), RAS, FASN, FNSAP | Ruminant Animal Nutrition | Professor |
| A. M. Bamgbose | B.Sc., M.Sc., Ph.D. (Ibadan), AAS | Agricultural Biochemistry and Nutrition | Professor |
| O. O. Oluwatosin | B.Sc., M.Sc., Ph.D. (Ibadan), RAS, FNSAP | Agricultural Biochemistry and Nutrition | Professor |
| O. M. O. Idowu | B. Agric., M. Agric., Ph.D. (Abeokuta), RAS | Monogastric Animal Nutrition | Professor |
| Olubukola A. Isah | B.Sc., M.Sc., Ph.D. (Ibadan), RAS | Ruminant Animal Nutrition | Professor |
| A. V. Jedege | B. Agric., M. Agric., Ph.D. (Abeokuta), RAS | Monogastric Animal Nutrition | Reader |
| A. O. Fafiolu | B. Agric., M. Agric., Ph.D. (Abeokuta), RAS | Monogastric Animal Nutrition | Senior Lecturer |
| R. A. Sobayo | B. Agric. Tech. (Akure), M.Sc. (Ibadan), Ph.D. (Abeokuta), RAS | Monogastric Animal Nutrition | Senior Lecturer |
| A. O. Oni | B. Agric., M. Agric., Ph.D. (Abeokuta), RAS | Ruminant Animal Nutrition | Senior Lecturer |
| Yemisi R. Aderinboye | B. Agric. (Zaria), M. Agric., Ph.D. (Abeokuta), RAS | Ruminant Animal Nutrition | Senior Lecturer |
| Oluwakemi T. Irekhore | B. Agric. (Ago-Iwoye), M.Sc., Ph.D. (Ibadan), RAS | Monogastric Animal Nutrition | Senior Extension Fellow |
| Adebukunola O. Lala | B. Sc. (Ibadan), M.Agric., Ph.D. (Abeokuta), MBA. (Lagos) | Monogastric Animal Nutrition | Senior Research Fellow |
| Kafayat O. Adebayo | B. Agric., M. Agric.,Ph.D. (Abeokuta) | Ruminant Animal Nutrition | Lecturer I |
| Risikat M. Akinbode | B. Agric., M. Agric., Ph.D. (Abeokuta) | Ruminant Animal Nutrition | Lecturer II |
| O. O. Adelusi | B. Agric., M. Agric., Ph.D. (Abeokuta) | Ruminant Animal Nutrition | Lecturer II |

B. Agric. (Animal Nutrition)

In addition to the general 100 – 400 level courses, the following courses must be taken and passed at 40% or higher grade by students in 500 level of ***Animal Nutrition*** option of the B. Agric. programme.

**500 LEVEL: FIRST SEMESTER**

| Course code | Course title | U | L | T | P |
|---|---|---|---|---|---|
| ABG 501 | Animal Experimentation and Research Techniques | 3 | 2 | 1 | - |
| ANN 501 | Nigeria Feeds and Feeding Stuffs | 2 | 1 | - | 1 |
| ANN 503 | Ruminant Animal Nutrition | 2 | 1 | - | 1 |
| ANN 505 | Nutrient Requirements of Farm Animal II | 2 | 2 | - | - |
| ANN 507 | Feed Technology I | 2 | 1 | - | 1 |
| ANN 509 | Instrumentation in Animal Science | 3 | 2 | - | 1 |
| APH 503 | Animal Health and Diseases | 2 | 2 | - | - |
| ANN 513 | Feed Mill Design and Management | 2 | 1 | - | 1 |
| AGS 597 | Seminar I | 1 | - | - | 1 |
| | Elective | 2 | 2 | - | - |
| | **Total** | **21** | **14** | **1** | **6** |
| **Electives** | | | | | |
| ANN 515 | Basic Nutrigenomics | 2 | 2 | - | - |
| ANN 511 | Commercial Feed Mixture and Premix Production | 2 | 1 | - | 1 |
| ANN 517 | Organic Livestock Nutrition | 2 | 1 | - | 1 |
| APH 505 | Animal Products and Handling | 2 | 1 | - | 1 |

**500 LEVEL: SECOND SEMESTER**

| Course code | Course title | U | L | T | P |
|---|---|---|---|---|---|
| ABG 500 | Applied Animal Breeding and Genetics | 3 | 2 | - | 1 |
| PRM 500 | Pasture and Range Management | 3 | 2 | - | 1 |
| ANN 502 | Feed Safety and Quality Control | 2 | 2 | - | - |
| ANN 504 | Companion Animal Nutrition | 2 | 2 | - | - |
| ANN 506 | Monogastric Animal Nutrition | 2 | 2 | - | - |
| ANN 508 | Feed Technology II | 2 | 2 | - | - |
| AGS 598 | Seminar II | 1 | - | - | 1 |
| AGP 599 | Project | 4 | - | - | 4 |
| | Elective | 2 | 2 | - | - |
| | **Total** | **21** | **14** | **-** | **7** |
| **Electives** | | | | | |
| ANP 502 | Reproductive Physiology | 3 | 2 | - | 1 |
| ANN 510 | Micro-livestock Nutrition | 2 | 2 | - | - |

**COURSE SYNOPSES**

**ANN 212: INTRODUCTORY AGRICULTURAL BIOCHEMISTRY (3 Units)**

Basic Chemistry of carbohydrates, lipids, proteins and nucleic acids Vitamins and their coenzyme functions. Minerals. The nature, classification and function of enzymes and hormones. Bioenergetics

**ANN 302: INTRODUCTION TO FEED TECHNOLOGY (2 Units)**

Introduction: General information/History/Concepts, key terminologies, definitions Glossary of definitions. State of the art technology in feed science and technology. Importance of feed technology in relation to animal productivity. Problems of feed manufacturing units and control measures. Relationship between Animal feed technology and Science of nutrition- How science affects feed technology and how technology affects animal nutrition science. Branches of feed technology. Animal feed science and technology.

**ANN 303: PRINCIPLES OF ANIMAL NUTRITION (2 Units)**

Chemical composition of animal body in relation to their food. Nutrient types energy, protein, lipids, fibre, minerals and vitamins. Nutrients for body maintenance and production – growth, pregnancy, lactation and egg production. Bioenergetics. Nutrients metabolism. Nutrient deficiency and symptoms.

Practical: Study of the nutrient deficiency symptoms in livestock.

**ANN 304: PRINCIPLES OF AGRICULTURAL BIOCHEMISTRY (2 Units)**

Metabolism of carbohydrates, lipids, proteins and nucleic acid. Chemistry and mode of action of enzymes and hormones. Chemistry and analysis of selected agricultural products.

**ANN 306: NUTRIENT REQUIREMENTS OF FARM ANIMALS I (2 Units)**

Feeding standards, history, usefulness and limitations. Concept of nutrient requirements. Determination of requirements for energy, protein, lipids, fibre, minerals and vitamins. Nutrient requirement and environment, Animal and Environment interaction. Managing the nutritional requirements of monogastric and ruminants in terms of their digestive physiology. Feed intake, Concept of basal metabolism.

**ANN 501: NIGERIAN FEEDS AND FEEDING STUFFS (2 Units)**

Classification of foods, feeding stuffs and feed supplements; Chemistry and nutritive values of succulent feeding stuffs, Concentrate feeds, cereals, legumes and oil seeds. Chemistry and nutritive values of some Nigerian grasses and legume species. Storage and quality control of feeding stuffs and feeds.

**ANN 502: FEED SAFETY AND QUALITY CONTROL (2 Units)**

Utilization of slaughter by-products, micro-biological and chemical hazards in feed production, Identification of xenogeneic proteins, feed law, and sanitary supervision of feed plants. Product evaluation, quality and determination. Contamination and adulteration of feed ingredients. Feed quality parameters. Material weight determinations and types of scales. Maintenance of scales. Pest management in

facilities, Environment and public health implications of feedmill location. Safety factors. Regulatory controls and biosecurity. Factors affecting feed processing and quality.
Practical: Examination of feeds for quality- physical, microbiological and chemical.

**ANN 503: RUMINANT ANIMAL NUTRITION (2 Units)**
Microbiology of rumen; physiology of rumen action; Metabolic processes and pathways; Non-protein nitrogen utilization; Determination of digestion coefficients, balance trials; systems for energy evaluation, scheme for protein values; water in relation to nutrition and water metabolism; requirements and their inter-relationship in nutrition; Feed additives, proximate analysis; ration formulation, nutritional disorders.
Practical: Examination and survey of existing forms of pet food.

**ANN 504: COMPANION ANIMAL NUTRITION (2 Units)**
Principles of Nutrition in feeding horses, dogs and cats. Nutrient requirements of various classes, types and species of horses, dogs and cats. Feeding standards. Nutritional and metabolic diseases and their control and prevention through diets. Feed utilization and management. Feeding race/sport horse, pregnant animals and young ones of horses, cats and dogs. Pet food manufacturing and requirements.

**ANN 505: NUTRIENT REQUIREMENTS OF FARM ANIMAL II (2 Units)**
Nutrient requirements of cattle, sheep, goats, poultry, rabbits, swine and horses for maintenance, growth, production and reproduction. Measurement of body needs, digestibility and balance trials. Factors affecting digestibility and balance of nutrients. Respiratory quotients. Partitioning of nutrients in the body. Factors governing energy, protein, minerals and vitamins needs of farm animals. Concept of rumen by pass nutrients.

Practical: Determination of nutrient digestibility and nitrogen balance. Determination of energy value of feedstuffs. Demonstration of *in sacco* technique.

**ANN 506: MONOGASTRIC ANIMAL NUTRITION (2 Units)**
Principles of monogastric nutrition, Elements of human nutrition; Dietary allowance, food surveys, food balance sheets; feeding standards; nutrient requirements for the various classes of monogastric animals, feed additives. Water in relation to nutrition. Water metabolic computation and ration formulation. Feed evaluation. Feed mixing and feed manufacture on large scale. The feed industry.

**ANN 507: FEED TECHNOLOGY I (3 Units)**
Introductory feed manufacturing technology. Advances in formula feed manufacturing. Art (science) feed formulation, Feed Processing and manufacturing. Feed toxicology, packaging and shelf life of feeds. Particle-size reduction-bulk

density-processing of grains and oilseeds, processing of roughages. Ingredient functionality. Diet development and processing Drying, toasting enhancement through feed additives for coating and pelleting.
Practical: Familiarization with various feed mill equipment, layout and operations.

**ANN 508: FEED TECHNOLOGY II (2 Units)**
Principles of material handling, grinding, mixing, pelleting and other operations. Crumbling, flaking, popping, extrusion etc. Principles of instrumentation and analysis with emphasis on application to quality control and research in the feed industry. Introduction to pulverisers, pelletisers, complete feed block equipment. Plant layout and design of different capacity of feed mills, problems related to feasibility, records keeping in different sections of the feed mill. Extrusion feed technology and application. Solid state fermentation (SSF) technology.
*Practical:* Practical exposure to pulverisers, pelletizers, complete seed block equipment. Plant layout design capacity examination. Problems of feasibility, record keeping in different sections. Practical exposure preparing feeds, urea molasses mineral blocks. Premixes etc.

**ANN 509: INSTRUMENTATION IN ANIMAL SCIENCE (2 Units)**
Basic principles governing common laboratory equipment; principles governing basic analytical procedures. Basic instrumentation in animal production, nutrition, physiology, breeding, genetics and forage science.

**ANN 510: MICROLIVESTOCK NUTRITION (2 Units)**
Definitions. Little known small animals with a promising economic future. Biology of Micro livestock species. Nutritional behavioural patterns. Feeding under different systems of management. Feed resources and alternative feed ingredients. Low-cost feeding and utilization of feed resources. Nutrient requirements of micro-livestock. Appropriate technologies for feeding micro livestock

Practical: Feeding and record keeping in selected micro-livestock species. Dissection and identification of parts of the GI tract in selected species.

**ANN 511: COMMERCIAL FEED MIXTURES AND PREMIX PRODUCTION (2 Units)**
State of commercial feed industries in Nigeria, constrains and prospects. Types of mixture and procedures of production; cleaning, grinding, granulation, expanding, extrusion, micronization, dehulling, oiling; addition of active substances and proper choice depending on the techniques applied; Packaging, branding and labelling; systems of quality control; feed distribution and supply. Premix production techniques and formulation; minerals and vitamins ingredients procurement and processing; ingredients interaction. Physico-chemical properties and value of nutrients for production of feed and mineral-vitamin mixtures. Preparation of components for production of mixtures.

Practical: Identification of different premix ingredients. Premix formulation. Compounding of premixes for different categories of livestock species.

**ANN 513: FEEDMILL DESIGN AND MANAGEMENT (2 Units)**

Basic structures of feed mills. Grinding machines- types and procurement. Mixers-vertical, horizontal and premix mixers. Mobile feedmills. Siting of mills and environment considerations. Power management and capacity and electrical design. Manpower requirement. Safety precautions in feedmill management. Practical. Field trips.

**ANN 515: BASIC NUTRIGENOMICS (2 Units)**

Definitions, concept of nutrigenomics, difference between nutrigenetics and nutrigenomics and how diet and nutrition affect gene expression. Importance of nutrigenomics in animal production. Nutrigenomics tools. Applications of nutrigenomics in Animal Sectors, Nutrigenomics applications in animal science. Basic nutrigenomics technologies in animal nutrition. Future of nutrigenomics.

**ANN 517: ORGANIC LIVESTOCK NUTRITION (2 Units)**

Definitions, principles of organic agriculture and the norms for organic livestock nutrition. Organic standards for feeding Cattle, sheep, goat, poultry and micro livestock. Nutritional needs from organic forage and feed of good quality. List of prohibited substances in organic livestock feeds and diets. Allowed feed additives and supplements for organic livestock. Organic Livestock feed processing basics, organic livestock nutrient requirements, Feeding and Housing systems in organic livestock.

**AGS 597 SEMINAR I (1 Unit)**

This is a compulsory course for all final year students in the Department and students are to present seminars before the end of first semester.

**AGS 598 SEMINAR II (1 Unit)**

This is a compulsory course for all final year students in the Department and students are to present seminars before the end of second semester.

**AGP 599 PROJECT (4 Units)**

Compulsory for final year student(s) and student(s) is/are to defend the project at the end of second semester.

# DEPARTMENT OF ANIMAL PHYSIOLOGY

The Department of Animal Physiology was created in August 2006, the fifth in COLANIM. It is the only Department in the Nigerian University System devoted exclusively to the study of Animal Physiology under the Bachelor of Agriculture Degree Programme. At the end of a 5-year Undergraduate Programme, students graduate with the Bachelor of Agriculture. The Department runs Postgraduate Programmes leading to Master's (M. Agric.) and Doctorate (Ph.D.) degrees in Animal Physiology.

Animal Physiology is a major discipline within Animal Science. It involves the study of bodily functions such as digestion, circulation, respiration, reproduction, growth and adaptation in farm animals such as cattle, sheep, goats, pigs, rabbits, snails and poultry. Modern livestock production draws heavily from applied techniques in Animal Physiology. These physiological techniques enable the maximization of growth and reproductive efficiency in farm animals, thereby increasing profitability. Such techniques include Artificial Insemination, Controlled Breeding, Oestrus Synchronization, Superovulation and Embryo Transfer, as well as cryopreservation of spermatozoa, ova and embryos.

**Philosophy and Objectives**

The Bachelor of Agriculture programme has as its philosophy the production of agricultural graduates with broad knowledge of all aspects of Agriculture who specialize in Animal Production and are well-equipped with basic and applied knowledge in Animal Physiology. Such graduates are trained to be employers of labour, able to undertake modern livestock farming at high technical efficiencies for the domestic and global markets.

***The specific objectives of the programme are:***

- To produce graduate farmers who can engage in Animal Production and Research and will be capable of providing relevant and appropriate solutions to the country's agricultural and rural development problems and generally improve agricultural productivity.
- To produce graduates with the technical, productive and entrepreneurial skills in Animal Physiology, Animal Production and Agriculture in general, who can contribute meaningfully to the realization of national development goals in Agriculture and improve the food security of the nation.
- To produce graduates who can engage in livestock production at high technical efficiencies and competitive prices, comparable to farmers in the developed world.

**Academic Staff**

| Name | Qualification | Specialization | Designation |
|---|---|---|---|
| T. J. Williams | B. Agric. (Abeokuta), M.Sc. (Ibadan), Ph.D. (Abeokuta), RAS | Growth and Lactation Physiology | Senior Lecturer & Head of Department |
| O.M. Onagbesan | B. Sc. Agric. (Ibadan), M.Sc. (Edinburgh), Ph.D. (Southampton), RAS | Reproductive Physiology | Professor |
| O. F. Smith | B.Sc., M.Sc., Ph.D (Philippines), RAS | Endocrinology | Professor |
| I. J. James | B.Agric., M. Agric., Ph.D. (Abeokuta), RAS | Lactation Physiology | Professor |
| J. O. Daramola | B. Ed. (Ife), M.Sc., Ph.D. (Ilorin) | Artificial Insemination | Reader |
| J. A. Abiona | B.Agric., M. Agric. , Ph.D. (Abeokuta), RAS | Reproductive Physiology | Senior Lecturer |
| M. O. Abioja | B. Agric., M. Agric., Ph.D. (Abeokuta), RAS | Environmental Physiology | Senior Lecturer |
| Oluwaseun S. Iyasere | B.Agric., M. Agric. (Abeokuta), Ph.D. (Newcastle Upon Tyne) | Animal Behaviour | Lecturer I |
| O. E. Oke | B. Agric., M. Agric. , Ph.D. (Abeokuta), RAS | Environmental Physiology | Lecturer I |

B. Agric. (Animal Physiology)

In addition to the general 100 – 400 level courses, the following courses must be taken and passed at 40% or higher grade by students in 500 level of ***Animal Physiology*** option of the B. Agric. programme.

**500 Level: First Semester**

| Course code | Course title | U | L | T | P |
|---|---|---|---|---|---|
| ANP 501 | Lactation Physiology I | 2 | 1 | - | 1 |
| ANP 503 | Environmental Physiology | 2 | 1 | - | 1 |
| ANP 505 | Physiology of Growth | 3 | 2 | - | 1 |
| ANP 507 | Comparative Animal Behaviour | 2 | 2 | - | - |
| ANN 509 | Instrumentation in Animal Science | 3 | 2 | - | 1 |
| ANP 511 | Basic Genomics in Animal Physiology | 2 | 1 | - | 1 |
| ABG 501 | Animal Experimentation and Research Techniques | 3 | 2 | 1 | - |
| ANP 509 | Ethics in Animal Physiology Research | 1 | 1 | - | - |
| AGS 597 | Seminar I | 1 | - | - | 1 |
| | Elective | 2 | 2 | - | - |
| | **Total** | **21** | **14** | **1** | **6** |
| **Electives** | | | | | |
| APH 503 | Animal Health and Diseases | 2 | 2 | - | - |
| PRM 505 | Pasture, livestock and environment | 3 | 2 | - | 1 |
| ABG 505 | Heredity and Environment | 3 | 2 | 1 | - |

**500 Level: Second Semester**

| Course code | Course title | U | L | T | P |
|---|---|---|---|---|---|
| ANP 502 | Reproductive Physiology | 3 | 2 | - | 1 |
| ANP 504 | Artificial Insemination | 2 | 1 | - | 1 |
| ANP 506 | Endocrinology | 2 | 2 | - | - |
| ANP 508 | Reproductive Management and Controlled Breeding of Farm Animals | 3 | 2 | - | 1 |
| ANP 510 | Lactation Physiology II | 2 | 1 | - | 1 |
| ANP 512 | Basic Proteomics in Animal Physiology | 2 | 1 | - | 1 |
| AGS 598 | Seminar II | 1 | - | - | 1 |
| AGP 599 | Project | 4 | - | - | 4 |
| | Elective | 2 | 2 | - | - |
| | **Total** | **21** | **11** | **-** | **10** |
| **Electives** | | | | | |
| ABG 500 | Applied Animal Breeding and Genetics | 3 | 2 | - | 1 |
| ANN 508 | Monogastric Animal Nutrition | 2 | 1 | - | 1 |
| PRM 502 | Forage Conservation and Quality | 2 | 2 | - | - |
| ABG 504 | Artificial Insemination | 2 | 1 | - | 1 |

**COURSE SYSNOPSES**

**ANP 101: INTRODUCTORY ANIMAL PHYSIOLOGY I (2 Units)**

Characteristics of living things; Cellular basis of life: Cell organelles; Cell cycle, Cell division, Cell growth, Cell death; Classification of Animal Kingdom, Grades of Organization, A brief introduction of the various Animal Phyla: Protozoa Coelenterate, Porifera, Platyhelminthes, Nematoda, Annelida, Mollusca, Arthropoda, Echinodermata, and Chordata.

**ANP 102: INTRODUCTORY ANIMAL PHYSIOLOGY II (2 Units)**

Nature of Living Organisms/Activities of Living Things: Homeostasis, Growth and Development. Physiological systems in Mammals and Birds: Nervous, Endocrine, Respiratory, Circulatory, Reproductive, Digestive and Excretory systems.

**ANP 192: BASIC ANIMAL PHYSIOLOGY PRACTICAL (1 Unit)**

Classification of Animals: Brief introduction and study of representatives from various animal phyla: Protozoa, Coelenterate, Porifera, Platyhelminthes, Nematoda, Annelida, Mollusca, Arthropoda, Echinodermata and Chordata. Levels of organization, habitats, physical characteristics, evolutionary position Animal cell: Basic cell structure, identification of cell organelles. Mammalian and avian body systems: Nervous, Digestive, Respiratory, Endocrine, Reproductive, Circulatory and Excretory systems. Determination of pulse rate, respiratory rate and rectal temperature of farm animals.

**ANP 211: COMPARATIVE ANATOMY AND PHYSIOLOGY OF FARM ANIMALS**

**(2 Units)**

Comparative gross anatomy of major livestock species with emphasis on digestion, musculo-skeletal and reproductive systems. Comparative physiology of digestion, reproduction, endocrine, nervous, circulatory and excretory systems. Concept and principles of homeostasis.

*Practical:* Physical examination of bones, models of organs, laboratory tests and field observation

**ANP 302: INTRODUCTION TO ENDOCRINOLOGY (2 Units)**

Definition of Hormones, Classical versus non-classical endocrine glands, Intercellular communications (Direct, paracrine, endocrine and synaptic communications), Classification of hormones, By origin, By site of action, By structure, Mechanism of action, Lipid soluble hormones (cytoplasmic receptors), Lipid insoluble hormones (cell surface receptors), Mode of transport in blood, Measurement (Immunoassay – RIA and ELISA), Endocrine systems, Control of secretion, Feedback (long-loop, short loop, short-short loop), Hormone behaviour relationships, Organizational effects, Activating effects

**ANP 304: DIGESTIVE PHYSIOLOGY (2 Units)**

General principles of anatomy and function of the digestive tract in various species of farm animals, physiological processes involved in metabolism of carbohydrates, fats, fatty acids, proteins and amino acids. In addition, lectures are given about the digestive systems of ruminants, poultry and monogastric animals such as rabbits and pigs. Emphasis on differences in digestion processes in various animal species including companion animals. Physiological mechanisms involved for each species will be emphasized.

**ANP 501: LACTATION PHYSIOLOGY I (2 Units)**

Mammary gland anatomy of cattle. Comparative mammary gland anatomy of cattle, pigs, sheep and goats. Mammary tissue histology and cell biology. Mammary gland development. Induction of lactation, lacto genesis, principles, and mammary cytology associated with lactogenesis, hormonal changes associated with Lactogenesis. The neonate and colostrum. Galactopoiesis – maintenance of lactation. Milk ejection, nursing frequency, oxytocin, milk ejection reflex. Mastitis.

**ANP 502: REPRODUCTIVE PHYSIOLOGY (3 Units)**

Introduction to animal reproduction, reproductive efficiency and profitable livestock production; Biological basis of sex. Sex differentiation. Intersex, homologues of the male and female reproductive system. Comparative anatomy of the male reproductive system. Comparative anatomy of the female reproductive system. Sexual development. Gametogenesis, spermatogenesis, sperm transport, sperm

output, hormonal control of spermatogenesis; Oogenesis, ova physiology, follicular development, ovulation, hormonal control of oogenesis. Reproductive cycles. Pregnancy. Infertility in farm animals.

*Practical:* Gross anatomy of male and female reproductive tracts, histology of the testis, ductus deferens, ampulla, epididymis, vesicular glands, histology of the ovary, oviduct, uterus and cervix. Gross anatomy of the gravid uterus. Oestrus detection in cattle, pigs, sheep and goats. Pregnancy diagnosis in sheep and goats by ballottement.

**ANP 503: ENVIRONMENTAL PHYSIOLOGY (2 Units)**

Effects of climate on livestock production, acclimatization and adaptation, physiological basis of adaptation. Sensitive and insensitive heat loss. Heat stress, physiological responses to heat stress, hormonal response, sweating, panting, depressed feed intake, heart rate, respiratory rate, rectal temperature, determination of heat stress indices. Behavioural responses to heat stress, modification of the microclimate to enhance animal productivity. Management of exotic breeds in tropical environment.

**ANP 504: ARTIFICIAL INSEMINATION (2 Units)**

Definition of artificial insemination (AI). Historical development of AI, role of AI in livestock improvement. Semen collection techniques, artificial vagina, dummy, electro-ejaculation, rectal massage. Semen evaluation, semen volume, colour, sperm concentration, sperm motility, live/dead (%), % normal sperm, pH. Comparative study of the ejaculates of bull, ram, buck, boar and stallion. Semen preservation, dilution methods, types of diluent, cooling, freezing, and thawing. Storage methods, ambient storage, chilled storage, frozen storage, chemical preservation. Insemination, semen dose, multiple inseminations, insemination methods, timing of insemination. Fertility of stored semen, factors affecting fertility. Non-return rates to AI. Management of AI Centre. World trade in frozen semen.

*Practical:* Preparation of artificial vagina for semen collection in rams, semen collection, semen processing, ambient storage, chilled storage. Insemination.

**ANP 505: PHYSIOLOGY OF GROWTH (2 Units)**

Definition of growth, cell division, cell enlargement, cell differentiation, morphogenesis. Measurement of growth, growth curves, lag phase, log phase, inflexion point, decelerating phase, plateau or stationary phase, positive growth, negative growth, absolute growth curve, absolute growth rate, relative growth rate. Patterns of growth, isometric and allometric growth, limited and unlimited growth. Role of hormones in growth and development. Prenatal growth and development, muscle growth and development, connective tissue growth and development, factors affecting growth – maturation rate, sex, nutrition, order of tissue maturity.

**ANP 506: ENDOCRINOLOGY (2 Units)**

Definition of endocrine glands and hormones. Hormonal effects, morphogenetic effects, homeostatic effects and integrative effects. Classification and functions of hormones, chemical classification, peptide and protein hormones, steroid hormones, classification based on site of production, hypothalamic hormones, hypophysial hormones, gonadal hormones, adrenal hormones, functional classification, primary hormones of reproduction, secondary hormones of reproduction. Hormonal functions. Chemistry of steroid hormones, structure, trivial and systematic names, biosynthesis. Mechanisms of hormone action, steroid hormones, peptide hormones. Hormonal assays.

**ANP 507: COMPARATIVE ANIMAL BEHAVIOUR (2 Units)**

Animal behaviour and livestock production. Neuro-endocrine basis of animal behaviour. Evolutionary aspects of animal behaviour. Adaptive aspects of animal behaviour. Sexual behaviour. Aggression and dominance in farm animals. Behavioural considerations in animal housing and herding. Modification of behaviour patterns in farm animals. Temperament in dairy cattle. Maternal and neonatal behaviour.

**ANP 508: REPRODUCTIVE MANAGEMENT AND CONTROL BREEDING OF FARM ANIMALS (3 Units)**

Definition and objectives of controlled breeding. Flushing, steaming up, neonatal management, oestrus detection, mating system, pregnancy diagnosis, sire management, management of reproductive disorders. Management of breeding records, use of computer in reproductive data management. Synchronized breeding, accelerated lambing and kidding. Management of artificial insemination service. Reproductive management of Cattle, Swine, Sheep and Poultry. Oestrous synchronization; assisted reproductive technologies.

**ANP 509: ETHICS IN ANIMAL PHYSIOLOGY RESEARCH (1 Unit)**

Ethical issues in Animal Physiology experimentation. Ethical committees and regulatory issues.

**ANP 510: LACTATION PHYSIOLOGY II (2 Units)**

Applied dairy science, emphasis on lactation management, herd health, labour saving equipment, buildings, and quality products, organization of dairy enterprise, business and economic aspects. Milking machine systems and management; pathological and environmental factors affecting lactation.

**ANP 511: BASIC GENOMICS IN ANIMAL PHYSIOLOGY (2 Units)**

DNA, RNA, Genes, Genomes and Methods in Genomics. Definitions; DNA sequencing, mRNA; Animal genome project(mouse and Sheep); implications of

genomics for Animal Science.

**ANP 512: BASIC PROTEOMICS IN ANIMAL PHYSIOLOGY (2 Units)**
Protein analysis, methods in proteomics- western blot; electrophoresis; amino acid sequencing; etc.

**AGS 597: SEMINAR I (1 Unit)**
This is a compulsory course for all final year students in the Department and students are to present seminars before the end of first semester.

**AGS 598: SEMINAR II (1 Unit)**
This is a compulsory course for all final year students in the Department and students are to present seminars before the end of second semester.

**AGP 599: PROJECT (4 Units)**
Compulsory for final year student(s) and student(s) is/are to defend the project at the end of second semester.

# DEPARTMENT OF ANIMAL PRODUCTION AND HEALTH

The Department of Animal Production and Health was established in 1989 at its mini-campus Isale-Igbein which is located in the centre of Abeokuta. The Department moved along with the University to the permanent site in December 1997. The Department emphasizes modern way of teaching and research in Animal Production. The Department has three laboratories for feedstuff analysis, meat processing and postgraduate research, respectively. Livestock product processing has been gradually introduced into the programme to enable the students acquire sufficient skill for self-employment after graduation. Meat, milk and egg processing feature prominently at 500level for the final year students. The meat processing laboratory in particular is fairly equipped for the manufacture of meat products such as sausages, burgers, etc.

The Department also introduced hatchery operations right from inception. The hatchery unit in the Department is equipped with both electric and fabricated kerosene incubators for small-scale hatchery operations. In addition, the Department emphasizes the significance of livestock diseases and various methods of control. Today, the Department of Animal Production and Health is one of the five Departments in the College of Animal Science and Livestock Production and it has the largest student enrolment. The Department offers programmes leading to the award of Bachelors, Masters and Doctoral degrees and Postgraduate Diploma in various areas of Animal Production.

**Philosophy and Objectives**

The primary philosophy that guides the training of students in the Department of Animal Production and Health is the production of skilled manpower that is adequately furnished with the comprehensive information required for livestock production systems in a conducive environment. Such professional manpower has to be produced in an atmosphere with the widest possible human and material resources, through the adoption of effective techniques of instruction, and exposure to the actual practice of Animal production. Consequently, there are opportunities for formal training at the Undergraduate and Postgraduate levels for the acquisition of basic and higher degrees respectively. These training programmes are mounted through classroom instruction, laboratory practical, field demonstration, and workshop practice.

The specific objectives of the programme are:

- To assist in the attainment of self-sufficiency in the production of livestock and livestock products.
- To contribute to the achievement of the goal of marked increase in the production of raw-materials to support the growth of several industries;

- To enhance the production and processing of livestock products
- To enhance the rural employment opportunities and the attendant improvement of the quality of rural life;
- To develop new patterns of livestock structures and government policies which clearly demonstrate that livestock production is an important part of our national economy.

**Academic Staff**

| Name | Qualification | Specialization | Designation |
|---|---|---|---|
| O. A. Fasae | B.Agric.Tech., M.Agric. (Akure),Ph.D.(Abeokuta), RAS | Ruminant Production | Reader & Ag. Head of Department |
| A. B. J. Aina | B.Sc., M.Sc., Ph.D.(Ibadan), PGDE (Ilorin), RAS | Ruminant Production | Professor |
| Bamidele O. Oluwatosin | B.Sc.,M.Sc.(Ibadan),Ph.D. (Abeokuta), RAS | Ruminant Production | Professor |
| O. S. Sowande | B.Agric., M.Agric., Ph.D. (Abeokuta), RAS | Ruminant Production | Professor |
| O. A. Adeyemi | B.Agric.,M.Agric.(Ilorin), Ph.D. (Abeokuta), RAS | Non-Ruminant Production | Professor |
| Olajumoke O. O. Adewumi | B. Agric. Tech., M.Agric. Tech., Ph.D.(Akure), RAS | Ruminant Production | Reader |
| O. M. Sogunle | B.Agric., M. Agric., Ph.D. (Abeokuta), RAS | Non-Ruminant Production | Reader |
| Kehinde A. Sanwo | B.Sc.(Ogun),M.Sc.(Ibadan), Ph.D.(Abeokuta), RAS | Meat Science/ Ruminant Production | Senior Lecturer |
| L. T. Egbeyale | B.Agric., M. Agric., Ph.D. (Abeokuta), RAS | Non-Ruminant Production | Senior Lecturer |
| K. O. Bello | B.Agric., M. Agric., Ph.D. (Abeokuta), RAS | Non-Ruminant Production | Senior Research Fellow |
| O. S. Akinola | B.Agric., M. Agric., Ph.D. (Abeokuta), RAS | Non-Ruminant Production | Senior Lecturer |
| O. O. Adeleye | B.Agric.,M.Agric.(Abk), Ph.D.(Newcastle Upon Tyne), RAS | Animal Welfare | Lecturer I |
| A. O. Yusuf | B.Agric.,M.Agric.,Ph.D. (Abeokuta), GAS | Ruminant Production | Lecturer I |
| Olapeju. Y. Ayo-Ajasa | B.Agric.,M.Agric.,Ph.D. (Abeokuta), RAS | Non-Ruminant Production | Lecturer I |
| C. P. Njoku | B.Agric.,M.Agric.,Ph.D. (Abeokuta) | Non-Ruminant Production | Lecturer I |
| F. A. Adewole | B.Agric., M.Agric., Ph.D. (Abeokuta) | Non-Ruminant Production | Research Fellow II |
| D. A. Ekunseitan | B.Agric.,M.Agric.,Ph.D. (Abeokuta), RAS | Non-Ruminant Production | Lecturer II |
| A. A. Ayoola | B.Agric.,M.Agric.,Ph.D. (Abeokuta), GAS | Non-Ruminant Production | Lecturer II |
| O. J. Odutayo | B.Agric., M. Agric. (Abeokuta), GAS | Non-Ruminant Production | Assistant Lecturer |

B. Agric. (Animal Production and Health)
In addition to the general 100 – 400 level courses, the following courses must be taken and passed at 40% or higher grade by students in 500 level of **Animal Production and Health** option of the B. Agric. Programme.

**500 Level: First Semester**

| Course code | Course title | U | L | T | P |
|---|---|---|---|---|---|
| APH 501 | Organic Livestock Production | 3 | 2 | - | 1 |
| APH 503 | Animal Health and Diseases | 2 | 2 | - | - |
| APH 505 | Animal Products and Handling | 3 | 2 | - | 1 |
| APH 509 | Beef Cattle Production | 2 | 2 | - | - |
| ANN 503 | Ruminant Animal Nutrition | 2 | 1 | - | 1 |
| ANN 509 | Instrumentation in Animal Science | 3 | 2 | - | 1 |
| ABG 501 | Animal Experimentation and Research Techniques | 3 | 2 | 1 | - |
| AGS 597 | Seminar I | 1 | - | - | 1 |
| | Elective | 2 | 2 | - | - |
| | **Total** | **21** | **15** | **1** | **5** |
| **Electives** | | | | | |
| ANN 505 | Nutrients Requirements of Farm Animals II | 2 | 2 | - | - |
| PRM 505 | Pasture, Livestock and Environment | 3 | 2 | - | 1 |
| ABG 503 | Animal Behaviour | 2 | 2 | - | - |

**500 Level: Second Semester**

| Course code | Course title | U | L | T | P |
|---|---|---|---|---|---|
| APH 506 | Dairy Cattle Production | 3 | 2 | - | 1 |
| APH 508 | Hatchery Technology and Management | 2 | 1 | - | 1 |
| ANN 502 | Nigerian Feeds and Feeding Stuffs | 2 | 1 | - | 1 |
| ANN 506 | Monogastric Animal Nutrition | 2 | 1 | - | 1 |
| ABG 500 | Applied Animal Breeding | 3 | 2 | - | 1 |
| APH 502 | Animal Welfare | 2 | 1 | - | 1 |
| AGS 598 | Seminar II | 1 | - | - | 1 |
| AGP 599 | Project | 4 | - | - | 4 |
| | Elective | 2 | 2 | - | - |
| | **Total** | **21** | **10** | **-** | **11** |
| **Electives** | | | | | |
| PRM 502 | Forage Conservation and Quality | 2 | 2 | - | - |
| AEM 512 | Macroeconomic Theory and Application | 3 | 2 | 1 | - |

**COURSE SYNOPSES**

**APH 202: INTRODUCTION TO ANIMAL AGRICULTURE (2 Units)**

General biology and management of pets in zoos, kennels, and at home. Working safely with companion animals. Management of animals in kennels, shelters, research facilities, and zoos. Regulatory issues of small animals used as companion pets and research.

**APH 311: NON-RUMINANT ANIMAL PRODUCTION (2 Units)**

Poultry production - problems and prospects. Management systems: management of broilers, layers and cockerels. Management of ducks and turkeys. Diseases and control. Hatchery enterprises. Factors affecting hatchery enterprises. Marketing and record keeping. Pig production - problems and prospects. Management systems: management of pregnant sows, piglets, growers, gilts, breeding sows and boars. Diseases and control. Planning production targets: record targets and record keeping. Pig production enterprise. Rabbit production - problems and prospects. Management systems: management of pregnant does, litters, growers, breeding does and bucks. Diseases and control. Planning production targets: record targets and record keeping. Rabbit production enterprise.

*Practical:* Visit to poultry, piggery and rabbit farms as well as hatcheries.

**APH 312: RUMINANT ANIMAL PRODUCTION (2 Units)**

Cattle production, problems and prospects in Nigeria. Indigenous and exotic breeds of beef and dairy cattle. Dairy and beef production systems. Dairy and beef production enterprises. Sheep and goat production- breeds, management systems, feeding for growth, production and housing. Common diseases and control in cattle, sheep and goats. Marketing of animals and their products. Methods of ageing in animals. Common farm operations, handling and control of animals.

Practical: Visit to cattle, sheep and goat farms to study various management practices and disease control measures. Live animal handling and control. Animal marking and identification methods.

**ANS303: ENTREPRENEURIAL SKILLS IN ANIMAL AGRICULTURE (2 Units)**

Introduction to entrepreneurship and new venture creation, entrepreneurship in theory and practice, the opportunity, forms of business, staffing, marketing and new ventures, Innovation, determining capital requirements for new business, raising capital for new business, financing new business using the CBN's interventions, financial planning and management, legal issues, Possible business opportunities in Animal Agriculture, starting a new business: Feasibility studies, Insurance and environmental consideration

**APH304: Introduction to Microbiology of Livestock Products (2 Units)**

Morphology and Reproduction process of micro-organism, micro-organisms in animal products, sources of contamination and factors affecting their microbial activities, deteriorative changes caused by micro-organisms in animal products, chemical and physical reactions caused by deteriorative changes in animal products, characteristics of some common food poisoning and infections.

**APH 306: Welfare Issues in Animal Science (2 Units)**

Introduction and Definition of Animal Welfare, five freedoms and Interpretations, evolutionary theory of Animal Ethics, introduction to behaviour and Welfare of Broiler Chicken (Meat type birds) and Environment, introduction to behaviour and Welfare of Layer Chicken (Egg-type birds) and Quails, introduction to behaviour and Welfare of Pigs and Rabbits, introduction to behaviour and Welfare of Ruminant Animals

**APH 501: ORGANIC LIVESTOCK PRODUCTION (3 Units)**

Introduction (overview of organic agriculture): Definition of organic agriculture; Global organic farming; Differences between organic farming and other forms of farming i.e. traditional, conventional, low input sustainable farming, Challenges to organic farming, Proper Housing and Design, Rearing of young stock and conversion of older stock Nutrition and Feeding, Routine Husbandry Practices, Breeds and Breeding, Sanitation and Farm Hygiene, Animal Health Care and Parasite control, Animal Welfare and fairness, Medicinal Plants; Identification, conservation, collection and Extraction Methods, Methods of medicine administration, Record keeping, Product Handling, Certification and Marketing Hygiene and Sanitation; manure removal and disposal, beddings, air circulation

Practical: Field visits to organic livestock farms, organic promotion organizations and local organic certification company.

**APH 502: ANIMAL WELFARE (2 Units)**

Welfare - definitions and measurements. Concept of animal welfare. The assessment of farm animal welfare. Animal rights versus animal welfare. Welfare problems in livestock-mortality, skeletal disorders, muscle disorders. Ascites and sudden death syndrome, respiratory and mucous membrane problems. Stress indicators in livestock. Thermal discomfort. Environmental factors linked to welfare problems- air quality, litter quality, temperature, light, stocking density, stockmanship, environmental enrichment. Nutrition and livestock welfare. Welfare issues in animal handling and transportation. Animal rights issues-present and future.

**APH 503: ANIMAL HEALTH AND DISEASES (2 Units)**

Disease-causing organisms – bacteria, virus, fungi, protozoa etc. Symptoms,

diagnosis, treatment and control of common livestock diseases. Life cycle of parasites. Principles of parasite control, immune system of the body. Care of sick animal – isolation, quarantine and culling. Simple animal operations – castration, dehorning, drenching, drug administration. Public health, significance of animal diseases and common zoonotic diseases

**APH 505: ANIMAL PRODUCTS AND HANDLING (3 Units)**

Pre-slaughter handling of different farm animals. Slaughtering methods; dressing and post-mortem changes in meat. Meat quality. Methods of meat preservation. Processing of abattoir by-products. Meat inspection and grading. Meat processing – bacon, sausage, etc. Meat hygiene. Milk products and processing e.g. ice cream, butter, yogurt, cheese, etc. Egg quality, handling, storage and grading. Animal by-products, blood, hooves, faeces and their uses. Hides and skin processing- flaying, curing, tanning, hides and skin utilization.

Practical: Production of meat, egg and milk products in the Laboratory. Visit to abattoir and dressing lines.

**APH 506: DAIRY CATTLE PRODUCTION (3 Units)**

A survey of dairy industry in Nigeria. Production systems and breeds used in dairy production. Management of dairy animals. Physiology of milk production. Feeding of dairy animals. Dairy chemistry. Specific diseases of dairy animals. Establishment and maintenance of a dairy enterprise.

Practical: Visit to a well-established dairy. Practice milking. Practicals on dairy microbiology.

**APH 508: HATCHERY TECHNOLOGY AND MANAGEMENT (2 Units)**

Establishment of hatchery and layout of infrastructures. Management of breeders with particular reference to nutrition and health. Major factors affecting fertility of eggs. Prevention of trans-ovarian diseases in breeders. Egg formation in female reproductive tract, egg abnormalities. Physical characteristics of hatch-able eggs. Pre-incubation care of hatch-able eggs. Incubation periods in poultry species. Incubator types and hatchery sanitation. Ventilation, temperature and humidity regulation in an incubator. Egg candling and turning. Embryonic development and mortality. Major factors influencing hatchability of eggs. Sexing and marketing of chicks. Brooding and management of chicks. Hatchery waste management.

Practical: Incubation of hatching eggs using the department table-top incubators. Visit to commercial hatchery.

**APH 509: BEEF CATTLE PRODUCTION (2 Units)**

Prospects and problems of beef industry in Nigeria. Sources of beef animals. Brief

review of beef production systems. Factors to consider in establishing beef herd/industry. Grazing methods, uses and problems. Factors affecting beef quality. Mating methods in beef herd. Cost of beef production. Health problems in beef production.

Practical: Judging of beef cattle

**AGS 597: SEMINAR I** **(1 Unit)**

This is a compulsory course for all final year students in the Department and students are to present seminars before the end of first semester.

**AGS 598: SEMINAR II** **(1 Unit)**

This is a compulsory course for all final year students in the Department and students are to present seminars before the end of second semester.

**AGP 599: PROJECT** **(4 Units)**

Compulsory for final year student(s) and student(s) is/are to defend the project at the end of second semester.

# DEPARTMENT OF PASTURE AND RANGE MANAGEMENT

The Department, at the time of inception of the University in 1988 was anchored in the College of Plant Science and Crop Production. It took off in September 1991 with the assumption of duty of the first academic staff and coordinator and admission of students from the 1992/93 session. With a restructuring programme in 1994, the Department was relocated to the College of Animal Science and Livestock Production (COLANIM), making it the first Department of Pasture and Range Management in the Nigerian University System.

**Philosophy and Objectives**

The Department is primarily involved in the training of students at the undergraduate Bachelor of Agriculture (B. Agric.) and Postgraduate (PGD, M. Agric./Ph.D.) Levels. The aim is to train students in the science, production and management of forage feed resources for effective ruminant animal production. The Department also conducts research and provides support services in all areas of forage resources for year round feed availability for all classes of ruminant animals etc. Studies are also conducted on ecological improvement, land reclamation, turf making etc.

The primary philosophy that guides the training of students is the production of skilled manpower that are adequately furnished with the comprehensive information required for engaging in economic agricultural production in an environment characterized by rural setting and adequate land endowment. Such knowledgeable professional manpower has to be produced in an atmosphere with the widest possible human and material resources, through the adoption of effective techniques of instruction, and exposure to the actual practice of agriculture. Consequently, there are opportunities for formal training at the Undergraduate and Postgraduate levels for the acquisition of basic and higher degrees respectively. These training programmes are mounted through classroom instruction, laboratory practical, field demonstration, and workshop practice.

The major objectives of the Department, based on the foregoing philosophy, are as follows:

i. To assist in the attainment of self-sufficiency in the production of basic food;
ii. To contribute to the achievement of the goal of marked increase in the production of agricultural raw materials to support the growth of our several industries;
iii. To enhance the production and processing of export produce;
iv. Emphasise on relevant, appropriate and manageable technology to modernize agricultural production, processing, storage preservation and distribution;

v. To enhance rural employment opportunities and the attendant improvement of the quality of rural life;
vi. To evolve effective ways of protecting agricultural land resources from ecological degradation such as erosion, pollution, etc.
vii. To develop new patterns of agricultural structures and government policies which clearly demonstrate that agriculture is an important part of our national economy.
viii. To introduce new areas such as turf making into our economy.

**Academic Staff**

| Name | Qualification | Specialization | Designation |
|---|---|---|---|
| J. A. Olanite | B.Agric.(Ogun), M.Sc. (Ilorin),Ph.D.(Ibadan), RAS | Forage Agronomy and Utilization | Professor & Head of Department |
| O. S. Onifade | B. Sc.,M.Sc., Ph.D. (Zaria), RAS | Forage Agronomy and Utilization | Professor |
| Alaba O. Jolaosho | B.Sc., M.Sc., Ph.D. (Ibadan), AAS | Pasture Agronomy, Forage Conservation and Utilization | Professor |
| O. M. Arigbede | B.Sc., M.Sc., Ph.D. (Ibadan), RAS | Ruminant Nutrition/ Forage Science | Professor |
| Victoria O. A. Ojo | ND (Ibadan),B.Agric., M.Agric., Ph.D. (Abeokuta), RAS | Forage Production and Utilization | Senior Lecturer |
| P. A. Dele | B.Agric.,M.Agric., Ph.D. (Abeokuta), RAS | Forage Agronomy and Utilization | Lecturer I |
| Oluwaseun J. Idowu | NCE (Osiele), B.Agric., M.Agric(Abeokuta), RAS | Forage Science | Lecturer I |
| Bolanle T. Akinyemi | NCE(Osiele),B.Agric., M. Agric.(Abeokuta), RAS | Forage Conservation and Utilization | Lecturer II |

B. Agric. (Pasture and Range Management)

In addition to the general 100 – 400 level courses, the following courses must be taken and passed at 40% or higher grade by students in 500 level of ***Pasture and Range Management*** option of the B. Agric. programme.

**500 Level: First Semester**

| Course code | Course title | U | L | T | P |
|---|---|---|---|---|---|
| PRM 501 | Forage Seed Production and Germplasm Conservation | 2 | 1 | - | 1 |
| PRM 503 | Techniques in Pasture Management and Utilization | 3 | 2 | - | 1 |
| PRM 505 | Pasture, Livestock and Environment | 3 | 2 | - | 1 |
| ABG 501 | Animal Experimentation and Research Techniques | 3 | 2 | 1 | - |
| ANN 503 | Ruminant Animal Nutrition | 2 | 1 | - | 1 |
| ANN 509 | Instrumentation in Animal Science | 3 | 2 | - | 1 |
| APH 509 | Beef Cattle Production | 2 | 2 | - | - |
| AGS 597 | Seminar I | 1 | - | - | 1 |
| | Elective | 2 | 1 | - | 1 |
| | **Total** | **21** | **13** | **1** | **7** |
| **Elective** | | | | | |
| PRM 507 | Pasture Measurement and Evaluation Techniques | 2 | 1 | - | 1 |
| ABG 503 | Animal Behaviour | 2 | 2 | - | - |
| ANP 501 | Lactation Physiology I | 2 | 1 | - | 1 |

**500 Level: Second Semester**

| Course code | Course title | U | L | T | P |
|---|---|---|---|---|---|
| PRM 500 | Pasture and Range Management | 2 | 1 | - | 1 |
| PRM 502 | Forage Conservation and Quality | 3 | 2 | - | 1 |
| PRM 504 | Range Management and Improvement | 2 | 1 | - | 1 |
| PRM 506 | Pasture Improvement and Biotechnology | 2 | 2 | - | - |
| ANN 502 | Nigerian Feeds and Feeding Stuffs | 2 | 1 | - | 1 |
| APH 506 | Dairy Cattle Production | 3 | 2 | - | 1 |
| AGS 598 | Seminar II | 1 | - | - | 1 |
| AGP 599 | Project | 4 | - | - | 4 |
| | Elective | 2 | 2 | - | - |
| | **Total** | **21** | **11** | **-** | **10** |
| **Electives** | | | | | |
| APH 501 | Organic Livestock Production | 3 | 2 | - | 1 |
| PCP 506 | Weed Science and Control | 2 | 2 | - | - |
| ANP 504 | Artificial Insemination | 2 | 1 | - | 1 |

## COURSE SYNOPSES

**PRS 201: INTRODUCTION TO FORAGE SCIENCE (2 Units)**

Forage pasture defined. Importance of forage in ruminant production, forage species in the tropics differentiated from temperate species i.e. grasses, legumes leguminous trees, their common and botanical names, their growth habit, nutritional and soil requirements, their botany and growth pattern. Biomass yield, dry matter content and importance of dry matter.

**PRM 302: PRINCIPLES OF PASTURE AND RANGE MANAGEMENT (2 Units)**

Systematic and botany of grasses and legumes. Identification and classification of tropical forage species. Methods of propagation, physiology of grasses and legumes. Tropical climate and implication for pasture production. Vegetation belts of Nigeria and adaptation of forage species. What is pasture? Pasture types, requirements for

established pasture, establishment, role of pasture in animal production, pasture management and utilization techniques. What is range? How is range different from pasture? Range resources and role in ruminant production, range management, range ecology, range and soil, influence of wildlife animal, range stability and roles of man. Range inventory and species stability, range as repository of forage germplasm, elements of range improvement, range ecology and management, relationships between animal science and range management.

**PRM 304: TROPICAL PASTURE PRODUCTION (2 Units)**

Differences between tropical and temperate pastures, common tropical pasture species, soil and rainfall requirements for tropical pasture production, site selection, land preparation and planting, planted versus natural pastures, fertilizer management of planted pasture, pasture types and fertilizer requirements, fertilizer and manure application, methods of utilization.

**PRM 500: PASTURE AND RANGE MANAGEMENT (2 Units)**

Pasture and range plants (grasses, legume, forbs, shrubs, and trees) and their importance, pasture establishment and renovation, fertilization, performance and management of natural pasture, pasture leys, management of improved grassland in semi-intensive and intensive production systems, grazing optimization theories (definition, grazing pressure, grazing resistance, soil-plant-animal interrelationships, nutrient cycling etc.), Range management and treatment (bush encroachment and control, burning, reseeding, rangeland degradation & reclamation.

**PRM 501: FORAGE SEED PRODUCTION TECHNIQUES AND GERMPLASM CONSERVATION (2 Units)**

Major species of grasses and legumes: botany, classification and management. Effects of environmental factors on forage plants. Forage legumes and their roles in tropical farming systems. Fodder bank technology, shrubs and tree legumes. Agronomic management for seed production. Seed harvesting, processing and storage, germplasm collection, conservation and use.

**PRM 502: FORAGE CONSERVATION AND QUALITY (3 Units)**

Different methods of forage conservation – hay, silage, haylage, crop residues etc. storing and feeding conserved feeds. Feeding values of conserved forages. Health hazards associated with conserved forages. Factors affecting chemical composition and digestibility of feeds. Anti-nutritional factors, mineral imbalance in forages.

**PRM 503: TECHNIQUES IN PASTURE MANAGEMENT AND UTILIZATION (3 Units)**

Types of forages and their attributes. Pasture site selection, land preparation, planting and agronomic management. Pasture utilization. Grazing management. Defoliation techniques and effects on botanical composition. Manure and fertilizer

uses on pastures. Effects of fertilizer types on pasture species. Weeds management and control in pastures. Pasture diseases and control.

**PRM 504: RANGE MANAGEMENT AND IMPROVEMENT (2 Units)**
Grassland agriculture and ecology. Secondary succession in grasslands. Natural pastures and their features. Rangelands: influence of biotic and edaphic factors. Range stability. Range condition. Physical development on the range. Range re-seeding and fertilisation. Bush burning and effects on range stability. Undesirable plants. Practical: field trips to representative range areas, Identification of undesirable/ toxic plants.

**PRM 505: PASTURE, LIVESTOCK AND ENVIRONMENT (3 Units)**
Systematic and botany of grasses and legumes. Identification and classification of tropical forage species. Methods of propagation. Physiology of grasses and legumes. Tropical climate and implication for pasture production. Vegetation belts of Nigeria and adaptation of forage species. Soil-plant-animal interrelationships.

**PRM 506: PASTURE IMPROVEMENT AND BIOTECHNOLOGY (2 Units)**
Tropical pasture species, general overview of productivity of tropical pasture species, general overview of plant breeding and biotechnology, application of principles and procedures of plant breeding and biotechnology in pasture improvement for adaptation, dry matter yield, quality and utilization.

**PRM 507: PASTURE MEASUREMENT AND EVALUATION TECHNIQUES (2 Units)**
Layout of pasture plots, plot mapping, planting methods and planting, methods of evaluation, (e.g. small plot evaluation trial, adaptation trial etc.) varietal trial, fertilizer trial, grazing effects, data to be taken in evaluation trials and methods of measurements, grazing trials, measurement of animal performance on pasture. Botanical composition, scoring, evaluation, determining and recommending renovation measures, pasture, quality evaluation.

**AGS 597: SEMINAR I (1 Unit)**
This is a compulsory course for all final year students in the Department and students are to present seminars before the end of first semester.

**AGS 598: SEMINAR II (1 Unit)**
This is a compulsory course for all final year students in the Department and students are to present seminars before the end of second semester.

**AGP 599: PROJECT (4 Units)**
Compulsory for final year student(s) and student(s) is/are to defend the project at the end of second semester.

# COLLEGE OF BIOSCIENCES

The College of Biosciences (COLBIOS) is one of the newest Colleges of the University. COLBIOS is one of the two Colleges carved out of the former and large College of Natural Sciences (COLNAS).

Considering the fact that science is the bedrock of agricultural and technological development and that modern agriculture in all its ramifications can only be scientifically practiced. COLBIOS is central in the generation of basic knowledge from handling all aspects of agriculture and its mandate. In this regard, it is imperative that all other colleges must link to COLBIOS for applied research. Presently, it is mandatory that all students passing through FUNAAB must pass through the College of Biosciences, in their 100 and 200 levels. This is an indication of the important role the College plays in fulfilling the mandates of the University. It may therefore be correct to refer to COLBIOS as the mother of all Colleges in FUNAAB. Presently, the Departments in the College which offer four year Bachelor of Science Degree programmes are:

i. Department of Biochemistry
ii. Department of Microbiology
iii. Department of Pure and Applied Botany
iv. Department of Pure and Applied Zoology

These departments have proved their worth in carrying out the mandate of the Universities of Agriculture.

**Philosophy**

The primary philosophy that guides the training of students is the production of skilled manpower that is adequately furnished with the comprehensive information required for engaging in economic agricultural production in an environment characterized by rural setting and adequate land endowment. Such knowledgeably professional manpower has to be produced in an atmosphere with the widest possible human and material resources, through the adoption of effective techniques of instruction, and exposure to the actual practice of agriculture and management sciences. Consequently, there are opportunities for formal training at the Undergraduate and Postgraduate levels, for the acquisition of basic and high degrees respectively.

These training programmes are mounted through classroom instruction, laboratory practical, field demonstrations and workshop practice. Deriving from the foregoing philosophy and the major objectives of the University, among others, are:

i. To assist in the attainment of self-sufficiency in the production of basic food;
ii. To contribute to the achievement of the goal of marked increase in the production of agricultural raw materials to support the growth of our several industries as well as the financial entrepreneurial management skills;
iii. To achieve the production and processing of export produce;
iv. To enhance with emphasis on relevant, appropriate and manageable technology to modernize agricultural production, processing, storage, preservation and distribution;
v. To enhance the rural employment opportunities and the attendant improvement of the quality of rural life;
vi. To evolve effective ways of protecting agricultural land resources from ecological degradation such as erosion, pollution, etc.;
vii. To develop new patterns of agricultural structures and government policies which clearly demonstrates that agriculture is an important part of our national economy

**Objectives**

Science disciplines are the bedrock of agricultural and technological developments and are therefore of natural growth. The training of scientists in an agricultural and management setting is to:

i. Enable agricultural and management problems be resolved scientifically with an overall aim of attaining self-sufficiency in food production;
ii. Ensure a thorough and reliable training which will assure our graduates employment opportunities;

iii. Inculcate into science graduates an entrepreneurial culture, good communication skills, computer literacy, problem solving, life-long learning and subject specific skills;
iv. Train students to be creative, innovative and seek self-employment

| Name | Qualification | Designation |
|---|---|---|
| O. A. Akinloye | B.Sc. (Ile-Ife), Ph.D. (Abeokuta) | Professor and Dean |
| S. O. Kareem | B.Sc., M.Sc., Ph.D. (Abeokuta) | Reader and Deputy Dean |

# DEPARTMENT OF BIOCHEMISTRY

**Background**

The Department of Biochemistry was established in the year 2001 when the Department of Chemical Sciences was split into two Departments, namely: Biochemistry and Chemistry Departments. Since then, the department has continued to maintain quality and high standards in its teaching and research efforts at both undergraduate and postgraduate levels.

**Philosophy**

The training in Biochemistry should respond to needs of the students, the changing nature of the subject, expectations of society and the human resources' requirements of the public and private sectors. Subject- specific knowledge must be complemented with the acquisition of skills that adequately prepare the graduate not only for white-collar jobs but also self-employment. Training in Biochemistry at FUNAAB emphasizes the inculcation of communication, entrepreneurial, problem-solving, life-long learning and information technology skills so as to make the training relevant to society and industry, and engender ability of graduates to create jobs.

**Objectives of the Programme**

The B.Sc. degree programme in Biochemistry like many other degree options in the College of Biosciences is a four-year programme designed to teach the basic concepts of the chemistry of life, from micro-organisms to man. The primary aim of the B.Sc. Biochemistry programme is to train students in basic science of biochemistry up to Bachelor's degree level. Specifically, the objectives of the programme include:

i. Providing students with a broad and balanced foundation of biochemical knowledge and practical skills;
ii. Stimulating students' interest in the application of biochemistry in industrial, economic, environmental, technological and social development;
iii. Instilling in students sense of enthusiasm for biochemistry, appreciation of its application in different contexts and to involve them in an intellectually stimulating and satisfying experience of learning and studying;
iv. Creating an awareness of the relevance of biochemistry in various ways in meeting the manpower needs of the country, especially in the fields of industry, medicine and agriculture;
v. Developing a research culture in the department in consonance with current trends in the biochemical world so as to inculcate broad scientific discipline in undergraduate students;
vi. Providing appropriate courses for students from other departments including Botany, Zoology Environmental Management and Toxicology, Microbiology, and Nutrition and Dietetics; and

vii. Providing a solid academic foundation for specialized training in biochemistry at higher degree levels (M.Sc. and Ph.D.).

**Duration of the Programme**

The duration of the B.Sc. degree in Biochemistry shall normally be four academic sessions (8 semesters) for students admitted into the 100 level and three academic sessions (six semesters) for those that come in through Direct Entry at 200 level.

**Minimum Academic Requirements for Graduation**

To qualify for the award of the degree of Bachelor of Sciences (Biochemistry), a student must have fulfilled the following approved minimum academic standards:

I. Spent not less than 3 or 4 years on the programme depending on point of entry
ii. Passed all the University (compulsory) courses
iii. Passed all the department's (core) courses and the required electives
iv. Must not have exceeded the minimum periods specified above by more than two years
v. Must have a CGPA of 1.5

**Academic Staff**

| Name | Qualification | Specialization | Designation |
|---|---|---|---|
| Regina. N. Ugbaja | B.Sc. (Ekpoma), M.Sc. (Lagos), Ph.D. (Abeokuta) | Lipid Biochemistry/ Neuroscience | Senior Lecturer/ Ag. HOD |
| O. Ademuyiwa | B.Sc., M.Sc. (Ife), Ph.D. (Munich) | Biochemical Toxicology/ Pharmacology | Professor |
| O. A. Akinloye | B.Sc., M.Sc. (Ife), Ph.D. (Abeokuta) | Phytomedicine/ Enzymology | Professor |
| Oluwatosin A. Dosumu | B.Sc. (Ogun)M.Sc., Ph.D. (Abeokuta) | Toxicology/Molecular Biology | Senior Lecturer |
| J. K. Akintunde | B.Sc. (Abeokuta), M.Sc., Ph.D.(Ibadan) | Toxicology | Senior Lecturer |
| O. B. Onukwor | B.Sc. (Sokoto), M.Sc., Ph.D.(Abeokuta) | Toxicology/Biochemical Energetics | Lecturer I |
| J. Akamo | B.Sc., M.Sc., Ph.D. (Abeokuta) | Clinical Biochemistry | Lecturer I |
| *A. M. Kosoko | B.Sc. (Abeokuta) M.Sc. (Ibadan) | Drug Metabolism and Molecular Toxicology | Lecturer II |
| D. O. Babayemi | B.Sc., M.Sc. (Abeokuta) | Immunotoxicology | Lecturer II |
| Esther O. Adeyi | B.Sc., M.Sc. (Abeokuta) | Immunochemistry | Lecturer II |
| O. T. Somade | B.Sc. (Abeokuta), M.Sc. (Ibadan) | Environmental Oncology/ Molecular Biology | Lecturer II |
| Dorcas I. Akinloye | B.Sc., M.Sc. (Abeokuta) | Phytochemistry/Lipidology | Lecturer II |

| Name | Qualification | Specialization | Designation |
|---|---|---|---|
| *T. D. Oyewale | B.Sc. (Abeokuta)<br>M.Sc. (Westminster) | Medical Biochemistry | Assistant Lecturer |
| E. O. Eteng | B.Sc., M.Sc. (Calabar) | Clinical/Environmental Toxicology | Assistant Lecturer |
| C. A. Moses | B.Sc., M.Sc. (Zaria) | Phytomedicine | Assistant Lecturer |

* Study Leave.

**CURRICULUM FOR B.Sc. DEGREE IN BIOCHEMISTRY**

**100 Level: First Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BIO 101 | General Biology I | 2 | 2 | - | - |
| BIO 103 | Introductory Physiology | 2 | 2 | - | - |
| BIO 191 | Practical Biology I | 1 | - | - | 1 |
| CHM 101 | Introductory Physical Chemistry | 3 | 3 | - | - |
| CHM 191 | Practical Chemistry I | 1 | - | - | 1 |
| MTS 101 | Algebra | 3 | 2 | 1 | - |
| PHS 101 | General Physics I | 3 | 3 | - | - |
| PHS 191 | Physics Laboratory I | 1 | - | - | 1 |
| GNS 101 | Use of English | 2 | 2 | - | - |
| GNS 111 | Introduction to Social Problem | 1 | 1 | - | - |
| ETS 201 | Entrepreneurship Studies I | 2 | 2 | - | - |
| | Total | 21 | 17 | 1 | 3 |

**100 Level: Second Semester**

| **Course Code** | **Course Title** | **U** | **L** | **T** | **P** |
|---|---|---|---|---|---|
| BIO 102 | General Biology II | 2 | 2 | - | - |
| BIO 192 | Practical Zoology | 1 | - | - | 1 |
| CHM 102 | Introductory Organic Chemistry | 2 | 2 | - | - |
| CHM 104 | Introductory Inorganic Chemistry | 2 | 2 | - | - |
| CHM 192 | Practical Chemistry II | 1 | - | - | 1 |
| MTS 102 | Calculus and Trigonometry | 3 | 2 | 1 | - |
| PHS 102 | General Physics II | 3 | 3 | - | - |
| PHS 192 | Physics Laboratory II | 1 | - | - | 1 |
| AEM 102 | Principles of Economics | 2 | 2 | - | - |
| GNS 102 | Introduction to Nigerian History | 1 | 1 | - | - |
| | **Total** | **18** | **14** | **1** | **3** |

**200 Level: First Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BCH 201 | General Biochemistry I | 3 | 2 | - | 1 |
| MCB 201 | General Microbiology I | 3 | 2 | - | 1 |
| CHM 211 | Basic Inorganic Chemistry I | 2 | 2 | - | - |
| CHM 221 | Basic Organic Chemistry I | 2 | 2 | - | - |
| CHM 231 | Basic Physical Chemistry I | 2 | 2 | - | - |
| CHM 291 | Experimental Chemistry I | 1 | - | - | 1 |
| GNS 201 | Writing and Literary Appreciation | 1 | 1 | - | - |
| GNS 202 | Elements of Politics & Government | 1 | 1 | - | - |
| GNS 203 | Use of Library | 1 | 1 | - | - |
| GNS 204 | Logic & History of Science | 2 | 2 | - | - |
| ETS 301 | Elements of Psychology | 2 | 2 | - | - |
| CSC 201 | Introduction to Computer Science for non-majors | 3 | 2 | 1 | - |
| | **Total** | **23** | **19** | **1** | **3** |

**200 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BCH 202 | General Biochemistry II | 3 | 2 | 1 | 1 |
| BCH 204 | Food & Nutritional Biochemistry | 3 | 2 | - | - |
| ZOO 202 | Introductory Genetics & Evolution | 2 | 2 | - | - |
| ZOO 206 | General Physiology | 2 | 1 | - | 1 |
| CHM 212 | Basic Inorganic Chemistry II | 2 | 2 | - | - |
| CHM 222 | Basic Organic Chemistry II | 2 | 2 | - | - |
| CHM 232 | Basic Physical Chemistry II | 2 | 2 | - | - |
| CSC 204 | Computer Programming II | 2 | 2 | - | - |
| APH 202 | Introduction to Animal Production | 3 | 2 | 1 | - |
| | **Sub-Total** | **21** | **17** | **2** | **2** |
| **Elective** | | | | | |
| BOT 204 | Cell Biology | 2 | 2 | - | - |
| | **Total** | **23** | **19** | **2** | **2** |

**300 Level: First Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BCH 301 | Metabolism of Carbohydrates | 2 | 2 | - | - |
| BCH 303 | Metabolism of Lipids | 2 | 2 | - | - |
| BCH 305 | Metabolism of Amino Acids & Proteins | 2 | 2 | - | - |
| BCH 307 | Metabolism of Nucleic Acids | 2 | 2 | - | - |
| BCH 309 | Bioenergetics | 2 | 2 | - | - |
| BCH 311 | Biochemical Methods | 3 | 2 | - | 1 |
| BCH 323 | Enzymology | 2 | 2 | - | - |
| CHM 303 | Instrumental Methods of Analysis | 2 | 1 | - | 1 |
| MCB 307 | Microbial Genetics | 3 | 2 | - | 1 |
| STS 201 | Statistics for Agricultural & Biological Sciences | 3 | 2 | 1 | - |
| | **Total** | **23** | **19** | **1** | **3** |

**300 Level: Second Semester - Student Industrial Work Experience**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BCH 392 | Industrial Training (IT) | 4 | - | - | 4 |
| BCH 394 | Inspection/Visitation | 4 | - | - | 4 |
| BCH 396 | Industrial Training Report | 4 | - | - | 4 |
| BCH 398 | Seminar | 4 | - | - | 4 |
| | **Total** | **16** | **-** | **-** | **16** |

**400 Level: First Semester**

| Course Code | Course | U | L | T | P |
|---|---|---|---|---|---|
| BCH 401 | Advanced Biochemical Methods | 2 | 1 | - | 1 |
| BCH 403 | Biosynthesis of Macromolecules | 1 | 1 | - | - |
| BCH 405 | Regulation of Metabolic Processes | 2 | 2 | - | - |
| BCH 407 | Toxicology | 2 | 2 | - | - |
| BCH 409 | Advanced Enzymology | 3 | 3 | - | - |
| BCH 411 | Functional Biochemistry | 2 | 2 | - | - |
| BCH 413 | Plant Biochemistry | 2 | 2 | - | - |
| BCH 415 | Bio-inorganic Chemistry | 1 | 1 | - | - |
| BCH 417 | Tissue Biochemistry | 1 | 1 | - | - |
| BCH 421 | Biochemical Reasoning | 1 | 1 | - | - |
| BCH 423 | Membrane Biochemistry | 2 | 2 | - | - |
| BCH 425 | Biotechnology | 2 | 2 | - | - |
| | **Total** | **21** | **20** | **-** | **1** |

**400 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BCH 402 | Seminar | 2 | - | - | 2 |
| BCH 404 | Industrial Biochemistry | 3 | 2 | - | 1 |
| BCH 412 | Immunochemistry | 3 | 2 | - | 1 |
| BCH 414 | Genetic Engineering | 2 | 2 | - | - |
| BCH 410 | Pharmaceutical Biochemistry | 2 | 2 | - | - |
| BCH 499 | Project | 4 | - | - | 4 |
| | Elective | 2 | 2 | - | - |
| | **Total** | **18** | **10** | **-** | **8** |
| | **Electives (To Choose Only One)** | | | | |
| BCH 416 | Bioinformatics and Biostatistics | 2 | 2 | - | - |
| BCH 418 | Forensic Biochemistry | 2 | 2 | - | - |

**COURSE SYNOPSES**

**BCH 201: GENERAL BIOCHEMISTRY I (3 Units)**

Principles of the chemical basis of life. The molecular basis of cellular structure - polysaccharides, lipids, proteins, nucleic acids. The cellular basis of life. Buffers, acidity and alkalinity; pH and pKa values and their effects on cellular activities. Chemistry of carbohydrates, lipids, amino acids and proteins, nucleic acids and

nucleoproteins. Enzymes and co-enzymes. Vitamins.

**BCH 202: GENERAL BIOCHEMISTRY II (3 Units)**

Methods of studying metabolism. Metabolism of carbohydrates, lipids and proteins; metabolism of purines, pyrimidines and nucleotides. Effects of acid and alkali on hydrolysis of nucleic acids. Structures and function of major cell components prokaryotes versus eukaryotic organisms photosynthesis. (Pre-requisites BCH 201)

**BCH 204: FOOD AND NUTRITIONAL BIOCHEMISTRY (3 Units)**

Food nutrients. Energy values of foods and energy expenditure by mammals. Nutritive value of foods – carbohydrates, fats, proteins, vitamins, mineral elements and water. Nutritional disorders, prevention and therapy. Nutritional status and nutritional requirements. Recommended dietary allowances. Assessment of nutritional status. Nutrient requirements in relation to physical activity and ageing. Diet and disease, obesity and under-nutrition. Food Constituents. An introduction to the theory and application of physical and chemical methods for determining the constituents of food; processing, preservation and storage of traditional foods – root and stem tubers, fruit and fruit drinks, seeds and grains, greens and vegetables. Food poisoning and intoxication, prevention and cure. Chemical changes in foods, food enzymes and their uses.

**BCH 301: METABOLISM OF CARBOHYDRATES (2 Units)**

Digestion and degradation of carbohydrates - sugars, storage polysaccharides and cell walls. Reactions of sugars - Glycolysis, the tricarboxylic acid cycle, the pentose phosphate pathway, the Cori cycle, the Calvin Pathway, gluconeogenesis and the disorders of carbohydrate metabolism. (Pre-requisites BCH 201, 202)

**BCH 303: METABOLISM OF LIPIDS (2 Units)**

A survey of structure, functions, biosynthesis and catabolism of different classes of lipids. The regulatory aspects of biosynthesis and catabolism of the lipids, especially in relation to homeostasis in the organism will be stressed. The lipids include: fatty acids, glycerides, phosphoglycerides, waxes, prostaglandins, terpenoids and steroids such as bile acids, steroid hormones, carotenoids and vitamin A, vitamin D and terpenoidquinones. Biological membranes. (Pre-requisites BCH 201, 202)

**BCH 305: METABOLISM OF AMINO ACIDS AND PROTEINS (2 Units)**

Amino acids as building blocks of proteins; covalent backbone of proteins. Primary structure of proteins. Reactions of amino acid side chains. Secondary, tertiary and quaternary structures of proteins. Isolation, fractionation, purification and characterization of proteins. Protein-protein interaction. Biological functions of protein - correlation of structure with functions in a few specific proteins. Oxidative degradation of amino acids, NH4 transport. Biosynthesis of Proteins. (Pre-requisites BCH 201, 202).

**BCH 307: METABOLISM OF NUCLEIC ACIDS (2 Units)**

Metabolism of purines and pyrimidines. Structure and properties of nucleotides and nucleic acids. Hydrolysis of nucleic acids. Elucidation of DNA structure and properties. Genome organization and biosynthesis of protein. Abnormalities in nucleic acid metabolism - xeroderma pigmentations and skin cancer. (Pre-requisites BCH 201, 202, CHM 222)

**BCH 309: BIOCHEMICAL METHODS (2 Units)**

A review of the laws of thermodynamics; free energy and chemical and electrochemical potentials. Nernst equation. High energy compounds. ATP hydrolysis, phosphate group transfer potential. ATP production and its regulation. Oxidative phosphorylation, substrate level phosphorylation, photophosphorylation, bioluminescence. Energy-dependent membrane transport. (Pre-requisites BCH 201, 202, CHM 231)

**BCH 311: BIOENERGETICS (2 UNITS)**

Principles of instrumentation. Principles, methodologies and applications of electrophoresis, chromatography, spectroscopy and spectrophotometry, centrifugation and isotopic techniques. Practical laboratory exercises emphasizing the applications of these techniques in biochemistry are expected to be carried out.

**BCH 323: ENZYMOLOGY (2 UNITS)**

Classification and nomenclature of enzymes. Effects of temperature, pH, ions and inhibitors on enzyme-catalysed reaction, enzyme kinetics and inhibition. Mechanism of enzyme-catalysed reactions. Michaelis-Menten Equation. Allosteric/Regulatory enzymes. Estimation of kinetic parameters - enzyme activities, Km, Vmax, KI. Zymogen activator, digestive enzymes etc. Coenzymes. (Pre-requisites BCH 201, 202, CHM 211, 222, 231; Co-requisites MTS101, 102)

**BCH 392, 394, 396 & 398: STUDENTS' INDUSTRIAL WORK EXPERIENCE (16 UNITS)**

Students would be attached to some organizations of biochemical interest (Hospital Laboratories, Pharmaceutical Industries, Quality Control Agencies and Research Institutes/Centres). They would be expected to receive sufficient practical training and be familiar with relevant biochemistry practices.

Detailed report of students' experiences and activities during the period of attachment would be submitted by students not later than first week of the following semester. Grading will be based on the written report, oral presentation in a seminar and on-site assessment by University and industry-based Supervisors.

**BCH 401: ADVANCED BIOCHEMICAL METHODS (3 Units)**

The purpose of this course is to familiarize students with operations of latest biochemical equipment and with methods of research assimilation and

dissemination of information. Students will therefore go round lecturers and laboratories housing specialized equipment with the aim of exposing them to such equipment under the supervision of the lecturer. Part of the course will also cover the effective use of the library, preparation of dissertations or theses, papers for journal publications and journal review. Special assignments and essays will be given to students. (Pre-requisites BCH 309)
Practical laboratory exercises emphasizing the applications of these techniques in biochemistry are expected to be carried out.

**BCH 402: SEMINAR (2 Units)**
Seminars would be given by students on selected topics of interest in Biochemistry.

**BCH 404: INDUSTRIAL BIOCHEMISTRY (3 Units)**
A short review of microbial physiology and genetics. A review of general metabolic pathways, control and application in industrial processes. Continuous culture methods - principles and applications. The chemostat and its application in industrial fermentations, Fermentations - alcoholic, amino acids, antibiotics and other secondary metabolites. Primary and secondary metabolism. Process evaluation and development. Over-production of metabolites - amino acids, taste enhancers, vitamins, toxins, etc. Methods for screening and selecting micro-organisms of industrial importance. Induction of mutation in micro-organisms and plants for the purpose of over-production. Strain selection/development and enhancement. Gene dosage and its application in industrial processes. Enzymes biotechnology - enzyme immobilization, enzyme reactors, industrial uses of enzymes.

**BCH 405: REGULATION OF METABOLIC PROCESSES (2 Units)**
The relationship of Kreb's cycle to protein, carbohydrate, lipid and nucleic acid metabolism. Integration of metabolic pathways. Illustration of regulation of linear and branched metabolic pathways using specific examples. Turnover rates and metabolic pools. Catabolite repression, end-product repression, the lactose and arabinose operons. Identification of different regulatory mechanisms in metabolic pathways.

**BCH 409: ADVANCED ENZYMOLOGY (3 Units)**
Steady state enzyme kinetics. Transient kinetic methods. Chemistry of enzyme catalysis. Regulatory enzymes. Molecular models for allosterism. Multienzyme complexes. Enzyme assays. Criteria for determining purity of enzymes. Enzyme reconstitution. Regulation of enzyme activity and synthesis.

**BCH 410: PHARMACOLOGICAL BIOCHEMISTRY (2 Units)**
Review of different types of drugs with examples of structures. Action of drugs and foreign compounds on living organisms. Absorption, distribution and termination of

action of drugs. Dose and time responses to drugs. Drug toxicity and aspects of drug abuse. Metabolic factors affecting chemotherapeutic agents. Theories of the mechanism of drug action. Drug resistance and other factors affecting drug efficacy. The physiological and biochemical action of some selected drugs. Nigerian traditional medicinal plants in the management and therapy of common ailments in Nigeria (malaria, sickle-cell, anaemia, common cold, hepatitis, etc.)

**BCH 411: FUNCTIONAL BIOCHEMISTRY (2 Units)**

Body fluids; blood-plasma proteins, blood clotting, iron metabolism, electrolyte, water and acid-base balance. Biochemistry of brain, conduction and transmission of nervous impulse. Bone; calcium and phosphate metabolism. Biochemistry of vision, reproductive tissues, hormones, immunochemistry and immunobiology. In-born errors of metabolism. Acquired immunodeficiency syndrome.

**BCH 412: IMMUNOCHEMISTRY (3 Units)**

Basic concepts of immunology. Structure of antigens, antigenic determinants and cellular response. Structure and classification of immunoglobulins and antibodies. Antigen and antibody interaction. Genetic basis of antibody diversity. The complement system in immune response. Hypersensitivity, immunopathology, autoimmunity, tumour and transplantation immunology. Immunopathogenesis of HIV. Immunochemical techniques - haemagglutination and complement fixation, precipitation reactions, immunoblotting, isolation of lymphocyte population, cytotoxic assay, etc.

**BCH 413: PLANT BIOCHEMISTRY (2 Units)**

Organisation of plant cells, photosynthesis, alkaloids and flavonoids, plant hormones. Structure-function relationship of plant hormones. Biosynthesis of carotenoid pigments. Biochemistry of plant development. The plant-cell-wall - structure, formation and growth. Lignin formation. Free amino acids, pyrimidines, purines and nucleosides in plants. Metabolism of auxins, gibberellins and cytokines. Synthetic growth regulators and herbicides

**BCH 414: GENETIC ENGINEERING (2 Units)**

Replication, transcription and translation - a brief review. Isolation and manipulation of nucleic acids. The genetic code and its relationship to cellular function. Gene mutation and mutagenic agents. Basic techniques of genetic engineering: Southern Blotting, Hybridization of nucleic acids, Gene probes, Polymerase chain reaction, Gene sequencing, Gel electrophoresis of nucleic acids. Site-directed mutagenesis. Enzymology of genetic engineering, i.e. Restriction endonucleases, ligases and others. Cloning vectors, Gene cloning, Gene banks/libraries Expression of eukaryotic genes in E. coli. Cloning in plant cells and mammalian cells. Recombinant DNA techniques and applications. Uses of genetic engineering in Agriculture, Health and Industry.

**BCH 415: BIOINORGANIC CHEMISTRY (1 Unit)**

Relationship between the physico-chemical properties and biological functions of inorganic ions. Ligand complexes and their biochemical significance. Electrolyte metabolism. Nitrogen fixation and sulphur cycle.

**BCH 416: BIOINFORMATICS AND BIOSTATISTICS (2 Units)**

Basic statistical concepts, Experimental design, Data transformation, Biological data, Accuracy of Measurement, Significant figures. Frequency distribution. Measure of central tendency, Measure of dispersion and variability. Graphical presentation of data. Normal distribution and standard curve. Statistical hypotheses and level of significance, Central limit theorem and confidence interval. t-test: Student t-distribution, One sample hypotheses, Two sample hypotheses: (Paired and Unpaired) Parametric t- distribution, Non- Parametric t- distribution. Multisample hypotheses: ANOVA, Fischer's test. Simple Linear Correlation and Regression. Biological databases, Sequence Analysis and alignments, BLAST, Molecular Phylogenetics, Basic Structure Modeling, Visualization of Visualization of Alignments, Trees and Structure Models.

**BCH 418: FORENSIC BIOCHEMISTRY (2 Units)**

Definition of Forensic Biochemistry. Forensic laws, codes, acts and standards. Governmental agencies involved in implementing forensic laws; such as the Codex Alimentarius Commission of the United Nations, Standard Organization of Nigeria, National Agency for Food and Drug Administration and Control, Institute of Public Analysts of Nigeria, National Drug Law Enforcement Agency, Nigeria Customs Services, etc. Forensic laboratories, equipment and operations. Regulation and Safety requirements for forensic laboratories. Overview of biochemical methods in forensic laboratories. Determination of substances of forensic interests in body fluids, marriage, parentage, and pregnancy. Alcohol consumption and breathalyser test, DNA – fingerprinting, Ames test, the AIDS test. Enforcement aspects of forensic biochemistry. Case studies and miscellaneous reports in forensic biochemistry.

**BCH 421: BIOCHEMICAL REASONING (1 Unit)**

Evaluation and design of experimental biochemistry from available information and data. Analysis, interpretation and inference drawing from data generated during biochemical research.

**BCH 423: MEMBRANE BIOCHEMISTRY (2 Units)**

Structure, composition and functions of biological membranes. Isolation, characterization and classification of membrane bilayers e.g. the unit membrane hypothesis; Membrane transport system-active versus passive transport of sugars and amino acids ionophores.

**BCH 425: BIOTECHNOLOGY (2 Units)**

Definition, history and evolution of Biotechnology. Scope (different areas) of biotechnology. Genes and Genetic engineering, Tools and Practice of genetic engineering (Restriction and other enzymes, vectors, DNA cutting and ligation, cloning in prokaryotic cells (etc.). Cell culture, biomass production and technology. Enzyme technology: Production and Purification, Enzyme/cell immobilization. Fermentation technology, operations, bioreactors. Applications of biotechnology in production of organic acids (citric and lactic acids), biofuels, in agriculture, health and food industries. Social and economic implications of Biotechnology.

**BCH 427: BIOSYNTHESIS OF MACROMOLECULES (1 Unit)**

Structure and functions of macromolecules. Storage and structural polysaccharides; mucopolysaccharides, glycoproteins, bacterial cell wall. Synthesis of complex lipids, lipoproteins and nucleic acids.

**BCH 429: TOXICOLOGY (2 Units)**

History of Toxicology, Absorption, Distribution and Elimination of Toxicants. Detoxification mechanisms. The biochemical modes of action of pesticides and herbicides. Toxicological effects of expired drugs. Side effects of drugs as a result of use and/or misuse. Allergy and its biochemical basis. Toxins in processed foods and beverages. Screening for toxic pollutants in food, water, etc. Biochemistry of aflatoxins and mycotoxins. Toxicological studies of food additives and food preservatives.

**BCH 433: TISSUE BIOCHEMISTRY (1 Unit)**

Muscle structure, composition, mechanism of contraction, source of energy for muscular work. Liver, distribution of nutrients, urea synthesis, excretory functions, detoxification reactions. Kidney renal functions and composition of urine. Biochemistry of adipose tissue.

**BCH 499: RESEARCH PROJECT (6 Units)**

Students are required to carry out independent research on topics (in Biochemistry) of academic interest. Students will be required to carry out literature survey on the topics, perform experiments and produce short reports. Students will be subjected to both seminar and oral examinations on the projects undertaken.

# DEPARTMENT OF MICROBIOLOGY

**Introduction**

Microbiology is a broad science encompassing the study of bacteria, algae, protozoa, fungi, and viruses in terms of their ecology, biochemistry, physiology, genetics, and role in disease processes. Of particular interest is the use of microbes in industrial applications for the production of foods and natural products, such as vitamins, as well as their rapidly expanding role in biotechnology and genetic engineering studies. A thorough understanding of microorganism requires a broad educational background, in Chemistry, Physics, Mathematics, and other areas of Biology.

**Philosophy**

Microbiology is the study of microorganisms, a large and diverse group of organisms that exist as single cells or cell clusters. The science of microbiology includes the study of microbial growth, biochemistry, genetics and ecology as well as the relationship of microorganisms to other organisms including humans. As a basic biological science, microbiology provides some of the most accessible research tools for probing the nature of life processes. Our sophisticated understanding of the chemical and physical principles governing life has developed from studies of microorganisms. As an applied biological science, microbiology deals with many important practical problems in medicine, agriculture, biodegradation and food industries, and is at the heart of biotechnology industries. Students pursuing a major in microbiology will have an opportunity to take coursework related to these important areas.

The philosophy of the degree programme therefore, is to train human resources who will develop the society technologically particularly in areas relating to human welfare and progress, thereby contributing to the building of national identity and integrity.

**The Specific Objectives of the Programme**

**Aims**

The degree programme aims at development of creative, innovative and self-reliant human resources in the form of graduates with entrepreneurial culture, good communication skills, computer literacy and problem-solving abilities who will transform the society for the better.

**Objectives**

The objectives of the Bachelor of Science (Microbiology) curriculum are to:

i. Make the student develop skill and acquire the necessary knowledge of teaching and productive research for solving current problems of the

Nigerian society in both basic and applied aspects of Microbiology.

ii. Emphasize technological and vocationally-oriented training to enable the student acquire the knowledge of Microbiology and techniques necessary for industries such as breweries, food processing and preservation, water works, pharmaceuticals, medicine, agriculture as well as research.

iii. Train the students to acquire the knowledge of Microbiology and its applications in health-care delivery particularly in pathological and immunological laboratories as well as forensic laboratories and environmental monitoring.

iv. Provide courses in Microbiology to students of other Departments and Colleges whose degree options require general knowledge of Microbiology and Biotechnology.

**Duration of the Programme**

The duration of the B.Sc. Degree in Microbiology shall normally be four academic sessions (8 semesters) for students admitted into the 100 level and three academic sessions (six semesters) for those that come in through Direct Entry at 200 level.

**Academic Staff**

| Name | Qualification | Specialization | Designation |
|---|---|---|---|
| Olufunke B. Shittu | B.Sc., M.Sc. (Ife); Ph.D. (Abeokuta) | Env. & Public Health Microbiology | Reader and Ag. Head of Department |
| Mobolaji O. Bankole | B.Sc., M.Sc. Ph.D. (Zaria) | Food and Industrial Microbiology | Professor |
| T. O. S. Popoola | B.Sc., M.Sc. (Jos), Ph.D. (Reading), C Biol, MBiol, MNIM | Applied Microbiology | Professor |
| Oluwatoyin R. Afolabi | B.Sc. (Ilorin), M.Sc., Ph.D. (Ibadan) | Food Microbiology & Biotech. | Professor |
| D. A. Ojo | B.Sc. (Wisconsin) MT (ASCP) (Iowa), M.Sc. (Minnesota) Ph.D. (Abeokuta) | Medical Microbiology & Public Health | Professor |
| Aderonke K. Akintokun | B.Sc., M.Sc., Ph.D. (Ibadan) | Envi. Microbiology & Biotechnology | Professor |
| Flora Oluwafemi | B.Sc., M.Sc. (Ibadan), Ph.D. (Benin) | Food Microbiology and Safety | Professor |
| S. O. Kareem | B.Sc., M.Sc. Ph.D. (Abeokuta) | Industrial Biotechnology (Enzyme Technology) | Reader |
| Olusola O. Odedara | B.Sc.(Ife), M.Sc., Ph.D. (Ibadan) | Plant Virology | Senior Lecturer |
| S. A. Balogun | B.Sc., M.Sc., Ph.D. (Ibadan) | Env. Microbiology & Biotech. (Petroleum Microbiology) | Senior Lecturer |

| Name | Qualification | Specialization | Designation |
|---|---|---|---|
| Tolulope M. Obuotor | B.Sc., M.Sc, Ph.D. (Ife) | Env. Microbiology | Senior Lecturer |
| Adejare R. Oloyede | B.Sc., M.Sc. Ph.D. (Abeokuta) | Agric. Microbiology & Biotech. | Lecturer I |
| Tolulope Adeleye | B.Sc., M.Sc. Ph.D. (Abeokuta) | Industrial Microbiology | Lecturer II |
| Williams E. Ike | B.Sc., M.Sc. Ph.D. (Ibadan) | Pharmaceutical Microbiology | Lecturer II |
| S. O. Adebajo | B.Sc. (Ogun), M.Sc., Ph.D. (Abeokuta) | Env. Microbiology | Lecturer II |
| Adediwura O. Arowosegbe | B.Sc., M.Sc. (Abeokuta) | Medical Microbiology & Public Health | Lecturer II |
| A. O. Badmos | B.Sc. (Ogun), M.Sc. (Abeokuta) | Food Microbiology | Assistant Lecturer |
| E. Oni | B.Sc. (Ogun), M.Sc. (Abeokuta) | Food Microbiology | Assistant Lecturer |
| A. E. Ojo | B.Sc., M.Sc. (Abeokuta) | Medical Microbiology & Public Health | Assistant Lecturer |
| Wasiu A. Abibu | B.Sc., M.Sc. (Abeokuta) | Env. Microbiology | Assistant Lecturer |
| Abiola T. Oladotun | B.Sc., M.Sc.(Abeokuta) | Medical Microbiology & Public Health | Assistant Lecturer |

## COURSE OUTLINE

### 100 Level: First Semester

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BIO 101 | General Biology I | 2 | 2 | - | - |
| BIO 103 | Introductory Physiology | 2 | 2 | - | - |
| BIO 191 | Practical Biology | 1 | - | - | 1 |
| CHM 101 | Introductory Physical Chemistry | 3 | 2 | 1 | - |
| CHM 191 | Practical Chemistry | 1 | - | - | 1 |
| GNS 101 | Use of English | 2 | 2 | - | - |
| GNS 102 | Introduction to Nigerian History | 1 | 1 | - | - |
| GNS 111 | Introduction to Social Problems | 1 | 1 | - | - |
| MCB 111 | Introduction to Microbiology | 3 | 2 | 1 | - |
| MTS 105 | Algebra & Trigonometry for the Biological Sciences | 3 | 2 | 1 | - |
| PHS 105 | Physics for Biological Sciences I | 3 | 2 | 1 | - |
| PHS 191 | Physics Laboratory I | 1 | - | - | 1 |
| | **Total** | **23** | **16** | **4** | **3** |

**100 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| AEM 102 | Principles of Economics | 2 | 2 | - | - |
| BIO 102 | General Biology II | 2 | 2 | - | - |
| BIO 192 | Practical Biology II | 1 | - | - | 1 |
| CHM 102 | Introductory Organic Chemistry I | 2 | 2 | - | - |
| CHM 104 | Inorganic Chemistry I | 2 | 2 | - | - |
| CHM 192 | Practical Chemistry II | 1 | - | - | 1 |
| MCB 114 | Introductory Biotechnology | 2 | 2 | - | - |
| MCB 116 | Basic Techniques in Microbiology | 2 | 2 | - | - |
| MTS 106 | Mathematics for Non-Major II | 3 | 2 | 1 | - |
| PHS 106 | Physics for Non-Major II | 3 | 2 | 1 | - |
| PHS 192 | Physics Laboratory II | 1 | - | - | 1 |
| | **Total** | **21** | **16** | **2** | **3** |

**200 Level: First Semester**

| Course Code | Course Title | | I | T | P |
|---|---|---|---|---|---|
| BIO 201 | General Ecology | 3 | 2 | 1 | - |
| BCH 201 | General Biochemistry I | 3 | 2 | - | 1 |
| CHM 291 | Experimental Chemistry I | 1 | - | - | 1 |
| CHM 211 | Inorganic Chemistry | 2 | 1 | - | 1 |
| GNS 203 | Use of Library | 1 | 1 | - | - |
| MCB 201 | General Microbiology I | 3 | 2 | - | 1 |
| MCB 207 | Biodeterioration | 2 | 2 | - | - |
| PCP 201 | Principles of Crop Production | 3 | 2 | - | 1 |
| STS 201 | Statistics for Agricultural & Biological Sciences | 3 | 2 | 1 | - |
| ZOO 261 | Invertebrate Zoology | 3 | 2 | - | 1 |
| | **Total** | **24** | **16** | **2** | **6** |

**200 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BCH 202 | General Biochemistry II | 3 | 2 | 1 | - |
| BIO 202 | Biological Techniques | 2 | 2 | - | - |
| CHM 202 | Introductory Analytical Chemistry | 3 | 2 | 1 | - |
| CHM 222 | Basic Organic Chemistry II | 2 | 2 | - | - |
| CHM 292 | Experimental Chemistry | 1 | 1 | - | - |
| ETS 206 | Entrepreneurial Studies & Change Management | 2 | 2 | - | - |
| GNS 201 | Writing & Literary Appreciation | 1 | 1 | - | - |
| GNS 202 | Elements of Politics and Govt. | 1 | 1 | - | - |
| GNS 204 | Logic and History of Science | 2 | 2 | - | - |
| MCB 202 | General Microbiology II | 3 | 2 | - | 1 |
| ZOO 202 | Introductory Genetics & Evolution | 2 | 2 | - | - |
| ZOO 206 | General Physiology | 2 | 1 | - | 1 |
| | **Total** | **24** | **20** | **2** | **2** |

### 300 Level: First Semester

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| CSC 201 | Introduction to Computer Science | 3 | 2 | 1 | - |
| FST 201 | Introduction to Food Science | 2 | 2 | - | - |
| MCB 301 | Bacteriology | 3 | 2 | - | 1 |
| MCB 303 | Soil Microbiology | 3 | 2 | - | 1 |
| MCB 305 | Microbial Physiology & Biochemistry | 3 | 2 | - | 1 |
| MCB 307 | Microbial Genetics & Molecular Biology | 3 | 2 | - | 1 |
| MCB 309 | Microbial Ecology | 2 | 1 | - | 1 |
| MCB 325 | Mycology | 2 | 1 | - | 1 |
| ZOO 363 | Biology of Tropical Parasites | 3 | 2 | - | 1 |
| | **Total** | **24** | **16** | **1** | **7** |

### 300 Level: Second Semester

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| MCB 392 | Industrial Training Assessment | 4 | - | - | 4 |
| MCB 394 | Industrial Training Visitation | 4 | - | - | 4 |
| MCB 396 | Industrial Training Report | 4 | - | - | 4 |
| MCB 398 | Industrial Training Seminar | 4 | - | - | 4 |
| | **Total** | **16** | **-** | **-** | **16** |

### 400 Level: First Semester

| COURSE CODES | COURSE TITLE | U | L | T | P |
|---|---|---|---|---|---|
| MCB 401 | Food Microbiology | 3 | 2 | - | 1 |
| MCB 403 | Virology & Tissue Culture | 3 | 2 | - | 1 |
| MCB 405 | Environmental Microbiology | 3 | 2 | - | 1 |
| MCB 407 | Immunology & Immunochemistry | 3 | 2 | - | 1 |
| MCB 409 | Pharmaceutical Microbiology | 3 | 2 | - | 1 |
| MCB 411 | Analytical Microbiology & Quality Control | 2 | 1 | - | 1 |
| MCB 493 | Essays in Microbiology | 3 | 2 | 1 | - |
| MCB 495 | Seminar I | 1 | 1 | - | - |
| | Elective | 3 | 2 | - | 1 |
| | **Total** | **24** | **16** | **1** | **7** |
| **Electives (3 units)** | | | | | |
| BOT 405 | Plant Pathology | 3 | 2 | - | 1 |
| EMT 401 | Environmental Monitoring System and Techniques | 3 | 2 | - | 1 |
| *ZOO 463 | Public Health Parasitology | 2 | 2 | - | - |
| *ZOO 465 | Practical Course in Public Health Parasitology | 2 | - | - | 2 |

**Note: Either ZOO 463 or ZOO 465 should be selected as one elective course*

**400 Level: Second Semester**

| COURSE CODES | COURSE TITLE | U | L | T | P |
|---|---|---|---|---|---|
| MCB 402 | Pathogenic Microbiology | 3 | 2 | - | 1 |
| MCB 404 | Industrial Microbiology | 3 | 2 | - | 1 |
| MCB 406 | Petroleum Microbiology | 3 | 2 | - | 1 |
| MCB 410 | Epidemiology and Public Health | 3 | 2 | - | 1 |
| MCB 412 | Advance Food Microbiology | 3 | 2 | - | 1 |
| MCB 422 | Entrepreneurial Skills in Microbiology | 2 | 1 | - | 1 |
| MCB 496 | Seminar II | 1 | 1 | - | - |
| PHS 364 | Energy and Environment | 1 | 1 | - | - |
| MCB 499 | Project | 4 | - | - | 4 |
| | **Total** | **23** | **13** | **-** | **10** |

**COURSE SYNOPSES**

**MCB 111: INTRODUCTION TO MICROBIOLOGY (3 Units)**

Prokaryotic and eukaryotic cells; cell structure of prokaryotes and microbial eukaryotes; survey of major groups of eukaryotic and prokaryotic protists; history and development of microbiology; scope of microbiology; introduction to microorganisms as biological entities; distribution of microorganisms in nature; brief survey of microbes as friends and foes.

**MCB 114: INTRODUCTION TO BIOTECHNOLOGY (2 Units)**

Definitions of biotechnology; historical development and evolution of biotechnology; comparison of traditional and modern biotechnologies; the inter-disciplinary nature of biotechnology; benefits of biotechnology to man; biotechnology and development; the importance of microbiology in biotechnological pursuit; introduction to basic techniques in biotechnology; applications of biotechnology (bioremediation, biocontrol, biofertilizers, biogas, vermin-composting, bioengineering, bioinformatics, etc.); role of agricultural biotechnology in sustainable development; biosafety; regulation of biotechnology products and processes; intellectual property rights.

**MCB 116: BASIC TECHNIQUES IN MICROBIOLOGY (2 Units)**

Microbiologists' tools, apparatus and glassware – wire loop, Bunsen burner, etc. Principle of Microscopy and photography. Principle of microbial cultivation. Development of culture media. Basic identification techniques for bacteria, fungi, viruses and microscopic algae. Fundamental microbiological methods: aseptic technique, culture methods, microscopy, metabolic and physiological tests; Colorimetry and centrifugation; Practical to comprise hands-on experience with analytical instruments used in microbiology research and clinical labs.

**MCB 201: GENERAL MICROBIOLOGY I (3 Units)**

Biology of microorganisms: nutrition, metabolism, growth and reproduction in microorganisms; role of microorganisms in nature- how they affect people, property,

and the environment; broad aspects of host-parasite relationships, public health; bacterial, mycotic and viral diseases; epidemiology; ecology of soils and water; environmental pollution; systematic classification of microorganisms; biological and biochemical reactions of microorganisms.

**MCB 202: GENERAL MICROBIOLOGY II (3 Units)**

Principles and methods of microbiology: microscopy and microscopic techniques; staining techniques for differentiation of microorganisms; culturing of microbes: preparation of culture media for microbial growth, enrichment and cultivation of microbes, isolation of pure cultures; factors affecting growth of microorganisms; enumeration of microorganisms; maintenance of cultures; identification of microorganisms to include colonial and cellular morphology as well as biochemical and molecular identification procedures; principles of sterilization and disinfection.

**MCB 207: BIODETERIORATION (2 Units)**

Microbial deterioration of materials: Foods, Jet fuels paper paints, textiles, metals. Factors favouring deterioration of materials. Major microbial groups involved in deterioration, Impact of processing and new technologies on biodeterioration. Biodeterioration control.

**MCB 301: BACTERIOLOGY (3 Units)**

A detailed coverage of classification and characteristics of bacteria-the morphology, life cycle and biochemical characteristics of bacteria and other eukaryotes to include their isolation and identification; the significant role of bacteria in agriculture, industry, medicine, pharmaceuticals and foods; bacterial infections and methods in diagnostic bacteriology; aspects of molecular bacteriology. Practical involves selected experiments in cultivation, physiology, and taxonomy of major groups of bacteria.

**MCB 303: SOIL MICROBIOLOGY (3 Units)**

The terrestrial environment; the nature, chemical activities and methods of investigation of soil micro flora, Characteristics of the soil environment; microbial flora and fauna of soil; microbial activities in soil; nitrogen cycle, carbon cycle, sulphur cycle, mineral transformation by microorganisms, organic matter decomposition; ecological relationships among the soil pathogens; effects of pesticides on soil microorganisms; biodegradation of pesticides; biofuels generation; Microbiology of the rhizosphere; Techniques in soil microbiology.

**MCB 305: MICROBIAL PHYSIOLOGY AND BIOCHEMISTRY (3 Units)**

A review of cell structure and function; bacterial cell wall synthesis; microbial synthesis of nucleic acids and proteins and their regulations; the nutritional types of different bacteria in relation to their energy metabolism and biosynthetic activities; dynamics of microbial growth; enzymes and enzyme kinetics; biochemistry of microbial processes such as electron transport regulation, respiration and oxidative

phosphorylation; heterotrophic and biosynthetic pathways; biosynthesis of microbial products; buffer preparation. Course deals with fundamental physiological and metabolic processes of bacteria; emphasis on growth, functions of cell structures, varieties of energy metabolism, metabolic regulation, and differentiation at the prokaryote level. Practical involves components and metabolism of the bacterial cell; emphasis on techniques of analysis of metabolism and molecular structure.

**MCB 307: MICROBIAL GENETICS AND MOLECULAR BIOLOGY (3 Units)**

Principles of genetic analysis; characteristics and biological functions of nucleic acids and proteins in microbial cells with emphasis on nucleic acid replication, transcription, translation and regulation; Plasmids and transposable genetic elements, mutagenesis and DNA repairs, bacteriophage genetics and genetics of Nitrogen fixation; Mechanism 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 and other lower eukaryotic genetics; molecular immunology; principles and applications of Polymerase chain reaction, DNA sequencing, Southern, Northern and Western Blot molecular immunology and genetic engineering/recombinant DNA technology.

**MCB 309: MICROBIAL ECOLOGY (2 Units)**

Microbes and ecological theory ; Microorganisms in their natural environments; The life of microorganisms in air, springs, rivers, lakes and seas; Survey of the roles of microorganisms in the ecosystem; Microbial interactions; microbial populations and community dynamics; Physiological, morphological and genetic adaptations of microorganisms to their environment; Nitrogen fixation; Biogeochemistry of water bodies; molecular microbial ecology. Students will also become acquainted with approaches to discover the mechanisms micro-organisms use to establish their ecological niche in both pathogenic and environmental settings.

**MCB 325: MYCOLOGY (2 Units)**

Structures, characteristics, reproduction, physiology and classification of various groups of fungi. Economic importance of fungi in Medicine, Agriculture, Food, and Industry. Mycotic infections (Pathogenesis, Virulence factors, host-defence factors, Immunity to fungal infections); epidemiology of fungal diseases of man, plant and animals. Food safety including mycotoxigenic fungi and mycotoxins.

**MCB 392: INDUSTRIAL TRAINING ASSESSMENT (4 Units)**

Assessment of log books on 6 months industrial training spent by the students in Microbiological/ Biotechnological related industries.

**MCB 394: INDUSTRIAL TRAINING VISITATION (4 Units)**

On the spot assessment of 6 months of industrial training must be spent by the students in Microbiological/Biotechnological related industries. Focus should be on work carried out by students and ability to understand basic scientific methods and principle at work place.

**MCB 396: INDUSTRIAL TRAINING REPORTS (4 Units)**

Assessment of scientific writing of industrial training reports

**MCB 398: INDUSTRIAL TRAINING SEMINAR (4 Units)**

Final seminar presentation on topics related to industrial training experiences should be presented by students at the end of second semester.

**MCB 401: FOOD MICROBIOLOGY (3 Units)**

Natural flora of importance in foods, their behaviour and uses in the food industry; Sources of microorganisms in food; distribution, role and significance of microorganisms in foods, intrinsic and extrinsic parameters of foods that affect microbial growth; Microbiology of water supplies; contamination from sewage, handling, processing dust, etc. Food and water-borne diseases, food infections and toxicants. Indices of food sanitary quality and food microbiological standards. Laboratory methods of assessing microbiological status of different classes of food commodities- beverages, cereals, roots and tubers, fruits and vegetables, meat, fish and dairy products.

**MCB 402: PATHOGENIC MICROBIOLOGY (3 Units)**

Study of some microbial pathogens of plants and animals with emphasis on those prevalent in Nigeria. The geographical distribution, isolation, identification, morphology, life cycle, source of infection, transmission and the host. Ecology, clinical manifestations of specific bacterial, viral and fungal pathogens of man. The normal human flora; principles of infection, immunity and serology; host-parasite relations; etiology, epidemiology, pathogenic mechanisms; spectrum of infection, clinical symptoms, laboratory diagnosis and procedures, prophylactic and therapeutic procedures, control and prevention of selected bacteria, protozoan and fungal diseases of animals including man especially those prevalent in Africa.

**MCB 403: VIROLOGY AND TISSUE CULTURE (3 Units)**

Origin and nature of viruses; structure, properties and classification of viruses; the chemical and physical properties of bacterial, animal and plant viruses; principles of isolation, cultivation, purification and maintenance of bacteriophages and other viruses *in vivo*; transmission of viral diseases in plants and animals; interference phenomenon and interferon; systematic virology especially those endemic in Africa-polio, measles, rabies oncogenic viruses, lassa virus; AIDS virus etc.; Viral genetics; viruses and genetic engineering; application of cell culture technique in virology.

**MCB 404: INDUSTRIAL MICROBIOLOGY (3 Units)**

Nature of industrial microbiology; aspects of the biology of moulds, yeasts, bacteria, actinomycetes and viruses of industrial importance; microorganisms important in various fermentations; The biochemistry of fermentation: fermentors and their design, batch and continuous systems; yeast technology; enzyme technology; culture techniques and maintenance of selected cultures; mutation, strain selection and development; hybridization; media formulation; optimization of fermentation media and conditions at laboratory scale; aspects of biochemical engineering; patents and patent law. Developments in petroleum microbiology; application of microorganisms in oil bioprocesses and as biosensors; advances in microbial catabolism of hydrocarbons; mechanisms of microbial responses to hydrocarbon substrates - changes in membrane architecture, active uptake and efflux of hydrocarbons, chemo-taxis; developments in oil bio-processing – microbial transformation of petroleum wastes, production and upgrading of petroleum and petrochemicals; desulphurization; use of bacterial biosensors for online monitoring of pollutants.

**MCB 405: ENVIRONMENTAL MICROBIOLOGY (3 Units)**

The microbial environment; concepts in environmental microbiology. The aquatic environment – distribution, diversity and role of microorganisms in terrestrial, freshwater and marine ecosystems; microbiology of water supplies, water treatment, water supply and public health – sewage and sewage disposal in the hot climates; principles of biodegradation of materials; major microbial groups involved in bioremediation; the role of microbes in different climates; the role of microbes in processing, recovery and degradation of petroleum products; aero- biology- sources, importance and control of air-borne microorganisms. Practical: techniques for study of interaction of microorganisms with and within their natural habitats; symbiosis between microorganisms and plants and animals; role of microorganisms in element cycling; food fermentation by bacteria.

**MCB 406: PETROLEUM MICROBIOLOGY (3 Units)**

Developments in petroleum microbiology; application of microorganisms in oil bioprocesses and as biosensors; advances in microbial catabolism of hydrocarbons; mechanisms of microbial responses to hydrocarbon substrates - changes in membrane architecture, active uptake and efflux of hydrocarbons, chemo-taxis; developments in oil bio-processing – microbial transformation of petroleum wastes, production and upgrading of petroleum and petrochemicals; desulphurization; use of bacterial biosensors for online monitoring of pollutants. Importance of bacteria in degradation, bioremediation of oil spills, bio-control.

**MCB 407: IMMUNOLOGY AND IMMUNOCHEMISTRY (3 Units)**

Basic concepts of the immune system; a brief historical review of immunology as a

subject; innate and specific acquired immunity; the antigens, nature and types, the antigenic determinant site; the immunoglobins: structure, classification, genetics, and functions; the complement system; antigen– antibody interactions; biochemical and immunochemical assays; theories of antibody formation, cells and organs involved in the immune response; synthesis of humoral antibody; development of the immune response; infection and immunity; biological products of immunization; herd immunity; recommended immunization schedules; hypersensitivity; fundamental immunologic phenomena – immunologic tolerance, auto immunity, transplantation immunology; prophylactic transplantation immunology and therapeutic application of immunology.

**MCB 409: PHARMACEUTICAL MICROBIOLOGY (3 Units)**

The chemistry of synthetic chemotherapeutic agents and antibiotics; production and synthesis of antibiotics and other antimicrobial agents; relationship of antimicrobial agents to different groups of microorganisms; the mode of action and assay of antimicrobial agents; concepts of antibiotic sensitivity and resistance as related to microbial physiology; quality control of pharmaceutical products; concepts of growth and death in microorganisms; history and applications of antibiotics; antibiotic resistance mechanisms; discovery and approval of new antibiotics; sources of antibiotics; role in nature.

**MCB 410: EPIDEMIOLOGY AND PUBLIC HEALTH (3 Units)**

Statistical applications to epidemiology; Nature of epidemiological investigations; Spectrum of infections; Herd Immunity; Latency of infections, Zoonoses. Antigenic drifts. Biological products for immunization. Schedule for International control of diseases.

**MCB 411: ANALYTICAL MICROBIOLOGY AND QUALITY CONTROL (2 Units)**

Microorganisms as reagents in quantitative analysis; selection of test organisms for assays (antibiotics, amino acids, vitamins etc.) responses of microorganisms used in assays; obtaining, measuring and interpreting responses; preparation of assay samples; methods of assays; aspects of quality control; plant and equipment sanitation; microbiological standards and specifications; HACCP; microbiological quality control in related industries (food, agriculture, pharmaceutical etc.).

**MCB 412: ADVANCED FOOD MICROBIOLOGY (3 Units)**

Advanced ecology, taxonomy, biochemistry and analytical technology of food microorganisms (bacteria, yeasts, fungi and viruses associated with food spoilage, food-borne diseases and fermentations). Principles of food preservation: high temperature, low temperature, radiation, pressure, use of additives, drying. The microbiology of local food stuffs: gari, palm wine, ogi, fufu, etc.; Microbiology of the dairy industry. Investigation of food-borne disease outbreaks, food sanitation control and inspection. Emphasis should be on new developments in food microbiology such

as exploitation of microorganisms in novel processes for the production of food ingredients and economic consequences of microorganisms in food.

**MCB 422: ENTREPRENEURIAL SKILLS IN MICROBIOLOGY (2 Units)**

Production of farm fresh milk (Pasteurization) and yoghurts. Fermented foods, beverages and condiments – 'Ogi', Iru, garri, malt drinks, pito, etc. Table water production.

**MCB 493: ESSAYS IN MICROBIOLOGY (3 Units)**

Under the supervision of staff, the student is expected to select a seminar topic for detailed study, using library methods. The emphasis should be on recent advances in chosen field. The course is expected to give the student the opportunity for independent thought and expression. The study will result in seminars.

**MCB 495: SEMINAR I (1 Unit)**

Literature review and pre-project data seminar should be presented by the students during first semester.

**MCB 496: SEMINAR II (1 Unit)**

Post-data seminar should be presented by the students at the end of second semester.

**MCB 499: PROJECT (4 Units)**

A student will be expected to carry out a field/detailed research investigation under supervision of a staff in any special area of microbiology, write up a project report and be examined for his/her knowledge of the work before a panel of internal and external examiners in an oral examination.

# DEPARTMENT OF PURE AND APPLIED BOTANY

**Introduction**

**Historical Background**

The Department of Pure and Applied Botany is one of the four Departments in the College of Biosciences. The Department of Pure and Applied Botany was established December 1, 2014 when the Department of Biological Sciences was split into the Department of Pure and Applied Botany and Department of Pure and Applied Zoology.

The academic staff of the department comprises renowned academics and researchers with vast knowledge in their areas of specialization. The department provides sound academic teaching in specialized areas of Botany at both undergraduate and postgraduate levels i.e. PGD, M.Sc. and Ph.D. It has a Botanical Garden, screen house and adequately equipped laboratory for practicals.

**Philosophy**

The Pure and Applied Botany programme is designed to provide students with sound understanding of the concept and methodologies of Botany with focus on key areas of human development, thereby contributing to national development and integrity.

**Objectives**

The three basic need of man (food, shelter and clothing), are provided either directly or indirectly by plants. Therefore, Botany which is the scientific study of plants is of great importance for the continued existence of humans on Earth. Therefore, the Department has the following objectives:

i. To provide students with a broad and balanced foundation of botany knowledge and practical skills.
ii. To develop in students the ability to apply knowledge and skills to solving theoretical and practical problems in botany.
iii. To develop in student, a range of transferable skills that are of value in Pure and Applied Botany employment.
iv. To provide students with knowledge and skills that will enhance further studies in specialized areas of Pure and Applied Botany or multi-disciplinary areas involving botany.
v. To provide, through training and orientation, an appreciation of the salutary rewards of inter-and-multi-disciplinary approach to the solution of complex life problems
vi. To generate in students an appreciation of the importance of Pure and Applied Botany in industrial, economic, environmental, technological and social development.

The programme is structured to include period of formal studies (lecture, practical and tutorial), industrial training, planned field trips and research projects. Emphasis is given to computer training as well as using practical approach to solving problems in Pure and Applied Botany.

**Duration of the programme**

The duration of the B.Sc. degree in Pure and Applied Botany shall normally be four academic sessions (8 semesters) for students admitted into the 100 level and three academic sessions (six semesters) for those that come in through Direct Entry at 200 level.

**Minimum Academic Requirements for Graduation**

To qualify for the award of the degree of Bachelor of Sciences (Pure and Applied Botany), a student must have fulfilled the following approved minimum academic standards:

i. Spent not less than 2, 3 or 4 years on the programme depending on point of entry
ii. Passed all the University (compulsory) courses
iii. Passed all the department's (core) courses and the required electives
iv. Must not have exceeded the minimum periods specified above by more than two years
v. Must have a CGPA of 1.0

**Academic Staff**

| Name | Qualification | Specialisation | Designation |
|---|---|---|---|
| Iyabo A. Kehinde | B.Sc., M.Sc., Ph.D. (Ibadan) | Plant Pathology | Professor and Head of Department |
| M. Kadiri | B.Sc. (Kano), M.Sc., Ph.D. (Ibadan) | Plant Physiology | Professor |
| D. A. Agboola | B.Sc. (Nsukka), M.Sc., Ph.D. (Ilorin) | Plant Physiology | Professor |
| A. S. Oyelakin | B.Sc., M.Sc., Ph.D. (Abeokuta) | Cytology and Cytogenetic | Lecturer II |
| O. O. Fawibe | B.Sc., M.Sc. (Abeokuta) | Plant Physiology | Lecturer II |
| P. O. Bankole | B.Sc. (Ago-Iwoye), M.Sc., Ph.D. (Lagos) | Mycology and Biotechnology | Lecturer II |

**100 Level:First Semester**

| Course code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BIO 101 | General Biology I | 2 | 2 | - | - |
| BIO 103 | Introductory Physiology | 2 | 2 | - | - |
| BIO 191 | Practical Biology I | 1 | - | - | 1 |
| ZOO 101 | Mammalian Body | 2 | 2 | - | - |
| CHM 101 | Physical Chemistry I | 3 | 2 | 1 | - |
| CHM 191 | Practical Chemistry I | 1 | - | - | 1 |
| GNS 101 | Use of English | 2 | 2 | - | - |
| GNS 111 | Introduction to Social Problems | 1 | 1 | - | - |
| MTS 105 | Mathematics for Non-Major | 3 | 2 | 1 | - |
| PHS 105 | General Physics for Non-Major | 3 | 2 | 1 | - |
| PHS 191 | Physics Laboratory | 1 | - | - | 1 |
| | **Total** | **21** | **15** | **3** | **3** |

**100 Level: Second Semester**

| Course code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BIO 102 | General Biology II | 2 | 2 | - | - |
| BIO 192 | Practical Biology II | 1 | - | - | 1 |
| BOT 102 | Flowering Plants, Forms and Functions | 2 | 2 | - | - |
| BOT 104 | Introductory Molecular Biology | 3 | 2 | - | 1 |
| BOT 106 | Seedless Plants | 2 | 1 | - | 1 |
| CHM 102 | Introduction to Organic Chemistry | 2 | 2 | - | - |
| CHM 104 | Introduction to Inorganic Chemistry | 2 | 2 | - | - |
| CHM 192 | Practical Chemistry II | 1 | - | - | 1 |
| GNS 102 | Introduction to Nigerian History | 1 | 1 | - | - |
| MTS 106 | Mathematics for Non-Major II | 3 | 2 | 1 | - |
| PHS 106 | General Physics for Non-Major II | 3 | 3 | - | - |
| PHS 192 | Physics Laboratory II | 1 | - | - | 1 |
| | **Total** | **23** | **17** | **1** | **5** |

**200 Level: First Semester**

| Course code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BIO 201 | General Ecology | 2 | 1 | - | 1 |
| BCH 201 | General Biochemistry | 3 | 2 | - | 1 |
| BOT 215 | Medicinal Plants | 3 | 2 | - | 1 |
| CHM 221 | Organic Chemistry I | 2 | 2 | - | - |
| GNS 201 | Writing and Literary Appreciation | 1 | 1 | - | - |
| GNS 202 | Elements of Politics & Government | 1 | 1 | - | - |
| GNS 203 | Use of Library | 1 | 1 | - | - |
| GNS 204 | Logic and History of Science | 2 | 2 | - | - |
| MCB 201 | General Microbiology 1 | 3 | 2 | - | 1 |
| PCP 201 | Principles of Crop Production | 3 | 2 | - | 1 |
| STS 201 | Statistics for Agricultural & Biological Sciences | 3 | 2 | 1 | - |
| | **Total** | **24** | **18** | **1** | **5** |

**200 Level: Second Semester**

| Course code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BIO 202 | Biological Techniques | 2 | 1 | - | 1 |
| BIO 210 | Research Methods | 2 | 2 | - | - |
| BOT 202 | Angiosperm Morphology | 2 | 1 | - | 1 |
| BOT 204 | Developmental Biology | 2 | 2 | | |
| BOT 206 | Plant cell Biology and Molecular Genetics | 2 | 2 | - | - |
| BOT 208 | General Plant Physiology | 2 | 1 | - | 1 |
| BOT 212 | Seed plants | 2 | 1 | - | 1 |
| CHM 222 | Organic Chem. II | 2 | 2 | - | - |
| ETS 206 | Entrepreneurship and Change Management | 2 | 1 | - | 1 |
| FIS 310 | Oceanography | 2 | 1 | - | 1 |
| MCB 202 | General Microbiology II | 3 | 2 | - | 1 |
| | **Total** | **23** | **16** | **0** | **7** |

**300 Level: First Semester**

| Course code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BOT 301 | Plant Genetic | 2 | 2 | - | - |
| BOT 303 | Plant Ecology | 3 | 2 | - | 1 |
| BOT 305 | Field course | 1 | - | - | 1 |
| BOT 323 | Comparative Plant Anatomy | 3 | 2 | - | 1 |
| BOT 325 | Mycology | 3 | 2 | - | 1 |
| BOT 327 | Bryology & Pteridophytes | 2 | 1 | - | 1 |
| BOT 329 | Plant Taxonomy & Biosystematics | 3 | 2 | - | 1 |
| BOT 331 | Biometry | 2 | 1 | - | 1 |
| CSC 201 | Introduction to Computer Science | 3 | 2 | 1 | - |
| HRT 303 | Horticultural crops production for Botany students | 2 | 1 | - | 1 |
| | **Total** | **24** | **15** | **1** | **8** |

**300 Level: Second Semester**

| Course code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BOT 392 | Industrial Training Assessment | 4 | - | - | 4 |
| BOT 394 | Industrial Training visitation | 4 | - | - | 4 |
| BOT 396 | Industrial Training Reports | 4 | - | - | 4 |
| BOT 398 | Industrial Training Seminars | 4 | - | - | 4 |
| | **Total** | **16** | **-** | **-** | **16** |

**400 Level: First Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BOT 401 | Current Topics | 1 | - | - | 1 |
| BOT 403 | Plant Anatomy II | 2 | 1 | - | 1 |
| BOT 405 | Plant Pathology | 3 | 2 | - | 1 |
| BOT 407 | Plant Tissue Culture | 3 | 2 | - | 1 |
| BOT 409 | Economic Botany | 2 | 1 | - | 1 |
| BOT 411 | Plant Cytogenetics | 3 | 2 | - | 1 |
| BOT 413 | Plant Reproduction | 3 | 2 | - | 1 |
| BOT 415 | Entrepreneurship Opportunities in Botany | 2 | 1 | - | 1 |
| BOT 417 | Molecular Biology II | 3 | 2 | - | 1 |
| SOS 519 | Soil Biology and Ecology | 2 | 1 | - | 1 |
| | **Total** | 24 | 14 | - | 10 |

**400 Level: Second Semester**

| Course code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BOT 402 | Population Ecology | 2 | 2 | - | - |
| BOT 404 | Biotechnology and Bioinformatics | 2 | 2 | - | - |
| BOT 406 | Plant Physiology | 2 | 1 | - | 1 |
| BOT 408 | Nigerian Vegetation | 2 | 2 | - | - |
| BOT 410 | Conservation and Biodiversity | 3 | 2 | - | 1 |
| BOT 412 | Paleobotany and Paleontology | 3 | 2 | - | 1 |
| BOT 414 | Plant Virology | 3 | 2 | - | 1 |
| BOT 498 | Seminar II | 1 | - | - | 1 |
| BOT 499 | Project | 4 | - | - | 4 |
| PBS 504 | Plant Breeding | 2 | 1 | - | 1 |
| | **Total** | **24** | **14** | - | **10** |

**Course Synopses**

**BIO 101 – GENERAL BIOLOGY 1 (2 Units)**

The plant cell, prokaryotic and eukaryotic cells, cell growth, cell division and reproduction. General characteristics and morphology of cryptogams and phanerogams. Introduction to plant classification.

**BIO 103: INTRODUCTORY PHYSIOLOGY (2 Units)**

Nature of Living Organism/Activities of Living Things, Homeostasis, Growth and Development, Endocrine System, Respiration, Reproduction, Nutrition and Enzymes, Digestion, Excretion.

**BOT 105 – DIVERSITY OF PLANTS (3 Units)**

Plant forms (habit), variations of form within and between habits, causes, influences and implication of variation. Strategies of diversity, application of diversity, importance of diversity. Introduction to vegetation.

**BIO 191 – PRACTICAL BIOLOGY I** **(1 Unit)**
Practical classes to address BOT 101 and BOT 105 curriculum.

**BOT 102 – FLOWERING PLANTS, FORMS AND FUNCTIONS** **(2 Units)**
Introduction to spermatophytes (gymnosperm and angiosperm), their forms, habitat, stem features, root system, floral formula and fruits (containing seeds).

**BOT 104: INTRODUCTORY MOLECULAR BIOLOGY** **(3 Units)**
Definition of molecular biology, basic laboratory techniques in molecular biology. Molecular biology in plant and plant diseases identification.

**BOT 106: SEEDLESS PLANTS** **(2 Units)**
A survey of the evolution, morphology, ecology and importance to man o the Cryptograms and Pteridophytes. A survey of the major types of development in seedless plants.

**BIO 102: GENERAL BIOLOGY II** **(2 Units)**
Basic Principles of Zoological Nomenclature, Outline Classification of Animal Kingdom, Grades of Organisation A brief introduction of the various animal Phyla: Protozoa Coelenterata, Porifera, Platyhelminthes, Nematoda, Annelida, Mollusca, Arthropoda, Echinodermata, Chordata.

**BIO 192: PRACTICAL BIOLOGY II** **(1 unit)**
Practical classes for BIO 102

**BIO 201 – GENERAL ECOLOGY** **(2 Units)**
Aims and Scope of ecology, basic units of ecology (Population, Community and Ecosystem), biotic and abiotic components of an ecosystem. Production in ecosystems. Energy flow and nutrient cycling. Dynamics of population and communities.

**BOT 215: MEDICINAL PLANTS** **(3 Units)**
Plants used by indigenous people of West Africa for plant, animal and human diseases. Plants used as dyes, food colours, preservatives and pesticides. Collection and preservation of ethnobotanical plants.

**BOT 202: ANGIOSPERM MORPHOLOGY** **(2 Units)**
General organization of the angiosperm, including the treatment of variations in the structure of the roots, stems, leaves, inflorescence, flowers, fruits and seeds.

**BOT 206: PLANT CELL BIOLOGY AND MOLECULAR GENETICS** **(2 Units)**
History and present trends in cell biology. Reproduction cell division. Cell differentiation and growth of cells. A brief study of the molecular basis of cell

structure and development, organelles and nucleic acids.

**BOT 204 – DEVELOPMENTAL BIOLOGY (2 Units)**

Heritable and non-heritable characteristics, probability and tests of goodness of fit. Quantitative inheritance, variations in genome structure. Introduction to population genetics. Current concept in evolution. Genetic variation and appreciation. Evolution of selected organisms.

**BOT 208 – GENERAL PLANT PHYSIOLOGY (2 Units)**

The fundamental principles of plant physiology including photosynthesis respiration, cell-water relationship, mineral nutrition, nutrient uptake and deficiency symptoms, enzyme and hormonal production.

**BOT 212 – SEED PLANTS (2 Units)**

A survey of the evolution, morphology, ecology and importance to man of the Gymnosperms and Angiosperms. A survey of the major types of development of embryo in gymnosperms and angiosperms.

**BIO 210 –RESEARCH METHODS (2 Units)**

Introduction to Research. Types of scientific studies and experienced design. Analysis and preparation of reports. Introduction to scientific project writing.

**BIO 202: BIOLOGICAL TECHNIQUES (2 Units)**

Botanical techniques, fixation and preservation, wax-embedding, microtomy staining and mounting, cytological preparation, photomicrography, herbarium practice, field work and population sampling, water culture and maintenance of experimental plants.

**BOT 301: PLANT GENETICS (2 Units)**

Aspect of human genetics: pedigree analysis. Further consideration of various deviations from basic principles gene interaction hardy-Weinberg Law Mutagenesis Sex determination.

**BOT 303: PLANT ECOLOGY (3 Units)**

Themes of energy; antecology, historical aspects. Current trends in ecology. Plant community hypotheses. Concepts of ecosystem: food chain, webs, interaction between plants and animals. Ecological groups, dystrophytes, halophyes, epiphyses and nesophites. The effect of physical environment on plants. Climate, biotic and topographic factors.

**BOT 323: COMPARATIVE PLANT ANATOMY I (3 Units)**

Characteristics and classification of tissues systems, organization of meristem, evolution vascular tissues, comparative wood anatomy. Anatomical adaptations to specialized habitats. Applied aspects of plant anatomy.

**BOT 325: MYCOLOGY (3 Units)**

Structure, life cycles, physiology and classification of fungi. The presence and role of fungi in agriculture, food and industry, mycotic infections, epidemiology of fungal diseases and economic importance of fungi in Agriculture, Food and Industry.

**BOT 327: BRYOLOGY AND PTERIDOPHYTES (2 Units)**

Structure and reproduction of the bryophytes and pteridophytes, spore dispersal mechanism. Pteridophytes, Bryophyte life-history, the protonemal, gametyphytic and sporophytic phases. Taxonomic considerations: family, genus, species, subspecies, variety and form concepts. Treatment of selected families and genera.

**BOT 329: PLANT TAXONOMY AND BIOSYSTEMATICS (3 Units)**

Taxonomy and its significance, principles and concepts in plant taxonomy. Construction and use of taxonomic keys. Experimental taxonomy with special emphasis cytotaxonomy and chemotaxonomy.

**BOT 331 – BIOMETRY (2 Units)**

Definitions and types of variables, descriptive statistics, inferential statistics, experimental designs, Graphs and Charts.

**BOT 305: FIELD COURSE (1 UNIT)**

Trip to various locations to enable better understanding of the different vegetations and plant diversity.

**HRT 303: HORTICULTURAL CROPS PRODUCTION FOR BOTANY STUDENTS (2 Units)**

Introduction; Relations between Botany & Horticulture; What is Horticulture?; Economic, nutritional & industrial importance of Horticultural Crops; Major Classes of Horticultural Crops – Olericulture (vegetable crops e.g amaranths, okra, pepper, etc); Floriculture (ornamental crops e.g roses, ixoras, etc,,); Pomology (non-tree fruits, e.g pineapple, sugar cane, etc, fruit tree crops e.g citrus, mango, etc, industrial/ plantation crops e.g cocoa, oil palm, rubber, etc.); Spice crops; Principles & practice of Horticultural crops production; Field establishment of Horticultural crops, management & cultural practices – climatic / soil requirements, transplanting methods, weed management practices, harvesting / produce handling & storage.

**BOT 392: INDUSTRIAL TRAINING ASSESSMENT (4 Units)**

Assessment of log books on 6 months industrial training spent by the students in botany related industry or agricultural establishment.

**BOT 394: INDUSTRIAL TRAINING VISITATION (4 Units)**

On the stop assessment of six months of industrial training must be spent by the students in a botany related industry or agricultural establishment. Focus should be

on work carried out by student and ability to understand basic scientific methods and principles at work place.

**BOT 396: INDUSTRIAL TRAINING REPORTS (4 Units)**
Assessment of scientific writing of industrial training report

**BOT 398: INDUSTRIAL TRAINING SEMINAR (4 Units)**
Final Seminar on topics related to industrial training experiences must be presented by student at the end of the second semester.

**BOT 401: CURRENT TOPIC SEMINAR IN BOTANY (1 Unit)**
Under the supervision of a member of academic staff, students are expected to select a seminar topic for detailed study, using library methods. The emphasis should be on recent advances in chosen field. The course is expected to give the student the opportunity for independent thought and expression. The study will result in seminars.

**BOT 403: PLANT ANATOMY II (2 Units)**
The structure and properties of the cell wall. Structure of wood and wood identification. Anatomy of plant growing in different ecological areas. Anomalous secondary growth in plants. Plant micro-techniques.

**BOT 405: PLANT PATHOLOGY (3 Units)**
Principles and concepts in plant pathology; causes of host-parasite relationship, infection and pathogenesis. Culture of fungi, diagnostic features, recognition and control diseases of major importance.

**BOT 407: PLANT TISSUE CULTURE (3 Units)**
Meristems and organizations of the shoot and root apices. Pattern and control of cell tissue differentiation. Development of vegetative organs. Plant tissue culture techniques and applications. Meristem culture, organ culture, embryo culture. The role of plant hormones and vitamins ontogeny of floral organs.

**BOT 409: ECONOMIC BOTANY (2 Units)**
The origin, history, sources, taxonomy, morphology and cultivation of economic plant species (food, fibre, medicine, forage, cereals, timber, etc.) in Nigeria.

**BOT 411: PLANT CYTOGENETICS (3 Units)**
Review of cell organization and cell division. Principles of inheritance, gene expression and interaction. Linkage and crossing over. Variation in chromosome number and structure. Determination of sex, mutation and cytoplasmic inheritance.

**BOT 413: PLANT REPRODUCTION (3 Units)**

Sexual and asexual (vegetative reproduction review), meiosis and mitosis, haploidy and diploidy role in plant reproduction. Typical plant reproduction organ in lower and higher plants (primitive and advance forms), basic differences between plant and animal reproduction. Gametophytic and sporophytic phases (alteration of generation). Strategies in variation of reproductive organs, pollination and fertilization. Fruits and seeds as end-products.

**BOT 415: ENTREPRENEURSHIP OPPORTUNITIES IN BOTANY (2 Units)**

Mushroom cultivation: Cultivation of edible and medicinal mushroom. Plant disease diagnostics: Identification of plant and plant disease causing organisms. Seedlings production enterprise: Raising seedlings for aesthetics, medicine, food, clothing and shelter. Plant collection and supply enterprise.

**BOT 417: MOLECULAR BIOLOGY II (3 Units)**

Plant nuclear and organelle genome organization, gene structure, mechanisms of gene regulation, gene transfer, and special topics related to development and response to biological and environmental stimuli.

**BOT 498**: **SEMINAR II (1 Unit)**

Post-data Seminar

**BOT 499**: **PROJECT (4 Units)**

Students will be expected to carry out a field/detailed research investigation under supervision of a staff in any special area of Botany, write up a project report and a Pre-Data seminar and a Post-Data Seminar on the proposed project work will be presented by the students.

**BOT 402: POPULATION ECOLOGY (2 Units)**

Demographic characteristics of natural populations and techniques of estimating the growth and regulation of population.

**BOT 404: BIOTECHNOLOGY AND BIOINFORMATICS (2 Units)**

History and evolution of the new technology, different areas of biotechnology including genetic engineering, cell culture, biomass production and technology, enzymes technology, immobilized cell and enzymes, biofuels, microbial insecticides and nitrogen fixation. Potential application of biotechnology in the developing countries in the area of agriculture, health and energy. Social and economic importance of biotechnology. Introduction to Bioinformatics, Genomics and Proteonomics, Gene banks and Bioinformatics Software.

**BOT 406: PLANT PHYSIOLOGY (2 Units)**

The role of growth regulators (Auxins, gibberellins, cytokines, ethylene and abscisic acid) in plant growth and development phenomena such as abscission, apical dominance, tropisms and dormancy, solar radiation and plant development. Physiology of flowering.

**BOT 408: NIGERIAN VEGETATION (2 Units)**

A study of Nigerian forests, savannah grasslands and special emphasis on arid zones.

**BOT 410: CONSERVATION AND BIODIVERSITY (3 Units)**

Plant breeding concepts and methods.

**BOT 412: PALEOBOTANY AND PALEONTOLOGY (3 Units)**

Overview of Paleobotany, evolution and plants, diversification of land plants, Rise and dominance of seed plants, Origin and diversification of flowering plants.

**BOT414: PLANT VIROLOGY (3 Units)**

History, scope of plant virology; taxonomy and nomenclature, Effects of viruses on plants, Recent trends in virus transmission and movement in plants, Structure of plant viruses, Plant diseases caused by viruses-etiology, symptoms, diagnosis, control and management. Virus purification, translation, replication, gene organization. Physiology of virus infected plants; virus-vector-host interactions; Host resistance to virus infection. Studies on economically important viral diseases plant. Field diagnosis of plant virus diseases, Isolation and purification of plant viruses. Basic virus characterization, Serological and Molecular techniques in virus detection.

# DEPARTMENT OF PURE AND APPLIED ZOOLOGY

**Our Vision**

As an academic community of scientists and students engaged in advancing the discovery, dissemination and application of knowledge in Pure and Applied Zoology, we are guided by the pursuit of excellence in research and education, by creative collaborative approach and an awareness of the global context in Pure and Applied Zoology education in Nigerian universities system and the World.

**Our Mission**

Our mission is to:

i. Advance the frontiers of knowledge through innovation and research in the Pure and Applied Zoology;
ii. Facilitate development of scientists in the guidance of our undergraduate and post graduates students and in the training of post-doctoral fellows.
iii. Increase scientific literacy, foster an appreciation of scientific inquiry, and develop well-informed citizens by providing a general education in Pure and Applied Zoology to the student population;
iv. Participate in the university-wide academic community through interdisciplinary collaborations, programmes and curricula;
v. Contribute to local and international scientific communities through collaborations and service activities that promote education and dissemination of information;
vi. Contribute to our immediate community by collaborating with public, non-profit, private, and industry partners in Ogun State and Nigeria.

**Mode of Training**

Training would include lectures, practical, tutorials, including industrial training, planned field trips and research projects. Emphasis would be given to practical approaches to solving zoological problems.

Our curriculum emphasizes the study of animals at the molecular to the ecosystem level. Teaching and training is through lectures, laboratory works and field experiences, and the opportunity to carry out original research. Students gain proficiency in gathering, interpreting, and communicating scientific knowledge. The zoology programme prepares students to thrive and make important contributions in a world where scientific understanding is increasingly important.

**Learning Outcomes**

Graduates of Pure and Applied Zoology are expected to develop a wide range of different skills and abilities. These are divided into three broad categories:

**a. Regime of Subject Knowledge**: Graduates of Pure and Applied Zoology are

expected to develop high cognitive abilities and skills related to Pure and Applied Zoology.

b. **Competence and Skills:** Pure and Applied Zoology graduates are also to exhibit high practical skills in Pure and Applied Zoology.

c. **Behavioral Attitude:** Graduates of Pure and Applied Zoology are expected to be able to transfer this skill to non-Pure and Applied Zoology specific competencies.

**Attainment Levels**

Graduates of Pure and Applied Zoology are expected to have the ability to apply knowledge and skills to solving theoretical and practical problems in Pure and Applied Zoology in relation to national and societal development.

**Degrees awarded**

The Department of Pure and Applied Zoology awards Bachelors of Science (B.Sc.) Zoology. Programmes are also available at postgraduate level leading to the award of Post Graduate Diploma (PGD), Master of Science (M.Sc.) and Doctor of Philosophy (PhD).

**Advice and counselling**

There are level (100-400) / staff advisors. Students must consult with their level advisers on academic issues, such as course registration, work load etc. There is a central Counselling Unit in the University which students can consult on other social, notional or psychological issues.

**The Pure and Applied Zoology Students' Association**

The University has a policy of encouraging students to organize and participate in associations which promote academic, recreational, educational, social and cultural values. Registered students of the Department of Pure and Applied Zoology are members of the Pure and Applied Zoology Students' Association. Students of the department are encouraged to participate in the association's activities and payment of dues. The Department will not attend to students without evidence of current Association receipt.

**Academic Staff**

| Name | Qualification | Specialization | Designation |
|---|---|---|---|
| S.O.H. Sam-Wobo | B.Sc., M.Sc., PhD. (Abeokuta) | Public Health Parasitology/ Epidemiology | Professor & HOD |
| A. B. Idowu | B. Sc. (Ado-Ekiti), M.Sc., Ph.D. (Ibadan) | Animal Physiology | Professor |
| U. F. Ekpo | B.Sc. (Calabar), M.Sc. (Ibadan), Ph.D. (Abeokuta) | Parasitology/ Epidemiology | Professor |
| Funmi A. Idowu | B.Sc. (Ibadan), M.Sc. (Lagos), Ph.D. (Abeokuta) | Medical Parasitology | Professor |
| O. A. Oke | B.Sc., M.Sc., Ph.D. (Ibadan) | Entomology | Professor |
| G. A. Dedeke | B.Sc. (Ago-Iwoye), M.Sc.(Ibadan), Ph.D. (Ogun) | Animal Ecophysiology | Reader |
| K. O. Ademolu | B.Sc., M.Sc., Ph.D. (Abeokuta) | Animal Physiology | Reader |
| A. A. Aladesida | B.Sc., M.Sc., Ph.D. (Ogun) | Taxonomy & Ecology | Lecturer I |
| J. Jonathan | B.Sc., M.Sc. | Parasitology | Asst. Lecturer |
| W. O. Alegbeleye* | B.Sc., M.Sc., Ph.D. (Ibadan) | Fisheries/Hydrology | Professor |
| O. A. Jaiyeola* | B.Sc., M.Sc., Ph.D. (Abeokuta) | Wildlife | Reader |
| O. A. Osipitan* | B.Sc., M.Sc., Ph.D. (Ibadan) | Entomology | Reader |
| J. A. Abiona* | B.Sc., M.Sc., Ph.D. (Abeokuta) | Animal Physiology | Senior Lecturer |

**100 Level: First Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BIO 101 | General Biology I | 2 | 2 | - | - |
| CHM 101 | Physical Chemistry I | 3 | 2 | 1 | - |
| GNS 101 | Use of English | 2 | 2 | - | - |
| ZOO 101 | The Mammalian Body | 2 | 2 | - | - |
| BIO 103 | Introductory Physiology | 2 | 2 | - | - |
| MTS 105 | Mathematics for Non-Major | 3 | 2 | 1 | - |
| PHS 105 | Physics for Non-Major I | 3 | 2 | 1 | - |
| GNS 111 | Introduction to Social Problems | 1 | 1 | - | - |
| BIO 191 | Practical Biology I | 1 | - | - | 1 |
| CHM 191 | Practical Chemistry I | 1 | - | - | 1 |
| PHS 191 | Physics Laboratory | 1 | - | - | 1 |
| | **Total** | **21** | **15** | **3** | **3** |

**100 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BIO 102 | General Biology II | 2 | 2 | - | - |
| BIO 192 | Practical Biology II | 1 | - | - | 1 |
| CHM 102 | Introduction to Organic Chemistry | 2 | 2 | - | - |
| CHM 104 | Introduction to Inorganic Chemistry | 2 | 2 | - | - |
| CHM 192 | Practical Chemistry | 1 | - | - | 1 |
| MTS 106 | Mathematics for Non-Major II | 3 | 2 | 1 | - |
| PHS 106 | Physics for Non-Major II | 3 | 2 | 1 | - |
| PHS 192 | Physics Laboratory II | 1 | - | - | 1 |
| GNS102 | Introduction to Nigerian History | 1 | 1 | - | - |
| ZOO 104 | Diversity of Animals | 2 | 1 | - | 1 |
| | **Total** | **18** | **12** | **2** | **4** |

**200 Level: First Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| BIO 201 | General Ecology | 2 | 1 | - | 1 |
| ZOO 203 | Histology | 2 | 1 | - | 1 |
| ZOO 261 | Invertebrate Zoology I | 2 | 1 | - | 1 |
| STS 201 | Statistics for Agricultural & Biological Sciences | 3 | 2 | 1 | - |
| GNS 203 | Use of Library | 1 | 1 | - | - |
| CHM 211 | Basic Inorganic Chemistry | 2 | 1 | - | 1 |
| CHM 231 | Physical Chemistry | 3 | 2 | - | 1 |
| MCB 201 | General Microbiology I | 3 | 2 | - | 1 |
| BCH 201 | General Biochemistry | 3 | 2 | - | 1 |
| | **Total** | **21** | **13** | **1** | **7** |

**200 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ZOO 202 | Introductory Genetics and Evolution | 3 | 2 | - | 1 |
| ZOO 262 | Invertebrate Zoology II | 2 | 1 | - | 1 |
| ZOO 206 | General Physiology | 3 | 2 | - | 1 |
| BIO 208 | Research Methods | 2 | 2 | - | - |
| APH 202 | Introduction to Animal Agriculture | 3 | 3 | - | - |
| GNS 201 | Writing and Literary Appreciation | 1 | 1 | - | - |
| GNS 202 | Elements of Politics and Government | 1 | 1 | - | - |
| GNS 204 | Logic and History of Science | 2 | 2 | - | - |
| ETS 206 | Entrepreneurship studies and Change Management | 2 | 2 | - | - |
| CHM 222 | Basic Organic Chemistry II | 2 | 1 | - | 1 |
| BIO 202 | Biological Techniques | 2 | 1 | - | 1 |
| | **Total** | **23** | **18** | **-** | **5** |

### 300 Level: First Semester

| Course code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ZOO 309 | Genetics II | 3 | 2 | - | 1 |
| ZOO 315 | Local Fauna | 2 | 1 | - | 1 |
| ZOO 317 | Field Course | 3 | 1 | - | 2 |
| ZOO 361 | Arthropod Diversity | 3 | 2 | - | 1 |
| ZOO 363 | Biology of Tropical Parasites | 3 | 2 | - | 1 |
| ZOO 365 | Chordates | 3 | 2 | - | 1 |
| ZOO 367 | Comparative Vertebrate Anatomy | 2 | 1 | - | 1 |
| ZOO 369 | Principles of Animal Development | 3 | 2 | - | 1 |
| CSC 201 | Introduction to Computer Science | 3 | 1 | 1 | 1 |
| | **Total** | **25** | **14** | **1** | **10** |

### 300 Level: Second Semester

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ZOO 392 | Industrial Training Assessment | 4 | - | - | 4 |
| ZOO 394 | Industrial Training Visitation | 4 | - | - | 4 |
| ZOO 396 | Industrial Training Reports | 4 | - | - | 4 |
| ZOO 398 | Industrial Training Seminars | 4 | - | - | 4 |
| | **Total** | **16** | | | **16** |

### 400 Level: First Semester

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ZOO 497 | Current Topics in Zoology | 2 | | - | 2 |
| ZOO 411 | Comparative Animal Physiology | 3 | 2 | - | 1 |
| ZOO 421 | Entrepreneurship opportunities in Zoology | 2 | 1 | - | 1 |
| ZOO 461 | Principles of Systematic Zoology | 2 | 2 | - | - |
| ZOO 463 | Public Health Parasitology | 2 | 2 | - | - |
| ZOO 465 | Practical Course in Public Health Parasitology | 2 | - | - | 2 |
| ZOO 467 | Applied Entomology | 2 | 2 | - | - |
| ZOO 469 | Field Course in Applied Entomology | 2 | - | - | 2 |
| ZOO 471 | Hydrobiology and Fisheries | 2 | 2 | - | - |
| ZOO 473 | PracticalCourse in Hydrobiology and Fisheries | 2 | - | - | 2 |
| | **Total** | **21** | **11** | | **10** |

**400 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ZOO 460 | Biotechnology and Bioinformatics | 3 | 2 | - | 1 |
| ZOO 464 | Zoogeography | 2 | 1 | - | 1 |
| ZOO 466 | Animal Behaviour | 3 | 2 | - | 1 |
| ZOO 470 | Special Topics in Physiology | 3 | 2 | - | 1 |
| ZOO 472 | Animal Ecology and Conservation | 3 | 2 | - | 1 |
| ZOO 496 | Seminar II | 2 | - | - | 2 |
| ZOO 498 | Project | 4 | - | - | 4 |
| | **Total** | **20** | **9** | **-** | **11** |

**COURSE SYNOPSES**

**BIO 101: GENERAL BIOLOGY I (2 Units)**

The plant cell, Procaryotic and Eukaryotic cells, cell growth, Cell division and Reproduction, Introduction to Plant Classification: General characteristics and morphology of cryptogams, pteridophytes, gymnosperms and angiosperms.

**BIO 103: INTRODUCTORY PHYSIOLOGY (2 Units)**

Nature of Living organism/Activities of Living things, Homeostasis, Growth and Development, Endocrine system, Respiration, Reproduction, Nutrition and Enzymes, Digestion, Excretion.

**BIO 191: PRACTICAL BIOLOGY I (1 Units)**

Practical classes for BIO 101 and BIO 103

**ZOO 101: THE MAMMALIAN BODY (2 Units)**

The anatomy and physiology of the mammal and adaptation to the environment. External features, skin, skeletal and muscular systems. Digestion and absorption of food; nutrition. Gas exchange and transport. The blood and circulatory system. The kidney and homeostasis. Nervous and chemical coordination. Maturation, sexuality and reproduction in man.

**BIO 102: GENERAL BIOLOGY II (2 Units)**

Basic principles of Zoological nomenclature, Outline classification of Animal kingdom, introduction to various animal phyla: Protozoa, Coelenterata, Porifera, Platyhelminthes, Nematoda, Annelida, Molusca, Arthropoda, Echinodermata, Chordata.

**BIO 192: PRACTICAL BIOLOGY II** **(1 Unit)**

Practical classes for BIO 102

**ZOO 104: DIVERSITY OF ANIMALS** **(2 Units)**

Diversity of Animal forms, structures and functions. Multicellularity and development of embryonic layers; History of animal diversity, Basis of categorization of the diversity of animals (symmetry, organization of tissues, body cavity, developmental mode, fate of plastophore); major feature of animal phylogenetics tree; introduction to animal systematic; geographical distribution of animal life and issues in the conservation of biodiversity with emphasis on Nigerian species.

**BIO 201 – GENERAL ECOLOGY** **(2 Units)**

Aims and Scope of ecology, basic units of ecology (Population, Community and Ecosystem), biotic and abiotic components of an ecosystem. Production in ecosystems. Energy flow and nutrient cycling. Dynamics of population and communities.

**ZOO 203 – HISTOLOGY** **(2 Units)**

The cellular basis of tissue formation. Main features of animal cells, tissue, organs and organ system. Histological and histochemical techniques. Cell communication. Stability of the differentiated state. Principles and preparation of microscope slides.

**ZOO 261 –INVERTEBRATE ZOOLOGY I** **(2 Units)**

Identification, phylogeny, general biology, behaviour and economic importance of acoelomate and pseudocoelomate and invertebrate of the Phylum protozoa, porifera, coelenterates, platyhelminthsis, Nematoda, Entoprocta, Nemertinea, Acanthocephala, Rotifera and including some basic principles of zoological nomenclature.

**BIO 202 – BIOLOGICAL TECHNIQUES** **(2 Units)**

Botanical and Zoological techniques: Microscope, preparation of microscope slides, photometry, colorimetry, chromatography, conductometry, experimental design. Fluid preservation, injection and corrosion techniques. Specialized preservation technique (e.g. plastination, embalming). Fixation and preservation, wax-embedding, microtomy, staining and mounting, cytological preparations, photomicrography, herbarium practices, field work and population sampling, water culture and maintenance of experimental plants.

**BIO 208: RESEARCH METHODS (2 Units)**

Research needs in Biology. Experimental and non-experimental methods. Generalization, basic data analysis. Preparation of scientific reports and manuscript Reference citing, and listing. Type of Referencing methods. Introduction to Reference Manager software

**ZOO 202: INTRODUCTORY GENETICS AND EVOLUTION (2 Units)**

Heritable and non-heritable characteristics, probability and tests of goodness of fit. Quantitative inheritance, variations ingenome structure. Introduction to population genetics. Current concept in evolution. Genetic variation and appreciation. Evolution of selected organisms.

**ZOO 206: GENERAL PHYSIOLOGY (2 Units)**

Metabolism and energy production, circulatory system of animals. Homeostasis, nervous and hormonal control of systems. Excretion and osmoregulation. A survey of the fundamental principles of plant physiology including photosynthesis respiration, cell-water relationship, mineral nutrition, nutrient uptake and deficiency, symptoms.

**ZOO 262 –INTERTEBRATE ZOOLOGY II (2 Units)**

Identification, phylogeny, general biology, behaviour and economic importance of coelomate invertebrate of the Phylum: Ectoprocta (Bryozoa), Brachiopoda, Phoronida, Mollusca, Annelida, Arthropoda, Echinodermata and Hemicordata including their classifications

**ZOO 309 – GENETIC II (2 Units)**

Aspect of animal genetics: pedigree analysis. Further consideration of various deviations from basic principles gene interaction hardy-Weinberg Law Mutagenesis Sex determination.

**ZOO 315 - LOCAL FAUNA (2 Units)**

General survey of local of animal such as protozoan, nematodes, mollusks, arthropods and vertebrates.

**ZOO 317 – FIELD COURSE (2 Units)**

This is designed to give students an opportunity to carry out a small independent research project during field trips to areas of zoological interest in the country.

Student are expected to submit report of their field visit.

**ZOO 361 – ARTHROPOD DIVERSITY (3 Units)**

Adaptive radiation within the phylum arthropoda, structure and functions of the body appendages. Insect evolution, classification and distribution. Behaviour and ecology of social insects.

**ZOO 363 – BIOLOGY OF TROPICAL PARASITES (3 Units)**

Classification, adaptation, morphology, life cycles and any other features of interest in the protozoans, platyhelminths, nematodes and parasitic arthropods, paying particular attention to the various adaptations of their group. Host parasites relations. Host susceptibility and specificity; Resistance and immunity. Facultative and obligate parasitism. Ecto and endoparasitism. Parasites of medical and veterinary importance.

**ZOO 365 – CHORDATES (2 Units)**

The diversity of vertebrate life. Basic organization and general biology of hemichordate. Urochordate, cephalochordate, Agnatha, Pisces, Amphibia, Reptilia, Aves and Mammalia. Nigeria or tropical West Africa examples to be used as much as possible.

**ZOO 367 – COMPARATIVE VERTEBRATE ANATOMY (2 Units)**

A comparative study of the integument and the digestive, respiratory, urinogenital, circulatory, nervous, muscular and skeletal systems of living vertebrates to illustrate the major adaptive change that have occurred during their evolution from fish to mammals

**ZOO 369 – PRINCIPLES OF ANIMAL DEVELOPMENT (2 Units)**

Gametogenesis, fertilization, cleavage, gastrulation and organogenesis in branchiostoma, amphibian, aves and mammalian, growth and differentiation, metamorphosis and regeneration.

**ZOO 392: INDUSTRIAL TRAINING ASSESSMENT (4 Units)**

Assessment of log books on 6 months industrial training spent by the students in botany related industry or agricultural establishment.

**ZOO 394: INDUSTRIAL TRAINING VISITATION (4 Units)**

On the stop assessment of six months of industrial training must be spent by the students in a botany related industry or agricultural establishment. Focus should be

on work carried out by student and ability to understand basic scientific methods and principles at work place.

**ZOO 396: INDUSTRIAL TRAINING REPORTS (4 Units)**

Assessment of scientific writing of industrial training report

**ZOO 398: INDUSTRIAL TRAINING SEMINAR (4 Units)**

Final Seminar on topics related to industrial training experiences must be presented by student at the end of the second semester.

**ZOO 497: CURRENT TOPICS SEMINAR IN ZOOLOGY (2 Units)**

The student shall under the supervision of an academic staff select a seminar topic for detailed study (review) using library methods. The emphasis should be on recent advances in the chosen field/topic. The course is expected to give the student the opportunity for independent thought and expression. The study will result in a seminar write-up and oral presentation.

**ZOO 411: COMPARATIVE ANIMAL PHYSIOLOGY (3 Units)**

Homeostasis as a central concept. A comparative study of animal functions – nutrition and digestion, respiration, blood circulation, excretion and osmoregulation in aquatic and terrestrial animals. The Integrating systems (nervous system, endocrine system and the sense organs). Bioluminescence. Chromatophores and colour change

**ZOO 421: ENTREPRENEURSHIP OPPORTUNITIES IN ZOOLOGY (2 Units)**

Elements of business management. Factors in choosing a zoological production career. Site location. Sources of funding. Raw material sourcing and recycling. Staffing. Records and accounting. Sourcing and creating market. Consumer psychology. Intellectual property development. Visits to business enterprises of zoology/veterinary-based industrial productions. Snailery, Apiculture. Raising insects for food. Silk production (Sericulture), Aquaculture, Vermiculture, Maggotry and Fumigation businesses.

**ZOO 461: PRINCIPLES OF SYSTEMATIC ZOOLOGY (2 Units)**

Zoological classification – the species category, polytypic species, population systematic, intra-specific categories, higher categories. Methods of zoological classification – taxonomic collections and identification, taxonomic characters, qualitative and quantitative analysis of natural variation, procedures of classification.

Zoological nomenclature – essential rules and interpretation of rules.

**ZOO 463: PUBLIC HEALTH PARASITOLOGY II (2 Units)**

Basic epidemiological methods and uses in Public Health. Epidemiological and control of tropical parasites of medical and veterinary importance. A mention of vectors of parasites in order to allow for the identification of principal groups involved in the transmission of parasitic diseases.

**ZOO 465: PRACTICAL COURSE IN PUBLIC HEALTH PARASITOLOGY II (2 Units)**

Practical methods in basic epidemiological parameters in public health and parasitology. Techniques for collections, preservation and identification of parasitic specimens.

**ZOO 467: APPLIED ENTOMOLOGY (2 Units)**

History of Entomology; Paleantology, life cycles and problems/habits. Attack and defence by insects, economic importance and chemical and biological control of insects.

**ZOO 469: PRACTICAL COURSE IN APPLIED ENTOMOLOGY (2 Units)**

Techniques for collection, preservation and identification of insects of medical, veterinary, agricultural and aesthetic importance.

**ZOO 471: HYDROBIOLOGY AND FISHERIES (2 Units)**

A comparative study of the hydrobiology and cycle of life in marine, brackish and fresh water. Fisheries biology including the food and feeding habits of fish populations. Fecundity and reproduction, age and growth. Aquaculture with reference to Nigeria. The Fish Fauna of Nigeria.

**ZOO 473: PRACTICAL COURSE IN HYDROBIOLOGY AND FISHERIES (2 Units)**

Techniques for measuring water parameters – Biochemical Oxygen Demand, Chemical Oxygen Demand, Total Dissolved Solid, Turbidity, bottom sediment sampling using grappler etc. Collection, preservation, morphometrics and identification of Nigerian fishes. Methods in Plankton identification. Fishing gear and fishing techniques.

**ZOO 496: SEMINAR II (2 Units)**

An open post data seminar will be presented on the project conducted by a student before the departmental examination panel with other students in attendance. The

student will be examined for lucidity, correct use of scientific terms pertaining to his or her project, ability to convince the panel of examiner on the originality of the project, grammatical expression and comportment.

**ZOO 498: PROJECT (4 Units)**

A student will be expected to carry out a field/detailed research investigation under supervision of a staff in any special area of Biology, write up a project report and be examined for his/her knowledge of the work before a panel of internal examiners in an oral examination.

**ZOO 460: BIOTECHNOLOGY & BIOINFORMATICS (3 Units)**

History and evolution of the new technology, different areas of biotechnology including genetic engineering, cell culture, biomass production and technology, enzymes technology, immobilized cell and enzymes, biofuels. Potential application of biotechnology in the developing countries in the area of agriculture, health and energy. Social and economic importance of biotechnology. Introduction to bioinformatics, genomic sequences, sequence alignment, molecular phylogeny.

**ZOO 464: ZOOGEOGRAPHY (2 Units)**

Introduction to animal distribution. Patterns that promote species richness and taxonomic relationships among species. Adaptation and changes in species distribution. A brief account of plate tectonics and continental drift theory in relation to earth's history as it affect animal distribution. Faunal regions.

**ZOO 466: ANIMAL BEHAVIOUR (3 Units)**

Reflexes and development of behavior. Physiology of animal behavior. Motivation and conflict effect of hormones on behavior, instinct and learning and evolution, social life in animals

**ZOO 470: SPECIAL TOPICS IN PHYSIOLOGY (3 Units)**

Specialized aspect of animal physiology such as muscle contraction and cytoskeletal elements, intracellular microenvironment and metabolic compartmentation: membrane organisation, receptors and endocytosis, cell communication

**ZOO 472: ANIMAL ECOLOGY AND CONSERVATION (3 Units)**

Animal populations and communities on the regulation of numbers, the ecology of local terrestrial and aquatic animals

## COLLEGE OF ENGINEERING


The College of Engineering is one of the two Colleges established in the Phase II of the educational development of the University of Agriculture, Abeokuta.

The Phase II took off in the 2001/2002 academic year. The first set of 100 level students was admitted under the coordination of the Head of the Department of Food Science and Technology (FST) at the College of Agricultural Management, Rural Development and Consumer Studies in that year. All the programmes designed for Departments of the College of Engineering became operational in August 2002.

Presently, the Departments in the College which offer 5 year B. Eng. degree programmes are:

i. Department of Agricultural & Bio-Resources Engineering
ii. Department of Civil Engineering
iii. Department of Electrical & Electronics Engineering
iv. Department of Mechanical Engineering
v. Department of Mechatronics Engineering

These Departments are proving their worth in carrying out the mandate of the University. The College won awards for the University at the 1st NUC Research Fair held in Abuja in 2004.

**Philosophy, Objectives and Mandate**

The primary philosophy that guides the training of students is the production of skilled manpower that is adequately furnished with the comprehensive information required for engaging in economic agricultural production in an environment characterized by rural setting and adequate land endowment. Such knowledgeable professional manpower has to be produced in an atmosphere with the widest possible human and material resources, through the adoption of effective techniques of instruction and exposure to the actual practice of agriculture. Consequently, there are opportunities for formal training at the Undergraduate and postgraduate levels for the acquisition of basic and higher degrees.

These training programmes are mounted through classroom instruction, laboratory practical, field demonstration and workshop practice. Deriving from the foregoing Philosophy and the major objectives of the University, among others, are:

i. To assist in the attainment of self-sufficiency in the production of basic food;
ii. To contribute to the achievement of the goal of marked increase in the production of agricultural raw materials to support the growth of our several industries;
iii. To achieve the production and processing of export produce;
iv. To enhance with emphasis on relevant, appropriate and manageable technology to modernize agricultural production, processing, storage, preservation and distribution;
v. To enhance the rural employment opportunities and the attendant improvement of the quality of rural life;
vi. To evolve effective ways of protecting agricultural land resources from ecological degradation such as erosion, pollution, etc.;
vii. To develop new patterns of agricultural structures and government policies which clearly demonstrate that agriculture is an important part of our national economy.

**Dean's Office**

| Name | Qualification | Designations |
|---|---|---|
| S. O. Ismaila | ND (Ilaro), B.Sc. (Ife), M.Sc., Ph.D (Ibadan), MNSE, R. Eng. (COREN) | Professor & Dean |
| O. U. Dairo | B.Sc., M.Sc. (Ife), Ph.D (Abeokuta) MNSE, MNIAE, R. Eng. (COREN) | Deputy Dean |

# DEPARTMENT OF AGRICULTURAL AND BIO-RESOURCES ENGINEERING

**Philosophy**

The philosophy of the Department is the production of skilled engineering manpower adequately furnished with comprehensive information required for providing scientific and engineering solutions to the nation's agricultural, bio-resources, and ecological problems. These graduates are produced with the aim of improving agricultural productivity, environmental sustainability and poverty reduction. Our graduates are trained to be self-reliant and entrepreneurial in order to become job creators and not job seekers. This is achieved through the adoption of effective techniques of instruction and exposure to actual engineering practices.

**Objectives**

The objectives of the Agricultural and Bio-Resources Engineering Programme are:

i. Production of engineers who would design systems, processes and machinery that will aid agricultural mechanization, with reference to the production and storage of crop, livestock and fibre.
ii. Training of engineering students, who will, on graduation, is able to design, manufacture and test machines required for the processing, utilization and storage of biological materials for human and livestock consumption.
iii. Development of engineers who would solve ecological problems, design and manage irrigation, drainage, water and soil conservation structures.
iv. Production of engineers who would successfully manage mechanized agricultural enterprises and agro-allied industries.
v. Training of students who will be interested in advanced research and development work in Agricultural and Bio – resources engineering.

**Options and Specialization**

The B.Eng. Agricultural and bio – resources engineering programme has been designed to reflect teaching and research focused in the following areas

i. Bio-Resources and Food Process Engineering
ii. Agricultural Power and Machinery Engineering
iii. Water and Ecological Resources Engineering
iv. Environmental Resources Engineering
v. Agricultural & Rural Structures Engineering

**Academic Staff**

| Name | Qualification | Specialization | Designation |
|---|---|---|---|
| A. F. Adisa | B.Sc., M.Sc., Ph.D (Zaria ) MNSE, MNIAE, R. Engr (COREN) | Farm Power and Machinery | Reader & Ag. Head of Department |
| J. K. Adewumi | B. Eng., M.Sc, Ph.D. (Zaria) MNSE,MNIAE, C. Engr, R. Engr (COREN) | Soil and Water Engineering. (Irrigation) | Professor |
| B.A. Adewumi | B.Sc,,M.Sc. (Ibadan), Ph.D (Akure),FNSE. FNIAE, MASABE, MAFST (India), MNIFST. R. Engr (COREN). | Food Engineering | Professor |
| E. S. A. Ajisegiri | B.Sc. ( Maiduguri), M.Sc, Ph.D. (Ibadan) FNIAE, MIAgE, R. Engr (COREN) | Crop Processing and Food Stability | Professor |
| T. M. A. Olayanju | B.Sc., M.Sc., Ph.D. (Ibadan) MNSE, MNIAE, MNIFST, R. Engr (COREN) | Mechanization | Professor |
| O. U. Dairo | B.Sc., M.Sc. (Ife), Ph.D (Abeokuta) MNSE, MNIAE, R. Engr (COREN) | Bio-resources & Crop Utilization Engineering | Reader |
| I. A. Ola | B.Sc (Ilorin), M.Sc. (Ife) , Ph.D (Abeokuta) MNSE, R. Engr (COREN) | Farm Power and Machinery Engineering | Senior Lecturer |
| A. A. Aderinlewo | B.Sc. (Ife), M.Sc.,Ph.D (Ibadan), MNSE, R. Engr (COREN) | Farm Power and Machinery Engineering | Senior Lecturer |
| A. Sobowale | B. Eng. (Akure), M.Sc., Ph.D. (Zaria), MNSE, MNIAE,MNIWE & MIAH | Water and Ecological Resources Engineering | Senior Lecturer |
| O. J. Adeosun | B.Sc. (Ife), M.Sc.,Ph.D. (Ibadan), MNSE, MSSSN, R. Engr (COREN) | Agricultural Waste Management & Environmental Engineering | Senior Lecturer |
| P. O. O. Dada | B.Sc. (Ilorin), M.Sc., Ph.D. (Abeokuta), MNSE, R. Engr (COREN) | Soil and Water Conservation Engineering | Senior Lecturer |
| P. O. Omotainse | B.Sc. (Minna), M.Eng. (Abeokuta), MNSE | Agricultural & Rural Structures Engineering | Assistant Lecturer |

**100 Level: First Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| GNS 101 | Use of English | 2 | 2 | - | - |
| GNS 111 | Introduction to Social Problems | 1 | 1 | - | - |
| MCE 101 | Introduction to Engineering Drawing | 2 | 1 | - | 1 |
| CHM 101 | Introductory Physical Chemistry | 3 | 2 | 1 | - |
| CHM 191 | Practical Chemistry I | 1 | - | - | 1 |
| MTS 101 | Algebra | 3 | 2 | 1 | - |
| MTS 103 | Vectors and Geometry | 2 | 2 | - | - |
| PHS 101 | General Physics I | 3 | 2 | 1 | - |
| PHS 191 | Physics Laboratory I | 1 | - | - | 1 |
| MCE 103 | Introduction t o Mechanics I | 1 | 1 | - | - |
| GNS 102 | Introduction to Nigerian History | 1 | 1 | - | - |
| GNS 203 | Use of Library | 1 | 1 | - | - |
| **Total** | | **21** | **15** | **3** | **3** |

**100 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE 102 | Introduction to Agricultural & Bio-Resources Engineering | 1 | 1 | - | - |
| ABE 106 | Elementary Fluid Flow | 1 | 1 | - | - |
| CHM 102 | Introductory Organic Chemistry | 2 | 2 | - | - |
| CHM 104 | Introductory Inorganic Chemistry | 2 | 2 | - | - |
| CHM 192 | Practical Chemistry II | 1 | - | - | 1 |
| MTS 102 | Calculus and Trigonometry | 3 | 2 | 1 | - |
| MTS 104 | Mechanics | 3 | 2 | 1 | - |
| PHS 102 | General Physics II | 3 | 2 | 1 | - |
| PHS 192 | Physics Laboratory II | 1 | - | - | 1 |
| STS 102 | Introduction to Statistics | 2 | 2 | - | - |
| **Total** | | **19** | **14** | **3** | **2** |

**200 Level: First Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE201 | Engineering Drawing I | 2 | 1 | - | 1 |
| CVE 201 | Engineer in Society | 1 | 1 | - | - |
| MCE 201 | Engineering Mechanics I | 2 | 2 | - | - |
| MCE 203 | Engineering Materials | 3 | 2 | 1 | - |
| MCE 205 | Fluid Mechanics I | 3 | 2 | 1 | - |
| ELE 201 | Applied Electricity I | 2 | 2 | - | - |
| ELE 203 | Fundamentals of Information and Communication Technology | 2 | 1 | - | 1 |
| ELE 291 | Applied Electricity Laboratory I | 1 | - | - | 1 |
| CSC 201 | Introduction to Computer Sciences | 3 | 2 | | 1 |
| GNS 201 | Writing and Literary Appreciation | 1 | 1 | - | - |
| MTS 201 | Mathematical Foundation | 3 | 2 | 1 | - |
| **Total** | | **23** | **16** | **3** | **4** |

**200 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE 202 | Engineering Drawing II | 2 | 1 | - | 1 |
| ABE 204 | Workshop Practice | 2 | 1 | - | 1 |
| CVE 202 | Strength of Materials | 2 | 2 | - | - |
| ELE 202 | Applied Electricity II | 2 | 2 | - | - |
| ELE 292 | Applied Electricity Laboratory II | 1 | - | - | 1 |
| MCE 202 | Engineering Mechanics II | 2 | 2 | - | - |
| MCE 204 | Engineering Thermodynamics | 3 | 2 | - | 1 |
| MTS 232 | Ordinary Differential Equations | 2 | 2 | - | - |
| GNS 204 | Logic and History of Science | 2 | 2 | - | - |
| GNS 206 | Peace and Conflict Resolution | 2 | 2 | - | - |
| ETS 206 | Entrepreneurial Studies & Change Management | 2 | 2 | - | - |
| **Total** | | **22** | **18** | **-** | **4** |

**300 Level: First Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE 301 | Agricultural Mechanics | 3 | 2 | - | 1 |
| ABE 303 | Hydraulics Engineering I | 2 | 2 | - | - |
| ABE 305 | Hydrology for Engineers | 3 | 2 | - | 1 |
| CVE 311 | Engineering Geology | 3 | 2 | - | 1 |
| MCE 321 | Mechanics of Machines I | 3 | 2 | 1 | - |
| MCE 341 | Engineering Mathematics I | 3 | 2 | 1 | - |
| SOS 211 | Principles of Soil Science | 2 | 2 | - | - |
| PCP 201 | Principles of Crop Production | 3 | 2 | - | 1 |
| | **Total** | **22** | **16** | **2** | **4** |

**300 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE 302 | Design of Agricultural Machine Elements | 3 | 2 | - | 1 |
| ABE 306 | Agricultural Land Surveying & GIS | 3 | 2 | - | 1 |
| ABE 350 | Engineering Entrepreneurship | 2 | 2 | - | - |
| CVE 308 | Soil Mechanics | 3 | 2 | - | 1 |
| ELE 342 | Engineering Mathematics II | 3 | 2 | 1 | - |
| MCE 318 | Engineering Metallurgy I | 3 | 2 | - | 1 |
| AEM 314 | Principles of Agribusiness & Farm Mgt. | 2 | 1 | 1 | - |
| APH 202 | Introduction to Animal Agriculture | 3 | 2 | 1 | - |
| | **Total** | **22** | **16** | **3** | **3** |

**400 Level: First Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE 401 | Agricultural Machinery I | 3 | 2 | - | 1 |
| ABE 403 | Engineering Properties, Handling &Processing of Bio-Materials I | 3 | 2 | 1 | - |
| ABE 405 | Irrigation and Drainage Engineering I | 3 | 2 | - | 1 |
| ABE 407 | Introduction to Agricultural Structures Design | 3 | 2 | - | 1 |
| ABE 413 | Engineering Communication | 2 | 2 | - | - |
| ABE 443 | Statistics for Engineers | 3 | 2 | 1 | - |
| ARD 201 | Introduction to Agric Extension | 2 | 2 | - | - |
| | Elective | 2 | 2 | - | - |
| | **Total** | **21** | **16** | **2** | **3** |

**Electives**

| | | | | | |
|---|---|---|---|---|---|
| ABE 411 | Bio – Instrumentation and Mechatronics | 2 | 2 | **-** | **-** |
| ABE 415 | Current Topics in Machines for Biotechnology | 2 | 2 | **-** | **-** |
| ABE 417 | Introduction to Bio-resources Engineering | 2 | 2 | **-** | **-** |
| CVE 409 | Highway Engineering | 2 | 2 | - | - |
| EMT 405 | Environmental Education and Awareness | 2 | 2 | **-** | **-** |

**400 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| *ABE 200* | *Students' Work Experience Programme (SWEP)* | *3* | - | - | *3* |
| ABE 297 | SWEP Seminar & Report | **2** | - | - | 2 |
| *ABE 300* | Students' Industrial Work Experience I (SIWES I) | *3* | - | - | *3* |
| ABE 397 | SIWES I Seminar | 2 | - | - | 2 |
| ABE 400 | Students' Industrial Work Experience II (SIWES II) | *8* | - | - | *8* |
| ABE 497 | SIWES II Report & Seminar | 2 | - | - | 2 |
| | **Total** | **20** | **-** | **-** | **20** |

**500 Level: First Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE 501 | Agricultural Power Systems I | 3 | 2 | - | 1 |
| ABE 503 | Rural Power Generation & Supply I | 3 | 2 | - | 1 |
| ABE 505 | Soil & Water Conservation Engineering | 3 | 2 | - | 1 |
| ABE 507 | Agric. Land Clearing & Development | 2 | 2 | - | - |
| CVE 509 | Engineering Entrepreneurship | 2 | 2 | - | - |
| ABE 597 | Seminar I | 1 | - | - | 1 |
| | Electives (2) | 6 | 4 | - | 2 |
| | **TOTAL** | **22** | **16** | **-** | **6** |

**Electives**

**BIO-RESOURCES AND FOOD PROCESS ENGINEERING (option)**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE 509 | Advanced Thermodynamics | 3 | 2 | 1 | - |
| ABE 513 | Agricultural & Food Process Engineering | 3 | 2 | - | 1 |
| ABE 515 | Engineering Properties, Handling & Processing of Bio-Materials II | 3 | 2 | 1 | - |
| ABE 517 | Food and Crop Storage Technology | 3 | 2 | 1 | - |
| ABE 519 | Solar Energy Applications for Bio-resource Engineers | 3 | 2 | - | 1 |

**AGRICULTURAL POWER AND MACHINERY ENGINEERING (option)**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| AGE 511 | Agricultural Power Systems II | 3 | 2 | - | 1 |
| AGE 513 | Agricultural & Food Process Engineering | 3 | 2 | - | 1 |
| ABE 515 | Engineering Properties, Handling & Processing of Bio-Materials II | 3 | 2 | 1 | - |
| ABE 519 | Solar Energy applications for Bio-resource Engineers | 3 | 2 | - | 1 |
| MCE 511 | Computer-Aided Design and Manufacture | 3 | 2 | - | 1 |

**WATER AND ECOLOGICAL RESOURCES ENGINEERING (option)**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE 521 | Irrigation Engineering I | 3 | 2 | 1 | - |
| ABE 523 | Hydraulics Engineering II | 3 | 2 | 1 | - |
| ABE 529 | Foundation Engineering | 3 | 2 | - | - |
| ABE 535 | Water Resources Engineering | 3 | 1 | - | 1 |
| CVE 504 | Geotechnical Engineering | 3 | 2 | 1 | - |

**ENVIRONMENTAL RESOURCES ENGINEERING (option)**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE 525 | Agricultural and Waste Water Management I | 3 | 2 | - | - |
| ABE 527 | Design of Environmental Control Structures | 3 | 2 | - | 1 |
| CVE 517 | Environmental Engineering | 2 | 1 | - | 1 |
| EMT 427 | Remote Sensing and GIS | 2 | 1 | - | 1 |
| WMA 509 | Water Quality Assessment and Pollution Control | 2 | 2 | - | 1 |

**AGRICULTURAL & RURAL STRUCTURES ENGINEERING (option)**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE 521 | Irrigation Engineering I | 3 | 2 | - | 1 |
| ABE 523 | Hydraulics Engineering II | 3 | 2 | - | 1 |
| ABE 527 | Design of Environmental Control Structures | 3 | 2 | - | 1 |
| ABE 529 | Foundation Engineering | 3 | 2 | - | 1 |
| CVE 504 | Geotechnical Engineering | 3 | 2 | - | 1 |

**500 Level: Second Semester**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE 502 | Agricultural Mechanization | 3 | 2 | - | 1 |
| MCE 522 | Engineering Law | 2 | 2 | - | - |
| AEM 502 | Business Management | 3 | 2 | 1 | - |
| ABE 597 | Seminar II | 1 | - | - | 1 |
| ABE 599 | Research Project | 4 | - | - | 4 |
| | Elective (3) | 9 | 6 | - | 3 |
| | **TOTAL** | **22** | **12** | **1** | **9** |

**Electives**

**BIO -RESOURCES AND FOOD PROCESS ENGINEERING (option)**

| Course Code | Course Title | U | L | T | P |
|---|---|---|---|---|---|
| ABE 504 | Mechanics of Deformation Bodies | 3 | 2 | - | 1 |
| ABE 506 | Farm Machinery & Equipment Servicing and Maintenance | 3 | 2 | - | 1 |
| ABE 508 | Design of Agricultural & Food Processing Machine | 3 | 2 | - | 1 |
| ABE 520 | Food Engineering | 3 | 2 | - | 1 |
| ABE 530 | Farm Transportation | 3 | 2 | - | 1 |