

COLLEGE OF NATURAL SCIENCES (COLNAS)

DEPARTMENT OF BIOLOGICAL SCIENCES

The Department of Biological Sciences comprises of Botany and Zoology units and offers postgraduate taught courses and research leading to the awards of Master of Science (M.Sc.) and Doctor of Philosophy (Ph.D.) degrees in the following core areas: Botany (Plant Physiology/Plant Taxonomy/Plant Cytology and Cytogenetics), Animal Physiology, Entomology and Parasitology

MASTER OF SCIENCE (M.Sc.) PROGRAMMES STRUCTURE

The programme consists of compulsory courses which shall be taken by all candidates, core courses in the candidate's area of specialization, elective courses which a candidate may take within and/or outside the Department as may be prescribed by the candidate's Supervision/Dissertation Committee, dissertation and seminars. The following M.Sc. courses are currently offered in the department:

- M.Sc. Botany (Plant physiology)
- M.Sc. Botany (Plant taxonomy)
- M.Sc. Botany (Cytology and Cytogenetics)
- M.Sc. Animal Physiology
- M.Sc. Entomology
- M.Sc. Parasitology

The structure is summarized below:

Compulsory Courses

Course Code	Course Title	Units
BIO 701	Current Topics (Seminar)	2
BIO 702	Research Techniques (Bioinstrumentation)	2
BIO 703	Biostatistics	2
BIO 799	Research Project	6
CSC 701	Use of Computer in Research	3
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M.Sc. BOTANY (PLANT PHYSIOLOGY)

Course Code	Course Title	Units
	Core Courses	3
BOT 701	Plant Growth and Development	3
BOT 702	Water Relations in Plants	3
BOT 703	Mineral Relations in Plants	3
BOT 704	Biosynthetic Mechanisms in Plants	3
BOT 705	Respiratory System in Plants	3
BOT 706	Enzymology in Plants	3
	Electives	
BOT 707	Plant Taxonomy and Biosystematics	3
BOT 708	Reproductive Biology of the Angiosperms	3
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M.Sc. BOTANY (PLANT TAXONOMY)

Course Code	Course Title	Units
	Core Course	
BOT 707	Plant Taxonomy and Biosystematics	3
BOT 708	Reproductive Biology of the Angiosperms	3
BOT 709	Systematics of the Algae, Bryophytes and Pteridophytes	3
BOT 710	Reproductive Biology of the Gymnosperms	3
BOT 711	Phytogeography	4
	Electives	
BOT 701	Plant Growth and Development	3
BOT 703	Mineral Relations in Plants	3
BOT 704	Biosynthetic Mechanisms in Plants	3
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M.Sc. BOTANY (CYTOLOGY AND CYTOGENETICS)

Course Code	Course Title	Units
	Core Courses	
BOT 707	Plant Taxonomy and Biosystematics	3
BOT 712	Phytomorphology and Variation in Plants	3
BOT 713	Cytogenetics	4
BOT 714	Cytology	4
BOT 715	Applied Cytogenetics	3
	Electives	
BOT 708	Reproductive Biology of the Angiosperms	3
BOT 709	Systematics of the Algae, Bryophytes and Pteridophytes	3
BOT 710	Reproductive Biology of the Gymnosperms	3
BOT 711	Phytogeography	4
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M.Sc. ANIMAL PHYSIOLOGY

Course Code	Course Title	Units
	Core Courses	
ZOO 703	Techniques in Animal Physiology	3
ZOO 707	Physiology of Digestion	3
ZOO 708	Animal Hormones	3
ZOO 710	Physiology of Excitable Tissues	3
ZOO 711	Physiology and Environment	3
BCH 710	General Biochemistry	3
	Electives	
ZOO 714	Physiology of Reproduction and Excretion	4
ZOO 716	Respiratory and Circulatory Physiology	3
ZOO 712	Insect Physiology and Biochemistry	3
ZOO 705	Physiology and Biochemistry of Parasites	3
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M.Sc. ENTOMOLOGY

Course Code	Course Title	Units
	Core Course	
ZOO 712	Insect Physiology and Biochemistry	3
ZOO 721	Insect Taxonomy	3
ZOO 722	Biology of non-insect arthropods	3
ZOO 723	Insect Ecology	4
ZOO 724	Principles & Methods of Insect Pest Management	3
	Electives	
ZOO 726	Insect Vectors	3
ZOO 702	Transmission of Tropical Parasites	3
ZOO 725	Aquatic Entomology	3
ZOO 727	Principles of Stored products Entomology	3
ZOO 728	Biology of selected insect groups	3
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M.Sc. PARASITOLOGY

Course Code	Course Title	Units
	Core Course	
ZOO 701	Animal Associations	3
ZOO 702	Transmission of Tropical Diseases	3
ZOO 703	Principle of Epidemiology	3
ZOO 704	Diseases caused by Protozoa	3
ZOO 705	Diseases caused by Helminths	3
	Electives	
ZOO 706	Physiology and Biochemistry of Parasites	3
ZOO 726	Insect Vectors	3
MCB 713	Advanced Immunology and Immunochemistry	3
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PhD PROGRAMMES

These shall normally be by research culminating in a Thesis in any of the special areas listed below:

CURRENT AREAS OF SPECIALISATION AT Ph.D. LEVEL

Plant Physiology
 Plant Taxonomy
 Plant Cytology and Cytogenetics
 Animal Physiology
 Entomology
 Parasitology

STRUCTURE

In addition to the Thesis, a candidate may be required to register for one taught course at postgraduate level (Listed under M.Sc. degree programme) or any others as may be prescribed by the Supervisor(s) or Committee.

DESCRIPTION OF POSTGRADUATE COURSES

BIO 701 – Current Topics Seminar (2 Units)

Literature on specific current topics to be reviewed by students and graded by two or three competent academic staff in the area of study.

BIO 702 – Research Techniques (2 Units)

BIO 799 – Research Project (6 Units)

Botany Courses

BOT 701 – Plant Growth and Development (3 units)

Seed dormancy and germination, seedling development. The phytohormones. Herbicides. Physiology of flowering, fruit development. Techniques in growth analyses. Tissue culture.

BOT 702 – Water Relations in Plant (3 Units)

The water relations of plants considered at cellular and organism levels. Plant cell and its biogenesis. Microbodies and vacuoles and their functions.

BOT 703 – Mineral Nutrition and Organic transportation in Plants (3 units)

Detailed anatomical structure of the stem, xylem and phloem. The mechanisms of ion uptake and transport. Utilization and mode of action of minerals. Mineral deficiency and toxicity. Transportation.

BOT 704 – Biosynthesis Mechanisms in Plants (3 Units)

The mechanisms of photosynthesis. Biosynthesis of proteins, lipids and plant pigments. Secondary plant products.

BOT 705 – Respiration System in Plants (3 Units)

Respiration and the respiratory pathways with special reference to the mechanisms of glycolysis, the pentose-phase pathways, the Krebs's cycle and the glyoxylate cycle.

BOT 706 – Enzymology in Plants (3 Units)

The synthesis and regulation of enzymes. Isolation and characterization of enzymes from plant tissues. Classification and kinetic properties of enzymes, Isoenzymes. Economic value of enzymes.

BOT 707 – Plant Taxonomy and Biosystematics (3 Units)

The nature of taxonomic character used in plant classification with special reference to vegetative, reproductive, morphological and orthodox and modern taxonomic methods. Character weighing and plant classification.

BOT 708 – Reproductive Biology of the Angiosperms (3 units)

Detailed analysis of the flower and fruit structure in the angiosperms. Pollination trend in the development.

BOT 709 – Systematics of the Algae, Bryophytes and Pteridophytes (3 units)

Morphological and functional differentiation of the algae. Economic value of algae, vegetative and reproductive structure in the bryophyte. Bryophyte as sensitive indicator of atmospheric pollution. Structure and classification of algae, bryophytes and pteridophytes.

BOT 710 – Reproductive Biology of the Gymnosperms (3 units)

Detailed analysis of the sporophyll and cone structures in the Gymnosperms. Evolutionary trend in the development of the cones in the bryophytes.

BOT 711 – Phytogeography (4 units)

BOT 712 - Phytomorphology and Plant Variation (3 units)

Current contents of plant kingdom. Plant forms and functions. Genetic background to plant morphology. Environmental influences on plant morphology. Variation in plant organs, number, size, shape, shape and arrangement of plant parts, vegetative morphology (root, stem and leaves), flora morphology (inflorescence, flower, fruit and seed). Descriptive terminology and modified applications.

BOT 713 Cytogenetics (4 units)

Boundaries and definitions on the subject matter of cytogenetics, genetic material and level of organization in prokaryotes and eukaryotes. Association of genes with chromosomes; mitosis, mitotic cycle and mitotic metaphase chromosomes in eukaryotes. Meiosis, meiotic metaphase chromosomes, meiosis in life cycles and in Mendelism, linkage, crossing over and chiasma formation, mitotic crossing over and gene mapping, genetic control of meiotic processes, Numerical change in chromosome numbers, aneuploidy and polyploidy. Chromosomes in populations, Introduction to population genetics. Practicals on cytogenetic techniques, Karyotype analysis, mitotic behaviours and gametogenesis, gene mapping techniques.

BOT 714 – Cytology (4 units)

Definitive analysis of basic structural unit of living organisms, structural and functional differentiation of plants and animal cells. Functional and adaptive significance of cellular inclusions. Cell theory. The cell cycle. Cell reproduction and introduction to cell culture. Cytology of diseased tissues. Practicals on detailed structure of plant and animal cells, slide preparation for preservation and examination of cells and diseased tissue.

BOT 715 – Applied Cytogenetics (3 unit)

Evolution in changing environments; mutations, chromosome strategies and evolution. Genetics of weeds and pests, evolutionary strategies in weeds and weedy behaviour, pest and pest behaviour, the weed-crop system. Evolutionary implication for flora and fauna of the future.

Zoology Courses

ZOO 701 – Animal Association (3 Units)

Heterospecific associations among animals (Symbiology). Types of parasitism, parasites and their hosts. The effects of parasitism on the parasite and host. Host specificity. The species problem and the evolution of parasitism in the animal kingdom.

ZOO 702 – Transmission of Tropical Parasites (3 Units)

Patterns of transmission of parasites in the tropics. The role of vectors in disease transmission. The role of the behaviour of parasitic organisms and their hosts in disease transmission.

ZOO 703 – Principle of Epidemiology (3 Units)

Introduction to epidemiology, basic measurements in epidemiology, observation used in epidemiology. Basic methods of study (Descriptive, cross-sectional, case-control, experimental) Statistical analysis.

ZOO 704 – Diseases Caused by Protozoa (3 Units)

Parasitic diseases caused by Protozoa and transmitted by insects, aetiology, epidemiology and control. Global situation of malaria and typanosomiasis. Parasitic diseases cause by protozoa and transmitted by tick and mites, aetiology, epidemiology and contract. Protozoa transmitted by resistant cysts. Field techniques of diagnosis.

ZOO 705- Diseases Caused by Helminths (3 Units)

Aetiology, epidemiology and methods of control of diseases of man, animals and plants caused by Nematodes, Cestodes and Trematodes, Epidemiological models of important helminths infections such as fascioliasis, ancylostomiasis and taeniasis, field techniques of diagnosis.

ZOO 706 – Physiology and Biochemistry of Parasites (3 Units)

Bioenergetics, purine and pyrimidine biosynthesis, amino acid metabolism and membrane biology parasitic protozoa and helminths. Nutritional requirements of parasites. Sub-cellular organization of metabolic pathways. Cultivation of parasites in vitro.

ZOO 707 – Techniques in Animal Physiology (3 Units)

Methods and objectives of photometric analysis: Reduction and oxidation, usual comparison, Instrumental techniques, Spectrophotometer, colour and absorption spectra, nephelometry and turbidimetry

Spectrophotometry: Absorption laws, absorption of light by coloured solution (Beer's law), optical density of solutions, relationship between light absorption and concentration, deviations from Beer's law, Instrumental Deviation, Deviations due to the nature of the sample, Spectrophotometers

The Preparation of Enzyme Extracts: Gut tissue, Tissue homogenates, Dialysis

Analysis of Protein: Estimation of extractable proteins in the different gut regions of animals. Separation of protein by chromatography, Different types of matrices that are commercially available. Partition, affinity, Gel, ion-exchange and absorption chromatography

Electrophoresis: amino acids proteins

Cathode Ray Oscilloscope: Various modes of oscilloscope, Calibration and use of the oscilloscope

Management of Rats and Mice in the Laboratory

ZOO 708 – Animal Hormones (3 Units)

Endocrine glands: Endocrine activity, Histological method and limitations

Hormones – definition and history of hormonal studies, Classification of invertebrate and vertebrate hormones, Regulation of hormones production and action, Stimulus – receptor coupling. Hormone receptors, Mediators of hormonal effectors/concept of secondary messengers. Hormones in metabolism growth and reproductions. Reproduction and morphogenesis. The hypothalamus – pituitary – gonadal axis. Production of hormones and the activities of the ovary and the testicles. Reproduction Cyclicity – Ovarian cycles, seasonal cycles, Pregnancy, Progesterone – binding proteins. Hormones and Colour Change: Physiological and morphological colour change.

Hormone Assay: Cytochemical bioassays. Dose – response relationships. Hormones and energy metabolism. Hormonal mechanisms during exercise

ZOO 709 – Physiology of digestion (3 Units)

The variety of alimentary systems, Introduction and the evolution of the alimentary systems

Animal Feeding Mechanisms: mechanisms for dealing with small particles, mechanisms for dealing with large particles of masses, mechanisms for taking in fluids or soft tissues, mechanisms for absorbing food through the general body surface

Alimentary System: the receiving portion of the alimentary system, the conducting and storage region of the alimentary system, the digestive regions of the alimentary system, Intestinal Symbionts, The region of water absorption and faeces formations

Gut Motility: Introduction/General structure of alimentary tract, Nervous system of the gut-main divisions, the reflex action, sympathetic system parasympathetic system, visceral afferent innervations.

Structure and electrophysiology of smooth muscle: Oesophagus – Swallowing and control, Stomach Monogastric/Digastric, movements and control, Small intestine: movement and control, Large intestine and rectum: movements and defecation

Enzyme: factor affecting enzyme activity, Determination of V and K_m and their significance, Irreversible and reversible inhibitors, the pancreas and bile: Secretion and Control.

ZOO 710 – Physiology of Excitable Tissues (3 Units)

Neural Organisation in invertebrate and vertebrates: Nervous tissue, Organisation, History and physiology, Central and Peripheral nerves, Brain and the Cranial nerves, Sensory and Special senses, The propagation and transmission of nerve impulses, Disorders: Homeostatic imbalances. Nervous integration and neural control of muscle function. The mechanics and biochemical basis of muscle contraction. Muscle tissues: types, characteristics and function. Physiology: energy and all or none principle. The comparative physiology of muscle, cilia and flagella

ZOO 711 – Physiology and Environment (3 Units)

Types of environment, environmental factors and effect on organisms, physiological adaptation of animals to their environment. Responses of animals to polluted environment. Food selection and feed behaviour. Dormancy and migration.

Migration: Introduction/migration in different animals. Causes, stimulation and mode of migration. Advantages and physiology of migration

Biological Rhythms

Pollution: Air and water pollution – Pollutants and their sources. Effects of man, plants and materials. Techniques for combating pollution. Greenhouse effect, Stress management

ZOO 712 – Insect Physiology and Biochemistry (3 Units)

Energy Metabolism: Supply of oxygen to tissues, ventilation during rest and flight. Respiration in aquatic insects. Pathways for the utilization of fuels in insect flight muscle. Oxidation of carbohydrate, protein and fatty acid. Maintenance of the metabolic fuel supply.

Transporting Tissues: Epithelial function, the gut – Nutrition, digestion, absorption and the salivary gland. Excretory system: Malpighian tubule functioning and structural organisation, the hindgut and rectum, Cryptonephridial system. Water balance – terrestrial insects, aquatic insects. Cuticle – Permeability and absorption of water vapour.

Growth and development: growth and morphogenesis. Endocrine control of development. Adult growth and development. Hormonal control of diapause, insect growth regulators

Nervous and Sensory Systems: Nerve cells, organization and functioning, Synaptic transmission, Integration, Neurosecretion, Insecticides

Muscle and Movement: Muscle structure, innervation and the muscle-nerve synapse. Muscle functioning, muscle and locomotion

Behaviour: Neural basis of behaviour. Circulation rhythms in behaviour, Hormones and behaviour, learning, pheromones. Social behaviour and orientation behaviour

Interactions with the Environment: Problem of small size, Temperature effects. Migration, circulation rhythms, photoperiodism and diapause. Insect as a medium for the study of physiology

ZOO 714 – Physiology of Reproduction and Excretion (3 Units)

Evolution of reproduction, excretory and urogenital systems and the attendant modifications in activities. Structure, function and development of the male and female reproductive systems in animals. Mechanisms of reproductive survival in distress time. Structure and physiology of excretory system in different animal's fluid, electrolyte and Acid-base Dynamics. Basic mechanisms involved in the elimination of nitrogenous materials and the regulation of acid-base balance.

Water balance and Excretion: water in the environment, water loss – evaporation, integumentary water loss, respiratory water loss, water loss by excretion and ionic regulation. Relationship between reproductive and excretory system in animals.

ZOO 716 – Respiratory and circulatory Physiology (3 Units)

Structure, function and ventilation of respiratory surfaces Gas exchange: Physical properties of oxygen and carbon dioxide in water and air. Factor affecting diffusion of gases. Oxygen diffusion and solubility. Limitations of diffusion – strategies available to overcome. Properties of air and water as respiratory environments. Respiratory organs in animals and how they function. Respiratory physiology in unusual environments

Detailed studies of circulation in animals: Circulatory structures, Blood and tissues fluids – composition and activities, Malformation and malfunctioning of circulatory system. Homertation, Blood typing, the lymphatic system and immunity. Relationship between circulation and respiration in animals.

ZOO 721 – Insect Taxonomy (3 Units)

Principles of insect classification. Introduction to the characters used in identification of insects at various taxonomic levels. Techniques for collection and preservation of insects. Advances biosystematics. Numerical taxonomy, taxonomy literature

ZOO 723 – Insect Ecology (4 Units)

The effect of environmental factors on insects: temperature, relative humidity, rainfall, wind, other abiotic factors. Competition: intra specific competition, inter specific competition, animal association found in insects. Population ecology of insects: insect population dynamics, use of life tables in population models. Factors affecting insect distribution. Causes of population ecology to insect pest management.

ZOO 722 – Biology of non-insect arthropods (3 Units)

Biology of terrestrial non insect arthropods in tropical Africa: Spiders, ticks, mites, scorpions, centipede, millipede. Classification and economic importance of non-insect arthropods

ZOO 725 – Aquatic Entomology (3 Units)

The aquatic environment as a living medium for insects. Habitat selection, adaptations of aquatic insects. Life cycles of selected aquatic insects. Production turnover. Aquatic insects as indexes of pollution.

ZOO 726 – Insect Vectors (3 Units)

Concept of insect vectors. Types of insect vectors. The habitats of insect vectors, habits of insect vectors. Life cycles of selected insect vectors. Behaviour of insect vectors in the transmission and control of diseases. Control of insect vectors: biological control, chemical control, ecological control. Economic importance of insect vectors

ZOO 727 – Principles of Stored products Entomology (3 Units)

Insects in stored products, damage done by insects to stored products, damage assessment methods in stored products. The biology of stored products insects. Factors influencing populations of stored products insects. Several techniques for screening stored products for infestation. Methods of controlling stored product pests.

ZOO 728 – Biology of selected insect groups (3 Units)

Taxonomy and morphogenesis, habitats, dispersal and population changes. Food plants and feeding behaviour, utilisation of food and general metabolism. Circadian and other rhythms, locomotor activity flight. Sensory perception, sound production

Reproduction: embryonic and post embryonic development. Economic importance of grasshoppers especially in the tropics. Biological and chemical control of insects.

ZOO 729 – Principles and methods of insect pest management (3 units)

Insect pest problem. Ecological background to insect pest control, methods of control, integrated control concept in relation to single insect pest species, current problems in pest management, case studies on practice and principle of pest management in the tropic. Systems analysis and economic of pest management.

BCH 710 – General Biochemistry (4 Credits)

General introduction to enzymes. Regulation in metabolic pathways. Detection of rate – controlling enzymes. Molecular mechanisms in the regulation of enzyme activity. Metabolic compartmentation. Review of carbohydrate, protein, lipid and nucleic acid metabolism in plants and animals and their regulation. Interrelationship of metabolic pathways. Porphyrins biosynthesis and function of metaflorphyrin – protein complexes. Generation of ATP and reducing potential in photosynthesis, photo-respiration and the glycolate pathway. Nitrogen fixation Biochemistry of tropical economic plants. Tissue heterogeneity. Inter-compartmental cooperation in cellular processes. Compartmentation and integration of metabolic pathways. Current topic in biochemical regulation.

MCB 713 – Advanced Immunology and Immunochemistry (3 Units)

Immunoglobulins and antibody systems, antigens, antigen-antibody interactions, hypersensitivity as well as transplantation immunology; reproductive and tumour immunology; immunogenetics, immunology of parasitic infections.

BIOLOGICAL SCIENCES ACADEMIC STAFF LISTING

Name	Rank	Qualification	Area of Specialisation
Agboola, D. A	Professor	B.Sc. (Nigeria), M.Sc. PhD (Ilorin)	Plant Physiology
Kadiri, M	Professor	B.Sc. (Kano), M.Sc., PhD (Ibadan)	Plant Physiology
Mafiana, C. F	Professor	B.Sc. M.Sc. (Lagos) PhD (Benin)	Parasitology
Ayodele, M. S	Professor	B.Sc. (Ibadan) M.Sc. (Ilorin) M.Sc., PhD (Ife)	Cytogenetics/Systematics
Idowu, A. B	Reader	B.Sc. (Ado-Ekiti), M.Sc. PhD (Ibadan)	Animal Physiology
Oke, O. A		B.Sc. M.Sc., PhD (Ibadan)	Entomology
Adegbite, A. E		B.Sc. M.Sc., Ph.D. (Ife)	Genetics/Cytogenetics
Ekpo, U. F		B.Sc. (Calabar) M.Sc. (Ibadan) PhD (UNAAB)	Parasitology
Kehinde, I. A		B.Sc. M.Sc.Ph.D (Ibadan)	Plant Pathology
Sam-Wobo, S. O		B.Sc. M.Sc. PhD. (UNAAB)	Parasitology
Idowu, O. A		B.Sc. (Ibadan) M.Sc. (Lagos) PhD (UNAAB)	Parasitology

DEPARTMENT OF MICROBIOLOGY

MASTER OF SCIENCE (M.Sc.) PROGRAMMES IN MICROBIOLOGY

STRUCTURE

The programme consists of compulsory courses which shall be taken by all candidates', core courses in the candidate's area of specialization, elective courses which a candidate may take within and /or outside the Department as may be prescribed by the candidate's Supervisor/Dissertation Committee, Dissertation and Seminars.

The structure is summarized below:

Compulsory Courses	C -	8 Units
Core Courses	R -	13 Units
Electives	E -	3-4 Units
Project (MCB) 799	C -	6 Units

Minimum total for award of M.Sc. Degree - 30 Units

Compulsory Course	-	Unit	L	P
MCB 701 - Current Topics Seminar	-	2	2	-
BIO 703 - Biostatistics	-	3	3	-
CSC 701 - Use of Computer in Research	-	4	3	1

CORE COURSES FOR DIFFERENT AREAS OF SPECIALIZATION

Environmental Microbiology

Course Code	Course Title
CSC 701	Use of Computer in Research
BIO 703	Biostatistics
MCB 701	Current Topics Seminar
MCB 702	Advanced Aquatic Microbiology
MCB 703	Advanced General Microbiology
MCB 704	Petroleum Microbiology
MCB 705	Advanced Soil Microbiology
MCB 708	Advanced Microbial Physiology & Biochemistry
MCB 709	Advanced Food Microbiology
BIO 702	Research Techniques
or	or
EMT 703	Environmental Impact Assessment
or	or
EMT 706	Waste Management Control

Food and Industrial Microbiology

Course Code	Course Title
CSC 701	Use of Computer in Research
BIO 703	Biostatistics
MCB 701	Current Topics Seminar
MCB 703	Advanced General Microbiology
MCB 706	Advanced Industrial Microbiology
MCB 707	Fermentation Techniques
MCB 708	Advanced Microbial Physiology & Biochemistry
MCB 709	Advanced Food Microbiology
MCB 716	Advanced Bacteriology
BIO 702	Research Techniques
or	or
MCB 718	Brewing Science

Medical Microbiology & Public Health

CSC 701	Use of Computer in Research
BIO 703	Biostatistics
MCB 701	Current Topics Seminar
MCB 703	Advanced General Microbiology
MCB 708	Advanced Microbial Physiology & Biochemistry
MCB 710	Advanced Virology
MCB 716	Advanced Bacteriology
MCB 712	Advanced Mycology
MCB 713	Advanced Immunology & Immuno-Chemistry
ZOO 703	Diseases caused by Helminths
or	or
ZOO 704	Diseases caused by Protozoa
or	or
BIO 702	Research Techniques

Agricultural Microbiology & Biotechnology

CSC 701	Use of Computer in Research
BIO 703	Biostatistics
MCB 701	Current Topics Seminar
MCB 702	Advanced Aquatic Microbiology
MCB 703	Advanced General Microbiology
MCB 704	Petroleum Microbiology
MCB 705	Advanced Soil Microbiology
MCB 708	Advanced Microbial Physiology & Biochemistry
MCB 715	Epidemiology of Plant Diseases
MCB 714	Advanced Microbial Ecology
BIO 702	Research Techniques

Ph.D (MICROBIOLOGY)

These shall normally be research culminating in a Dissertation/Thesis in any of the special areas of Microbiology.

STRUCTURE

In addition to the Dissertation/Thesis, a candidate may be required to register for one taught courses at Postgraduate Level (Listed under M.Sc. Degree Programme) or any other as may be prescribed by the Supervisor(s) or Committee

DESCRIPTION OF POSTGRADUATE COURSES IN MICROBIOLOGY

MCB 701 - Current Topics Seminar (2 Units)

Literature on specific current topics to be reviewed by students and graded by two or three competent academic staff in the area of study.

MCB 702 – Advanced Aquatic Microbiology (3 Units)

Types and uses of water, Different types of aquatic microorganisms, Importance of aquatic microbiology, Microbiological and Physicochemical studies of surface and ground waters, Microbiology of domestic water sewage, Water borne diseases, Microbial analysis of water, Water treatment, Microbial aspects of waste management.

MCB 703 – Advanced General Microbiology (4 Units)

Advanced topics in microbial systematics, Microbial cells, morphology and structure. Modern methods of classification of microorganisms. Microbial Metabolism. Microorganisms in various ecosystems, Origin and evolution of genetic code, Genetic recombination, transformation, transduction conjugation and plasmids. Current techniques in molecular genetics (Genetic engineering in microorganisms – gene cloning, and applications, PCR).

MCB 704 – Petroleum microbiology (3 Units)

Microbial aspects of genesis of petroleum. Microbial indicators of prospection. Tertiary recovery of oil by means of microorganisms. Microbial degradation of petroleum products. Use of microorganisms in oil clean up operations. Biodegradation of petroleum and Xenobiotics microbial leaching. Microorganisms in abatement of heavy metal pollution. Role of microorganisms in corrosion.

MCB 705 – Advanced Soil Microbiology (3 Units)

Soil as a habitat for microorganisms. General description of different soil types. Biogeochemical cycle (N₂ cycle, S cycle, C cycle, mineral transformation). Factors affecting microbial community in soil organic matter dynamics in soil. Microbial interactions (microbes and microbe interactions. Plant and microbe interactions). Soil environmental ecological interrelationships. Transformation of hydrocarbons, pesticides and herbicides. Methods of isolation and estimation of activity of soil microorganisms.

MCB706 - Advanced Industrial Microbiology (3 Units)

Natural and chemically enhanced microbial products, Development and production of diagnostic, assays, Role of microbial genetics in industrial microbiology, Industrial application of enzymes, Screening of new microorganisms for industrial purposes, Applications of organic chemicals in industries (acetone, methanol, butanol and ethanol), role of microorganisms in the degradation and transformation of chemicals in the environment, Cellulosic substrates and their breakdown, Quality control of industrial products.

MCB 707 – Fermentation Technology (3 Units)

Principles of fermentation, Fermentation techniques, Fermentors and Fermentors design, Continuous and batch system, Process cultivation and formulation of bi-products from microorganisms, Biomass production, Identification of potential industrial microorganisms, Starter culture techniques, Fermentation kinetics, Critical study of traditional fermentation processes, Element of biochemical engineering, Safety issues of fermented products.

MCB 708 - Advanced Microbial Physiology and Biochemistry (3 Units)

Diversity, metabolism, energetics and physiology of microorganisms, Forms of cell structures, Varieties of energy metabolic regulation and differentiation at the prokaryotic level, Macromolecules of their biosynthesis, DNA replication, Enzymology directionality and control, Initiation, propagation and elimination of RNA synthesis, Techniques of analysis of metabolism and molecular structure, Genetic recombination, Polarity and molarity suppression, Transistor control.

MCB 709 - Advanced Food Microbiology (3 Units)

Biochemistry of specific foods (Structure and performance of food materials), Application of molecular techniques in food analysis, Microbiological quality control in food industry, Sensory evaluation and technique, Microbiological safety of foods (Indices of food quality and microbial standards, The principles and applications of HACCP, Food borne microorganisms of public health significance, The applicability, Advantages and Limitations of a number of rapid methods for the detection and enumeration of food borne microflora, Methods of food preservation, Use of enzymes in food industries.

MCB 710 - Advanced Virology (3 Units)

Detailed of the classification and structural characterization, pathogenesis and pathology, epidemiology and control of viruses, which are agents of disease in man, animals and plants.

MCB 711 - Advanced Bacteriology (3 Units)

Detailed aspects of classification and morphological characterization, pathogenesis and pathology, diagnosis and epidemiology and control of bacteria diseases of plants, animals and man. Bacterial genetics (Plasmids, cloning etc.)

MCB 712 – Advanced Mycology (3Units)

Details of classification morphology characterization, pathogenesis and pathology, diagnosis, epidemiology and control of fungi, which are agents of diseases in man, animals and plants.

MCB 713 - Advanced Immunology and Immuno-chemistry (3 Units)

This course gives a detail treatise on immunoglobulins and antibody systems, antigens, antigen-antibody interactions, hypersensitivity as well as transplantation immunology; reproductive and tumor immunology; immunogenetics, immunology of parasitic infections.

MCB 714 – Advanced Microbial Ecology (3 Units)

Ecological principles and methods. Concepts of ecosystems and problems caused by humans. Energy cycles in ecological systems. Microorganisms in extreme environments.

MCB 715 - Epidemiology of Plant Diseases (3Units)

Topics covered are: Assessment of plant disease loss, sources and perennation of pathogens, microclimate and plant diseases, epiphytotics, ecology of seed-borne and folial pathogens. Epiphytotics in plant populations. Physiology and biochemistry of plant parasitic disease, pre and post penetration interaction of pathogen and host, phytoalexins; phytotoxins and cell wall degrading enzymes and growth substances produced during pathogenesis.

MCB 718 Brewing Science (3 Units)

Use of water in brewery, effects of specific ions and water purification, malting and shing to include a study of barley, its chemical composition, the malting process, milling and mashing; adjuncts, hops and wort treatment. Fermentation techniques, traditional fermentation of aicohol beverages and methods of up-grading them

ZOO 703 – Diseases Caused by Helminths (3 Units)

Aetiology, epidemiology and methods of control of diseases of man, animals and plants caused by Nematodes, Cestodes and Trematodes, Epidemiological models of important helminth infection such as fascioliasis, ancylostomiasis, and taeniais, field techniques of diagnosis.

ZOO 704 – Diseases Caused by Protozoa (3 Units)

Parasitic diseases caused by Protozoa and transmitted by insects, aetiology, epidemiology and control. Global situation of malaria and typanosomiasis. Parasitic diseases caused by protozoa and transmitted by ticks and mites, aetiology, epidemiology and contract. Protozoa transmitted by resistant cysts. Field techniques of diagnosis.

AREAS OF SPECIALISATION AT Ph.D LEVEL

Environmental Microbiology
Food and Industrial Microbiology
Medical Microbiology and Public Health
Agricultural Microbiology

ACADEMIC STAFF LIST

Name	Rank	Qualification	Area of Specialisation
M.O. Bankole	Professor	B.Sc., M.Sc., Ph.D. (ABU)	Food & Industrial Microbiology/Biotechnology
Akpan, I	Professor	B.Sc.Calabar, M.Sc., PhD. (Benin)	Food & Industrial Microbiology/Biotechnology
Popoola, T. O. S	Professor	B.Sc.,M.Sc.(Jos), Ph.D.(Reading), MIBiol., MNIM.	Applied Microbiology
Oluwatoyin R. A.	Senior Lecturer	B.Sc.Ilorin, M.Sc., Ph.D Ibadan	Food & Industrial Microbiology/Biotechnology
Ojo, D. A	Senior Lecturer	B.Sc (Wisconsin) MT (ASCP) (Iowa), M.Sc (Minnesota), Ph.D (UNAAAB)	Parasitology & Medical Microbiology
Akintokun, A. K		B.Sc., (Ibadan), M.Sc., Ph.D. (Ibadan)	Soil and Environmental Microbiology
Edema, M. O		B.Sc. (Ago-Iwoye) M.Sc., Ph.D(Ibadan)	Food & Applied Microbiology/Biotechnology
Oluwafemi, F. O		B.Sc. (Benin), M.Sc(Ibadan) Ph.D(Benin)	Microbiology & Food Biotechnology
Olaitan, J. A		B.Sc (LASU); M.Sc., Ph.D(Ibadan)	Environmental & Agricultural/Biotechnology

DEPARTMENT OF CHEMISTRY

M.Sc. INDUSTRIAL CHEMISTRY

1. INTRODUCTION

Chemical process industry, by its very nature, is a complex operation which requires highly trained personnel, and chemists occupy a very central position for such operation. Education in the traditional areas of chemistry is not always adequate to meet the challenges which usually confront chemists in the industry necessitating a regime of retraining programmes. The voids which are created in the relationship between chemistry and industry can be filled however by a carefully designed programme in industrial chemistry with the objective to train chemists for a broad-based knowledge of industrial processes, process economics and materials. The programme is therefore composite in form and intensive in scope requiring a sound knowledge of the physical, chemical and biological sciences at the undergraduate level.

2. PHILOSOPHY AND OBJECTIVE

The programme is designed to provide a broad based knowledge of industrial processes, process economics and materials in order to train chemists for industry and, for research and development. It is intended to foster professionalism in the theory and practice of chemistry and to promote self-reliance within the framework of the objectives set for the universities of Agriculture.

3. SCOPE OF PROGRAMME

The programme is two-phase, namely, a course work and a research project which must be presented in the form of a thesis.

4. ENTRY REQUIREMENT

A candidate for M.Sc. Industrial Chemistry must have a B.Sc (Hons) degree, First or Second Class Upper Division in Chemistry or Biochemistry, or B. Eng. in Chemical Engineering. In exceptional cases, candidates with Second Class (Hons) degree, Lower Division may be considered.

5. AREA(S) OF SPECIALIZATION

Industrial Chemistry.

6. COURSE DURATION

Full time course shall run for a minimum of four semesters. For the first year, the minimum number of course units for full-time students shall be twelve per semester and maximum of twenty per semester. Minimum number of units for graduation is 30.

7. COURSE OUTLINE

FIRST SEMESTER

Course Code	Course Title	Units
*CHM 727	Homogeneous & Heterogeneous Catalysis	2
CHM 745	Industrial Chemical Processes III	2
CHM 749	Polymer Science	2
CHM 751	Industrial Chemical Laboratory	1
CHM 753	Paint & Varnish	2
*CHM 767	Oil Refining Processes	2
Electives	Minimum	3
		14

Electives

Course Code	Course Title	Units
*CHM 701	Classical Methods of Analysis	
*CHM 743	Statistical Thermodynamics	
*CHM 747	Industrial Free Radical Chemistry	
CHM 765	Safety and Hazards	
EMT 703	Environmental Impact Assessment And Auditing	
		13

* Approved Course

M.Sc. Industrial Chemistry

SECOND SEMESTER

Course Code	Course Title	Units
CHM 746	Industrial Chemical Processes IV	
CHM 748	Polymer Technology	
CHM 750	Environmental Chemistry	
CHM 752	Polymer Characterization	
CHM 754	Industrial Chemical Laboratory	
CHM 756	New Product Development & Industrial Economics	
CHM 762	Heat Exchangers, & Unit Operations in Chemical Engineering	
Electives	Minimum	
		15

*CHM 796 - Research Project - 6

Electives

Course Code	Course Title	Units
*CHM 708	Quantitative Spectroscopic Methods of Analysis	
CHM 764	Petroleum Geochemistry	
CHM 768	Microbiological Chemistry	
CHM 773	Textile fibres	
		14

* Approved Course

8. COURSE DESCRIPTION

CHM 701 Classical Methods of Analysis (4 Units)

Precipitation and gravimetric analysis, stability, solution equilibria (the degree of completion of an analytical reaction). Masking and demasking agents. Precipitation titration, their theory and techniques, complexometric titration theory, titration curves. Types of EDTA titration, its application, metal ion indicators, Analytical data processing.

CHM 708 Quantitative Spectroscopic Methods of Analysis (3 Units)

Analytical Spectroscopy for molecular species covering topics of ultraviolet and visible absorption and emission, infrared spectroscopy. A knowledge of basic principle is assumed, the main emphasis being on the use of modern instrumentation for the solution of analytical problems and development of new analytical methods.

CHM 727 Homogeneous and Heterogeneous Catalysis (2 Unit)

Principles of homogeneous and heterogeneous catalysis, parameters important in determining catalytic activity, surfaces and surface catalysis, industrially important catalytic processes, modern techniques for characterizing catalysts. Design of homogenous and heterogeneous catalytic reaction systems, plug-flow reactors and continuous stirred reactors.

CHM 743 Statistical Thermodynamics (3 Units)

General theory, quantum and classical thermodynamics with application to the theories of solids, liquids and gases, chemical equilibrium, kinetic theory, relaxation and reaction of non-equilibrium system.

CHM 745 Industrial Chemical Processes III (2 Units)

Introduction: General considerations; economics of organic chemical industry; project assessment, feed stock evaluation; vertical integration; basic raw materials for organic chemical manufacture, Industrial processes based on synthesis gas; ammonia, based on methane; Industrial processes based on acetylene; Industrial processes based on ethylene; Industrial processes based on C4 Hydrocarbons. Industrial processes based on aromatic hydrocarbon: Styrene, cyclohexane, phenol, mono-chlorobenzene, maleic anhydride, nitrobenzene and their derivatives; resorcinol, benzene hexachloride, toluene, xylenes, naphthalene and their derivatives. Other industrial organic chemical processes; petroleum waxes; (detergent raw materials); carbon black; aerosols, cyclopentadiene and their derivatives petroleum resins, naphthenic acids; hydrogen sulphide and its derivatives.

CHM 746: Industrial Chemical Processes IV (2 Units),

Chemical details of some of industries in groups (a) to (d)

- (a) Heavy chemicals and their allied products, sulphuric acid, nitric acid; alkali products, washing soda, caustic soda, Chlorine production and chlorine products; electrochemical industries
- (b) Refractories and allied products. Cement, glass, ceramics, heat resistant materials.
- (c) Heavy industries: iron and steel, fertilizers, textiles, pulp and paper and coal.
- (d) Light industries: Leather, and pigments; pesticides and herbicides; plastics etc.

CHM 747: Industrial Free Radical Chemistry (2 Units)

Halogenation of alkanes, general principles of chlorination and bromination. Chlorination with hypochlorites, allylic chlorination and N-bromosuccinimide bromination. Sulphochlorination of alkanes. Nitration of alkanes including photonitrosation and chloronitrosation, Auto-oxidation, reactions of hypoperoxides and methods of formation in auto-oxidation reaction. Industrial applications of auto-oxidation of alkanes, olefines and alkylbenzenes. The action of auto-oxidation. Radical addition to olefines, sulphur, oxygen and nitrogen compounds. Factors which affect the rate and stereochemistry.

CHM 748: Polymer Technology (2 units)

Large scale industrial polymerization processes. Polymer processing: injection, extrusion, compression and transfer moulding of thermoplastics: Polymer additives, polymer surface coatings and adhesives.

CHM 749: Polymer Science (2 Units)

Reactivity of functional groups. Kinetics of polycondensation reactions. Example of Polycondensations reactions. Polyesters, polyamides, urea – formaldehyde and phenol-formaldehyde polymers. Chain polymerization reactions. Types of initiators, bulk, solution, suspension and emulsion polymerization, molecular weight and

molecular weight distribution. Physical properties of polymers. Molecular theory of viscoelasticity. The glassy state and glass transition, creep and stress relaxation behaviour of polymers. Theory of rubber elasticity.

CHM 750: Environmental Chemistry (2 Units)

Structure terminologies and methods of investigation in environmental studies. The main sources, Chemistry and methods of measurement of pollutants. Land pollution:- Concepts of advanced waste treatment, pesticides residues; Nuclear waste occurrence and disposal.

Water Pollution:- Types and quantities of effluents. Biological effects of water pollution. Effects of refractory contaminants, radio nuclides etc.

Air pollution:- Health hazards associated with aeronomic pollutants. Air pollutions problems in Nigeria and quality criteria.

CHM 751: Industrial Chemical Laboratory I (1 Unit)

Chemical laboratories designed to elucidate industrial chemical processes. Experiments on polymer characterization, polymer solutions and chain co polymerization reactions.

CHM 752: Polymer Characterization (2 Units)

End group analysis. Fractionation of polymer: Gel permeation chromatography. Viscometric methods in polymer characterization. Thermal analysis of polymer, thermogravimetry, Differential scanning calorimetry. Light scattering.

CHM 753: Paint & Varnishes (2 Units)

Principles, lacquers, emulsion paints and non-aqueous dispersions. Oil and alkyd paints. Thermosetting alkyd, polyester and acrylic paints based on nitrogen resins. Epoxy coatings, solvents, paint additives. Chemical treatment of substrates.

CHM 754: Industrial Chemical Laboratory II (1 Unit)

Laboratory techniques based on atomic and molecular spectroscopy. Techniques on industrial chemical processes.

CHM 756: New Product Development and Industrial Economics (2 Units).

Industrial research and development, organization, chemical intermediates, patents, technology licensing, project selection, new product development, new products, elements of cost, materialism, energy and labour, variable and fixed costs, overheads, marginal costs, contribution, profitability, Process integration, capital cost estimation, dependence on process and scale of operation, contracts, pricing of new products, the measurement of performance, value added, assets, cash flow, project evaluation, payback time, sensitivity and risk analysis, standards of profitability, dealing with inflation.

CHM 762: Heat Exchangers & Unit Operations in Chemical Engineering (2 Units)

Boilers, energy and energy conservation, concepts of unit operations, heat and mass balances, distillation, extraction, drying, crushing, grinding, absorption, cooling. Evaporation, boiling and condensation and equipment theory.

CHM 764: Petroleum Geochemistry (2 Units)

Origin and chemical transformation of sedimentary organic matter in the formation of petroleum and other fossil energy resources. Isolation and identification of biological markers (chemical fossil) utility of biological markers in oil exploration.

CHM 765: Safety and Hazards (2 Units)

General hazards in the industry, methods for minimizing risk, safety in chemical process, plant design and operation, chemical safety in research & development, employee responsibility, identification and assessment of hazards, environmental considerations in chemical industry, effluent treatment and pollution control.

CHM 767: Oil Refining Processes (2 Unit)

Crude oils, distillation processes, catalytic reforming and isomerization, hydrocracking and treatment processes, catalytic cracking and desulphurisation, lubricating oil production, product quality, motor gasoline refinery schemes.

CHM 768: Microbiological Chemistry (2 Units)

Isolation, culture and growth of micro organisms. Microbial metabolites. Also stereospecific and chirally-specific biochemical transformations using micro organisms.

CHM 772: Textile Fibres (2 Units)

General properties, cotton and the chemistry of cellulose, multicellular vegetable fibres, animal fibres, regenerated man-made fibres, synthetic fibres, manufacturing processes.

EMT 703: Environmental Impact Assessment and Auditing (2 Unit)

Introduction and principles of environmental impact assessment, origins and development, environmental impact assessment and auditing processes, impact prediction, evaluation and mitigation, monitoring and auditing, environmental impact assessment of development projects, e.g. new settlements, road network, electricity generation, etc. Improving the effectiveness of project assessment.

M.SC. IN ANALYTICAL CHEMISTRY

STRUCTURE

Compulsory Course	4
Core courses	16
project	6
Seminar	2
Electives	9
Total	37

M.SC. IN INORGANIC, ORGANIC, PHYSICAL AND INDUSTRIAL CHEMISTRY

STRUCTURE

Compulsory Course	4
Core Courses	16
Project	4
Seminar	2
Electives	9
Total	37

Course Code	Course Title	Units
	Compulsory	
CSC 701	Use in Computer in research	4
	Core Courser	
CHM701	Classical Methods of analysis	4
CHM 702	Advanced Techniques in Analytical Chemistry	2
CHM 703	Separation methods of analysis	3
CHM 704	Electroanalytical Methods	3
CHM 705	Quantitative Spectroscopic method of analysis	3
CHM 707	Analytical/Environmental Toxicology	3
CHM 796	Project	6
CHM 799	Seminar	2
		30
	Electives	
CHM 706	Applied Spectroscopy	3
CHM 709	Methods of Theoretical Chemistry	3
CHM 796	Laboratory Procedure and Techniques	1
NUT 707	Food Analysis	3
CHM 710	Water Analysis	3
CHM 712	Air Analysis	3
CHM 714	Soil and Rock Analysis	3
		19

PH.D CHEMISTRY

This is basically a research degree. The programme would be concerned mostly with research in the field of Chemistry.

STRUCTURE

Candidates may be required to take some courses depending on their background. Emphasis will however be on the research thesis.

Inorganic

Course Code	Course Title	Units
	Core	
CHM 703	Separation Method of Analysis	3
CHM 732	Recent Advances in Co-ordination Chemistry	3
CHM 734	Organometallic Chemistry	3
CHM 735	Inorganic & Organometallic Reaction	3
CHM 736	Mechanism	3
CHM 791	Bio-inorganic Chemistry Exptl. Techniques in Inog. Chem	1
		16
	Electives	
CHM 743	Statistical Thermodynamics	3
CHM 744	Symmetry and Group Theory	3
CHM 765	Advanced Natural Products Chemistry	3
CHM 770	Advanced Applied Spectroscopy	3
CHM 727	Heterogeneous and Homogeneous Catalysis	3
CHM 777	Process Synthesis	3
		18

Organic

Course Code	Course Title	Units
	Core	
CHM 703	Separation Method of Analysis	3
CHM 760	Reaction Mechanisms in Org. Chemistry	3
CHM 765	Advanced Natural Products Chemistry	3
CHM 766	Synthetic Methods in Org, Chemistry	3
CHM 793	Exptl. Techniques in Org. Chemistry	3
		15
	Electives	
CHM 743	Statistical Thermodynamics	3
CHM 732	Recent Advances in Co-ordination Chemistry	3
CHM 727	Heterogeneous and Homogeneous Catalysis	3
CHM 767	Oil refining	3
CHM 736	Bio-inorganic Chemistry	2
CHM 777	Process Synthesis	3
		18

Physical

Course Code	Course Title	Units
	Core	
CHM 703	Separation Method of analysis	3
CHM 743	Statistical Thermodynamics	3
CHM 744	Symmetry and group theory	3
CHM 755	Chemical Bonding	3
CHM 758	Chemical Kinetics	3
CHM 791	Experimental Technical in Inorganic Chemistry	1
		16
	Electives	
CHM 743	Statistical Thermodynamics	3
CHM 732	Recent Advances in Co-ordination Chemistry	3
CHM 736	Advanced Natural Products	3
CHM 765	Advanced Applied Spectroscopy	3
CHM 744	Asymmetry and Group Theory	3
		18

Areas of Specialisation

The area are:

Analytical Chemistry

Environmental Chemistry

Organic Chemistry

Physical Chemistry

Inorganic Chemistry

SYNOPSIS OF COURSES – U-L-P

CHM 701 – Classical methods of Analysis – 431

Reaction Chemistry of selected elements, analytical data processing titrimetry, gravimetry.

CHM 702 – Advanced Techniques in Analytical Chemistry – 211

X-ray methods, neutron activation and radiochemical techniques, enzymatic and kinetic methods, automated and process analysers.

CHM 706 – Applied Spectoroscopy – 431

Basic instrumentation techniques. Application of UV, i.r.,n.m.r and m.s in chemical analysis and structural elucidation, emphasis should be on n.m.r, m.s. High resolution ¹³C and other nuclei, shift reagents and other new experimental methods should be discussed. All of structure and fragmentation, chemical ionization field disorption field disorption, recent application of linked-sean in ms.

CHM 704 – Electroanalytical Metods – 211

Voltametry, electrogravimetry, coulometry. Polarography, amiperometry, conductivity.

CHM 709– Methods of Theoretical Chemistry – 44

Methods of mathematical analysis of interest to chemistry's including elements of computer science and its application problems such as error analysis, matrix calculations, numerical solution to differential equations.

CHM 707 – Food Analysis – 211

Quality parameters for various uses (industry agriculture and domestic). Uses of water. Methods of analysis of water for various quality parameters, water pollution control and water treatment.

CHM 712 – Air Analysis ULP – 211

Chemistry of the lower atmosphere. Air pollution. Methods of analysis of air for various parameters.

CHM 714 – Soil and Rock Analysis – 211

Particle size analysis: analysis of soil for organic matter micro and macronutrients. Chemistry and Geochemical materials classical methods in Rock analysis and analysis of metallurgical materials, modern destructive and non-destructive methods of analysis of geochemical and metallurgical materials.

CHM 732 – Advances in Co-ordination Chemistry – 44

Synthetic pathways; Bonding structural stereochemical aspects; complex structures and site preferences from regular symmetry, electronic spectra, magneo-chemistry.

CHM 734 – Organometallic Chemistry – 44

Synthesis, structure and reactivity in transition metal compounds. Metal carbonyls, arenes, aryls-cyclopentadienyls etc. Techniques employed in characterisation of organometallic e.g. i.r., n.m.r., f.d. X-ray, neutron organometallic as novel routes of otherwise inaccessible derivatives of medicinal and commercial interests.

CHM 735 – Inorganic and Organometallic Reaction Mechanism – 44

A mechanistic survey of inorganic and organometallic reactions. Derivation and simple and complex rate expressions and application of Pre-Equilibrium and steady state approximations to reaction intermediaries. Techniques employed in the investigation of reaction mechanisms and some difficulties encountered in mechanistic interpretations.

CHM 743 – Statistical Thermodynamics – 44

General theory and quantum and classical thermodynamics with application to the theories of solid, liquids and gases, chemical equilibrium, kinetic theory relaxation and reaction of non-equilibrium system.

CHM 744 – Symmetry and Group Theory – 44

Symmetry operations, groups, point groups, space groups character tables, reducible and irreducible representations and direct products. Application to problems in chemistry with special reference to electronic and vibrational spectroscopy crystal field theory, construction of molecular-orbitals, molecular crystals, Woodward-Hoffman rule and hybridization.

CHM 736 – Bioinorganic Chemistry – 22

A detailed review of the role of transition, non-transition elements in naturally occurring compounds such as haemoglobin, vitamin B12, Cytochrome C, Chlorophyll etc.

CHM 765 – Advanced Natural Products Chemistry – 44

Selected topics in natural-biosynthesis and chemistry of heterocyclic and marine natural products. Insect Chemistry.

CHM 766 – Methods in Organic Chemistry – 331

Important as well as new synthetic methods of elaborating important functional groups e.g. alkanes, alkynes, halides alcohol, intro compounds, amines, carbonyl and carboxyl group and nitrates. Ring synthesis and the use of protective groups in synthesis. Also asymmetric synthesis.

CHM 755 – Chemical Bonding – 44

General treatment on bonding in Organic and Inorganic compounds. Inorganic bonding and structure. Covalent bonding: Intermediate nature of bonds and factors affecting it. Weaker binding forces.

CHM 758 – Chemical Kinetics – 44

Aromatic Nucleophilic and Electrophilic substitution. Nucleophilic substitution – detailed mechanisms of catalysed and uncatalysed pathways. The ortho para ratio. Electrophilic: IP SO substitution. Diffusion controlled attack. Encounter, complexes-orientation, reactivity – selective, additivity of substituent effects. Acid Base properties in non-aqueous solution. Concepts of Acid-Base behaviour bronsted classification of solvents. Acid-Based in amphiprotic media. Solvent effects of proton activity interaction in Dipolar Aprotic solvents, acetone, DMF, DMSO, Acetonitrile Possible Gas phase versus solution acidities.

CHM 770 – Advanced Applied Spectroscopy – 431

Basic instrumentation and techniques. Applications of u.v., i.r., n.m.r. and m.s. in chemical analysis and structural elucidation. Emphasis will be on n.m.r., m.s. and c.m.s. High resolution, n.m.r. ¹³C and other nuclei; shift reagents and other new experimental methods will be discussed. All ion structure and fragmentation, chemical ionization, field desorption, recent application of linked scan techniques in m.s.

CHM 791 – Experimental Techniques in Organic Chemistry 1 – 1

CHM 793 - Experimental techniques in Organic Chemistry 1 – 1

CHM 796 - Project – 6

CHM 727 – Heterogeneous and Homogeneous catalysis

Activity, patterns, selectivity, efficiency of catalyst effect of temperature. Pulse micro-reactors. Catalysis, Hydrogenation olefin oxidation, carboxylation, Oligomerisation and dimerisation.

CHM 747 – Industrial Free radical chemistry – 33

Halogenation of alkanes-general principles of chlorination and bromination. Chlorination with hypochlorites, alkalic chlorination and N-bromosuccinimide bromination. Sulphochlorination of Alkanes. Nitration of Alkanes-including photolnitrosation and chloronitrosation and chloronitrosation.

Autoxidation-Reaction of hydroperoxide and methods of formation in autoxidation reaction. Industrial applications of the autoxidation of alkanes, olefins and alkylbenzenes. The action of autoxidation. Radical addition to the olefin CH₂X, CHX, CHX, Sulphur, oxygen and nitrogen, compounds, factors which effect the rate and stereochemistry.

CHM 767 – Oil Refining – 33

Crude oils, Distillation processes, catalytic reforming and isomerisation, Hydrocracking and treatment process, catalytic, cracking and desulphurisation, lubricating oil production, product quality, motor gasoline refinery schemes.

CHM 777 – Process Synthesis

Engineering of process systems large scale, low cost processing. Pattern of discovery, strategy of molecule synthesis. Engineering data on reaction paths, reaction paths with recycle, style synthesis of material flow.

Alternative Allocations Separation of solids from solids, exploiting volatility and Differences. Separation load, Selection separation phenomena, excursions from ambient conditions energy balance, Sensible Heat effects, Heat of chemical reactions, Heat Energy management.

LIST OF POSTGRADUATE TEACHERS

Name	Rank	Qualification	Area of Specialisation
Eromosele, I. C	Professor	B.Sc (Ib), M.Sc (Manchester), Ph.D (Dublin), Ficcon	Polymer Chemistry
Bamiro, F. O	Professor	B.Sc (Lagos), M.Sc(Manchester), Ph.D(stratchclyde), MIRSC, C. Chem. (Glasgow)	Analytical/Organic Chemistry
*Ojo, I.A.O	Professor	B.Sc, M.Sc, Ph.D	Inorganic and Pesticide Chemistry
C. O. Eromosele	Professor	B.Sc (Benin), M.Sc (Manchester), Ph.D (Benin)	Industrial Chemistry
Odukoya, O. O	Reader	B. Sc, M.Sc, Ph.D (Ib)	Analytical Chemistry
J. T. Bamgbose	Senior Lecturer	B.Sc, M.Sc, Ph.D (Ib)	Biophysical Chemistry
Dare, E. O	Senior Lecturer	B. Sc, M. Sc., Ph.D (Ilorin) Ad. Res. P. Dip. Chemical Eng. (Tokyo)	Material Chemistry
Akinlabi, A. K. B	Lecturer I	Ed (Lagos) M.Sc (Benin), M.Eng (London), Ph.D (Benin)	

***Associate Lecturer**

DEPARTMENT OF BIOCHEMISTRY

M.SC./PH.D BIOCHEMISTRY

SCHEDULE OF COURSES

All courses shall be registered for according to the established University regulations.

Course Code	Course Title	Units
	Core Courses	
BCH 710	General Biochemistry	4
BCH 711	Methods of Biochemical Analysis	4
BCH 720	M.Sc Project	6
		2
		16
BCH 721	Seminar	
	Optional Courses	
BCH 712	Clinical biochemistry & Biochemical Pharmacology	4
BCH 713	Elements of Biotechnology	4
BCH 715	Nutrition	4
BCH 716	Enzymology and Protein Chemistry	4
BCH 717	Plant Biochemistry	4
BCH 718	Molecular Biology	4
BCH 719	Environmental Biochemistry and Biochemical Toxicology	4
		28

WITHDRAWAL

A candidate who fails to accumulate 16 credits of course work at the end of the academic session shall be expected to withdraw from the programme. A candidate who obtains 16 credits but less than 30 credits MAY be allowed to register for the failed courses in the next year, provided at least one of the core courses BCH 710 and BCH 711 has been passed.

SEMINARS

Before embarking on their research work, candidates shall be expected to present a formal half-hour Seminar on their work plan and the state of scientific knowledge in the chosen area of research. The research work should normally start after certification of the soundness and practicability of the project by the Department and should be guided by suggestions raised at the Seminar.

At the end of the research project the candidate on the results obtained shall deliver another one-hour Seminar. The departmental board of Examiners will certify the Seminar as satisfactory before a student can proceed to write up his/her thesis. The Departmental Board of Examiners will assess this.

RESEARCH

A candidate for the M.Sc. or Ph.D degree shall be expected to undertake a research project under the guidance of Supervisor(s). Research projects are available in areas in which research work is currently being undertaken by the academic staff of the department. The broad areas are:

Enzymology and Protein Chemistry
Enzymology of plant and animal food system; Toxicology

Lipids/Membrane Biochemistry
Plant lipid Biochemistry; Membrane biophysics

Nutrition and & food Technology
Food Analysis, Processing and Preservation

Clinical biochemistry
Biochemical Basis of disease states and therapy

Molecular Biology.

DEMONSTRATION BY POSTGRADUATE STUDENTS

All postgraduate students will be expected to demonstrate at undergraduate practical classes as an integral part of their training. Students who do not perform this duty satisfactorily will not be signed up for presentation of their thesis.

DETAILED COURSE DESCRIPTION

BCH 710 – General Biochemistry (4 Credits)

General introduction to enzymes. Regulation in metabolic pathways. Detection of Rate Controlling enzymes. Molecular mechanisms in the regulation of enzyme Activity. Metabolic compartmentation

Review of carbohydrate, protein, lipid and nucleic acid metabolism in plants and animals and their regulation. Inter-relationship of metabolic pathways. Porphyrin biosynthesis and function of metalloprophyrin – protein complexes.

Generation of ATP and reducing potential in photosynthesis, photorespiration and the glycolate pathway. Nitrogen fixation. Biochemistry of tropical economic plants. Tissue heterogeneity. Intercompartmental Cupertino in cellular processes. Compartmentation and integration of metabolic pathways. Current topics in biochemical regulation.

BCH 711 – Methods of Biochemical Analysis

Review of basic techniques. Buffers and pH. Tissue preparations and cell culture. Principles of centrifugation. Preparation of subcellular organelles. Use of Marker enzymes.

Spectrophotometry and fluorimetry. UV and IR spectrophotometry. Fluorescence and Phosphorescence. Chromatographic purification of proteins and amino acids. Ion exchange, molecular sieving, affinity chromatography, Partition chromatography. Chromatographic separation of Lipids (thin-layer, column, gas-liquid chromatographic techniques etc). Electrophoresis – preparative and analytical.

Special techniques – Viscometry, X-ray diffraction, Circular Dichroism (C.D) and optical rotatory Dispersion (O.R.D) Magnetic Resonance Methods. Application of Radio labels in biochemistry.

Clinical Biochemistry approaches – Physiological Methods in Health and Disease. Techniques in Nutrition Studies – Analysis of mycotoxin, pesticides and Environmental contaminants. Emerging techniques in Biochemistry – recent research application of some techniques may be mounted.

BCH 712 – Clinical Biochemistry & Biochemical Pharmacology (4 Credits)

Molecular basis of inborn errors of metabolism, classical examples of diseases associated with carbohydrate, amino acid, lipid and nucleic acid metabolism. A detailed study of important medicinal plants. Drug therapy to our environment. Centrally acting drugs. Drugs as environmental contaminants.

BCH 713 – Elements of Biotechnology

Review of Microbial Biochemistry

Molecular architecture of the bacteria cell. Genetic organization and control of gene expression control at the level of transcription and translation; restriction endonuclease; hybrid DNA, recombinant DNA; genetic engineering, viruses.

Bacteria nutrition – e carbon and nitrogen sources. Growth of bacteria; Mathematical models of batch culture, product formation Models, fixed cultures, Immobilised enzymes and cells – preparation, kinetic performance, stability and application of immobilized system, Micro-organisms in the production of food, industrial chemicals chemotherapeutic agents and enzymes. Use of micro-organisms bioassay.

Elements of Biotechnology

Definition of biotechnology, examples of applications of genetic manipulation in areas of human health, food, agriculture and horticulture, energy, raw materials, chemicals and environmental management.

BCH 715 – Nutrition (4 Credits)

Nutrient metabolism. Disorders associated with inadequate and excessive nutrient intakes. Methods in Nutritional Biochemistry including basic statistical methods. Nutrient requirements, allowances, etc. Newer findings in Nutrition. New sources of food. Clinical nutrition. Ecology of nutrition. Environmental toxicants in foods. Nutritional problems in Nigeria, comparative nutrition.

BCH 716 – Encymology and Protein Chemistry (4 Credits)

General aspects of protein structure, covalent backbone and Conformation, Physical characterisation of proteins, molecular weight, density and charge: Sedimentation methods, gel permeation methods, electrophoresis.

SUB-UNITS

Enumeration and determination

Chain separation

Methods for the detection of peptide and peptides separation:

- | | | |
|-----|--------------------|---------------------|
| (a) | Separation methods | (b) Detection |
| (c) | Quantification | (e) Peptide mapping |

END-GROUP DETERMINATION

General and special determination

Interpretation, calculation and presentation of amino acid data

Fragmentation of polypeptide chains

Sequential degradation

Determination of the three-dimensional structure of proteins of special interest-hemoglobin, immunoglobins.

Enzymes as a class of proteins of special interest. Application of ligand binding to enzymes, kinetic of binding sites. Review of the classification of mechanisms of bisubstrate reactions. Bisubstrate enzyme kinetics. Theories of enzyme catalysis. Control of enzyme activity including consent of half-of site reactivity.

BCH 717 – Plant Biochemistry (4 Credits)

Cell and subcell, Ribosomes, the Nucleus, cell membranes, Microbodies the Chloroplasts, plant microtubules, vacuoles. The Primary cell wall. Lignin, cutin and suberin, surface waxes. Carbohydrate metabolism. The relationship between gluconeogenesis and carbohydrate oxidation in higher plants. Sucrose metabolism, structure, synthesis and enzymatic degradation of starch, insulin, manna and other reserve polysaccharides. Sites of synthesis of polysaccharides. Recent advances in the chemistry and biochemistry of plant lipids. Special aspects of metabolism of proteins and nucleic acids in plants. Absorption, section and translocation. Cell wall biogenesis. Mineral metabolism, sulphate reduction, Nitrate Metabolism, phytochromes, biosynthesis and action of plant hormones. Growth and differentiation in plants. Senescence. Terpenes and terpenoids; porphyrins, alkaloids, flavonoids, tannins and tannic, chemotaxonomy. Biochemical aspects of plant-parasite relationships current perspectives in research on phytoalexins.

Regulation of plant metabolism. Photosynthesis – the path of carbon and the path of energy. Nitrogen fixation. Selected aspects of the biochemistry of economic plants growth in Nigeria.

BCH 718 – Molecular Biology (4 Credits)

Genetic organization and control of gene expression in prokaryotes (Jacob-Monod hypothesis). Control at the level of transcription and translation, the operator, the promoter, the attenuator, polycistronic messenger, economy of gene control. Chromosome replication models. Genetic maps of eukaryotic cells, biochemistry of cell division, hybrid DNA, recombinant DNA, genetic engineering, transformation, conjugation. Biochemistry of viruses, lysogen and lysis, transduction, oncogenic viruses and cells. Mutagenesis and carcinogenesis. Sequence analysis of DNA, Gene variation and polymorphism. Molecular evolution. The future-star gazing.

BCH 719 – Biochemical Toxicology and Environmental Biochemistry (4 Credits)

Biochemical pollutants in air, land and sea. Allergens their detection, bioassay and effects. Pesticides and their residues. Biochemical interconversions of pesticides and their importance in agriculture and human health. Analysis of cell damage and cell death. A detailed survey of toxicology of drugs; chemicals and insecticides. Mode of action of toxins. Structure – activity relationships of these compounds. Carcinogenesis. Environmental and Industrial Toxicology.

STAFF LIST

Name	Rank	Qualification	Area of Specialisation
Dixon, P. A. F	Professor	B. Sc, M. Sc, Ph. D	Biochemical Pharmacology
E. A. Balogun	Professor	B. Sc, M. Sc, Ph. D	Biochemical Toxicology
Ademuyiwa, O	Reader	B.Sc. MSc, (Ife), Ph.D(Munich)	Biochemistry
Akinloye, O A		B. Sc, M. Sc, Ph. D	Biochemical Toxicology

DEPARTMENT OF MATHEMATICS

Master of Science (M.Sc.) and Doctor OF PHILOSOPHY (Ph.D)

Types of Programme

The Department offers course work and research leading to the award of M.Sc. and Ph.D degrees in Mathematics. The M.Sc. degree is a two-year programme, while the Ph.D is a three-year programme. However, if the Masters degree was obtained from the University of Agriculture, Abeokuta, or its equivalent elsewhere, minimum duration shall be four and six semesters for full-time and part-time candidates respectively.

M.Sc. IN MATHEMATICS

24 Units of relevant course work

6 Units of Thesis

A satisfactory seminar

Oral Defence.

Ph.D IN MATHEMATICS

The Ph.D programme is a six semesters full time programme (or eight semester part-time programme) consisting of:

Thesis:

Two satisfactory seminars;

Oral defence.

M.Sc. COURSES AVAILABLE IN THE DEPARTMENT

Course No.	Course Title	Units
COMPULSORY COURSE(S)		
MTS717	Functional Analysis	3
MTS718	Measure Theory & Integration	3
ELECTIVES		
(18 Units to be selected from the followings):		
MTS701	Cumulative Algebra	3
MTS702	Non-Associative Algebraic Systems	3
MTS703	Cumulative Banach Algebra	3
MTS704	Theory of Graphs	3
MTS705	Ordinary Differential Equations	3
MTS706	Latin Squares and Applications	3
MTS707	Algebra I	3
MTS708	Algebra II	3
MTS709	C*Algebras	3
MTS710	Homological Algebra	3
MTS711	Associative Rings	3
MTS712	Characters of Finite Groups	3
MTS713	Group Theory	3
MTS715	General Topology I	3
MTS716	General Topology II	3
MTS717	Measure and Integration	3
MTS718	Functional Analysis	3
MTS731	Mathematical Method I	3
MTS732	Mathematical Method II	3
MTS733	Viscous Flow Theory	3
MTS734	Comprehensible Flow Theory	3
MTS736	Hypersonics	3
MTS790	Reading Course	3
		69

MTS 701 – Cumulative Algebra (3 Units)

Rings and Modules of Fractions. Primary decompositions. Noetherian and Artin rings. Integral dependence. Valuations. Discrete valuation rings. Prüfer domains and Dedekind domains. Dimension theory and completions, special topics.

MTS702 – Non-Associative Algebraic Systems (3 Units)

Quasi-groups and loops, Isotopy and homomorphism theorems. Normal sub-loops and subquasi-group Moufang and Bol loops. Arbitrary non-associative algebra. Alternative ring and algebra. Power-associative algebra. Malcev algebra.

MTS703 – Cumulative Banach Algebra (3 Units)

The Gelfand theory of cumulative Banach algebras. Groups, algebras of holomorphic functions. Special topics.

MTS704 – Theory of Graphs (3 Units)

Introduction and basic concepts such as connectedness, trees, blocks, paths, circuits etc. Eulerian and Hamiltonian graphs. Reconstructions problems. Labeled graph. Chromatic number and genus. External and Ramsey type problems. Some applications.

MTS705 – Ordinary Differential Equations (3 Units)

Topics to be chosen from the following: Existence and uniqueness of solution; linear systems: non-singular boundary value problems; theory of periodic solutions; stability of asymptotic expansions perturbation theory; Poincaré – Bendixson theory.

MTS706 – Latin Squares and Applications (3 Units)

Quasi-groups and loops. Conjugate Latin squares. Orthogonal Latin squares topics. Application to computer science, experimental design etc.

MTS707 – Algebra I (3 Units)

Groups Definition and examples of groups, $GL(N, R)$, R any ring,. Solvable and its consequences. Solvable and nilpotent groups.

Rings, Ideals and quotient rings. Isomorphism theorems. Rings of fractions of a commutative ring with respect to multiplicative subsets. Local rings.

Modules, free modules. Projective and injective modules. Homomorphisms and the tensor product $M \otimes N$ of two R -modules M and N .

MTS708 – Algebra II (3 Units)

Quadratic forms and associated orthogonal groups; Von Neumann regular rings; matrices over Banach algebras; diagonalizability; normal and subnormal structures. Matrices over arbitrary rings.

MTS709 – C* Algebras (3 Units)

$C(X)$, $C_0(X)$, $B(H)$ as C^* -algebra. Gelfand – Neumann representation theory of C^* -algebras.

MTS710 – Homological Algebra (3Units)

Categories and functors. The category of modules and homomorphisms, exact sequences of modules. Projective and injective modules. The tensor product and the ring of homomorphisms. The derived functors. The torsion and extension functors. Applications.

MTS711 – Associative Rings (3 Units)

Nil and nilpotent ideals. The nilradical and Jacobson radical semi-simple rings. The density theorem. The ascending chain condition (A.C.C.) and descending chain condition (D.C.C.).

MTS712 – Characters of Finite Groups (3 Units)

Representations. Characters. Complex representations. Centre of group algebra. Some properties of characters. Induced characters. Equation in groups. Criteria of solubility. Non-simplicity criteria. Normal complements. Characters of relatively small Frobenius groups.

MTS713 – Group Theory (3 Units)

Elementary theory of abelian groups. Permutation groups. The sylow subgroups. Automorphisms, inner automorphisms, normal or semi-direct products. Free groups, free products and free products with amalgamations.

MTS715 – General Topology I (3 Units)

Continuity, compactness, connectedness, metrizable, product spaces.

MTS716 – General Topology II (3 Units)

The Weierstrass approximation theorem, the Stone-Weierstrass theorems for compact and locally compact spaces; the real and complex forms.

MTS717 – Measure and Integration (3 Units)

Lebesgue measure on the line, measure spaces. Integration. Convergence theorems. The Radon-Nikodym theorem. Differentiations. Fubini's theorem. The function spaces L_p and $C(X)$.

MTS718 – Functional Analysis (3 Units)

Banach spaces and their duals. Examples. Commutative algebras. Algebras with involution. Dual algebras. H^* -algebras. Algebras of operators. Algebras and functions.

MTS731 – Mathematical Method I (3 Units)

Revision of complex analysis. Many valued functions and Riemann surfaces. Analytical continuation and asymptotic expansions. Ordinary differential equations with a large parameter. First order linear differential equations. General first order equations. Second Order linear equations.

MTS732 – Mathematical Methods II (3 Units)

Calculus of Variation: Functionals. Geodesic curves, isoperimetric problems. Euler's equations and extension to higher derivatives and several dependent and independent variables.

MTS733 – Viscous Flow Theory (3 Units)

Navier-Stokes equations and exact solutions. Energy equation. Flow at small Reynold's Number – Stokes and Oseen's flows. Lubrication theory. Boundary layer theory. Approximate methods of solution. Unsteady boundary layers. Boundary layer separation and control.

MTS734 – Compressible Flow Theory (3 Units)

Surface phenomena. Centrifugal instability. Thermal instability on two-dimensional parallel flow as illustrated by Poiseuille flow between parallel plates. Kelvin – Helmholtz instabilities. The development of turbulence from instability of waves in a boundary layer.

MTS736 – Hypersonics (3 Units)

General features. Oblique shocks. Centred expansion of homentropic flow. Hypersonic small disturbance theory. Hypersonic analogy and blast wave solutions. Newtonian flow. Freeman's theory of hypersonic flow past plane and asymmetric blunt bodies. Constant density solution. Newtonian slender body theory – optimum power law body.

MTS731 – Mathematical Method I (3 Units)

Revision of complex analysis. Many valued functions and Riemann surfaces. Analytical continuation and asymptotic expansions. Ordinary differential equations with a large parameter. First order linear differential equations. General first order equations. Second Order linear equations.

MTS732 – Mathematical Methods II (3 Units)

Calculus of Variations: functional, Geodesic curves, isoperimetric problems. Euler's equations and extension to higher derivatives and several dependent and independent variables.

MTS733 – Viscous Flow Theory (3 Units)

Navier-Stokes equations and exact solution. Energy equation. Flow at small Reynold's Number – Stokes and Oseen's flows. Lubrication theory. Boundary layer theory. Approximate methods of solution. Unsteady boundary layers. Boundary layer separation and control.

MTS 734 – Compressible Flow Theory (3 Units)

Surface Phenomena. Centrifugal instability. Thermal instability of two dimensional parallel flow as illustrated by Poiseuille flow between parallel plates. Kelvin – Helmholtz instabilities. The development of turbulence from instability of waves in a boundary layer.

MTS736 – Hypersonics (3 Units)

General features. Oblique shocks. Centres expansion of homentropic flow. Hypersonic small disturbance theory. Hypersonic analogy and blast wave solutions. Newtonian flow. Freeman's theory of hypersonic flow past plane and asymmetric blunt bodies. Constant density solution. Newtonian slender body theory – optimum power law body.

MTS790 – Reading Course (3 Units)

STAFF BY RESEARCH INTERESTS

Name	Rank	Qualification	Area of Specialisation
Adeniran, O. J	Reader	B.Sc, M. Sc (Ife), Ph.D (UNAAB)	Loop Theory & Non Associative Algebra
Solarin, A.R.T	Professor	B.Sc, M.Sc, Ph.D (Ife)	Theory of Loops & Statistical Estimation Theory
Oguntuase, J. A	Senior Lecture	B.Sc, (UNAD), PGD (UNAAB), M.Sc, Ph.D (Ife)	Analysis, Theory of Inequality Operator Theory
Agboola, A. A.A	Senior Lecturer	B.Sc, M.Sc (Lagos), Ph.D (UNAAB)	Fuzzy Sets and Logic
Okunuga, S. A	Reader	B.Sc, M.Sc (Ilorin), Ph.D (Lagos)	Numerical Analysis & Computation
Akinleye, S. A	Lecturer I	B.Sc (Maiduguri), M.Sc (Ibadan), Ph.D (UNAAB)	Loop Theory & Optimization
Olajuwon, B. I	Lecturer I	B.Sc (Ago-Iwoye), M.Tech, Ph. D(LAUTECH)	Fluid Mechanics
Omeike, M. O	Lecturer II	B.Sc, M.Sc (Ibadan), Ph.D (UNAAB)	Differential Equation
Mewomo, O. T	Lecturer II	B.Sc (UNAAB), M.Sc (Ife), Ph.D (UNAAB)	Banach Algebra

DEPARTMENT OF STATISTICS

Master of Science (M.Sc.) and Doctorate (Ph.D)

Types of Programme

The Department offers course work and research leading to the award of M.Sc. and Ph.D degrees in Statistics. The M.Sc. degree is a two-year programme, while the Ph.D is a three-year programme. However, if the Masters degree was obtained from the University of Agriculture, Abeokuta, or its equivalent elsewhere, minimum duration shall be four and six semesters for full-time and part-time candidates respectively.

M.Sc. IN STATISTICS

24 Units of relevant course work

6 Units of Thesis

A satisfactory seminar

Oral Defence.

Ph.D IN STATISTICS

The Ph.D programme is a six semesters full time programme (or eight semester part-time programme) consisting of:

Thesis;

Two satisfactory seminars;

Oral defence.

M.Sc. COURSES AVAILABLE IN THE DEPARTMENT

Course No.	Course Title	Units
	COMPULSORY COURSE(S)	
STS701	Probability Theory	3
STS702	Statistical Inference	3
STS703	Sampling Tech. and Design of Experiments	3
STS709	Multivariate Analysis	3
STS704	Distribution Functions	3
		15
	ELECTIVES	
	(9 Units to be selected from the followings):	
STS706	Time Series	3
STS712	Nonparametric Methods	3
STS705	Stochastic Processes	3
DEM701	Advanced Demographic Techniques I	3
STS711	Theory Of Games	3
STS713	Robust Inference	3
STS714	Sequential Analysis	3
STS790	Reading Course	3
		24

STS701 – Probability Theory (3 Units)

Random variables. Expectation. Independence. Convergence concepts. Law of large numbers. Characteristic functions. Central limit theorem. Conditioning. Markov chain. Martingales. Gambling systems and stopping time and rules. Renewal theorem and local time theorem. Stochastic processes and Brownian motion. Stochastic process with stationary independent increments.

STS702 – Statistical Inference (3 Units)

Formation of the principles of statistical decisions as an aspect of the theory of games. Bayes. Minimax and admissible decision rules. The main theorems of statistical decision theory. Invariants and equivalent decision rules. Methods of solving for minimax, admissible minimax and invariant and equivalent rules. Particular applications to location parameter problems.

Decision theoretic approach to the theory of hypothesis testing. Bayes tests. Neyman-Pearson and the generalized Neyman-Pearson Lemma. Uniformly Most Powerful Test, unbiased, invariant and locally most powerful tests. Invariant and minimax tests. Maximum likelihood estimation and asymptotic theory.

STS703 – Sampling Tech. and Design of Experiments (3 Units)

Sampling Techniques

Sampling designs. Probabilistic and inferential problems of finite populations. Sampling with varying probabilities. Stratified single stage, multistage, multiphase and cluster sampling. Ratio and regression estimates.

Designs of Experiments

Basic ideas and assumptions. Randomization. Design of factorial experiments. Randomized blocks and Latin squares. Balanced incomplete block designs. Confounding and fractional replication in 2^m theory of optimum design.

STS704 – Distribution Functions (3 Units)

Univariate and bivariate cases including compound, generalized and modified distributions, Negative Multinomial, Multivariate Hypergeometric, Multivariate logarithmic series. Multivariate Neyman Type A, Dirichlet (B-) Compound Negative Multinomial, Multivariate Hypergeometric, Multivariate logarithmic series. Multivariate Neyman Type A, Dirichlet (B-) Compound Negative Multinomial, Weibull and non-central distributions.

STS705 – Stochastic Processes (3 Units)

Random walk. Gambling system and stopping time and rules. Markov processes and chain. Renewal theorem and local time stochastic processes and Brownian motion. Processes with independent increment. Martingales. Stochastic order relations. Queuing processes and applications.

STS706 – Time Series Analysis (3 Units)

Discrete time series trends. The classical model-AR, MA, RNA and ARIMA. Stationary processes. Harmonic analysis and estimation linear analysis. Estimation of continuous spectra.

STS709 – Multivariate Analysis (3 Units)

Multivariate analysis of variate. Multivariate normal distribution and its properties. Wishart and Hotelling's distributions. Application of estimation of parameters and tests on means and covariance matrix. Multiple regression analysis, component, discriminant, canonical, factor and cluster analysis. Multidimensional scaling.

STS710 – Sampling Distributions

Unbiased estimates. Asymptotic properties of sampling distributions. Fisher's lemma on degrees of freedom. Exact sampling distributions. The general variance. Regression coefficients. Partial and multiple correction coefficient.

STS711 – Theory of Games (3 Units)

Two-person, zero sum games and their geometric interpretations. Linear programming methods. The minimax theorem. Theories of n-person games and their applications.

STS712 – Non-parametric Methods (3 Units)

Statistical procedures based on ranks, order statistics, signs, permutation and runs. Testing for randomness, symmetry and independence. Invariance and sufficiency reductions. Treatment of ties, Asymptotics, U-statistics, Chernoff-Savage theorem. Efficiency of rank tests by Pitman's and Bahadur's.

STS713 – Robust Inference (3 Units)

Heuristic description of the concept and reasons for robust method. Development of basic tools such as the Prohorov model, von Mises functions and Fechet derivatives. M.L and R-estimates and their asymptotic properties. Influence curve. Asymptotic minimax theory of robust estimates. Finite sample minimax theory for robust tests and estimates.

STS714 – Sequential Analysis (3 Units)

The Wald sequential probability ratio tests and various generalizations including tests of composite hypothesis. Non-parametric sequential estimation and confidence intervals. Bayes sequential procedures. Stochastic approximations. Optimal stopping rules.

STS715 – Information Theory (3 Units)

Measures of Information. Noiseless coding. Discrete memoryless channel. Channel capacity. Channels with memory. Markov models Multi-way channels. Information sources. Source coding with fidelity criterion.

STS716 – Multivariate Analysis II (3 Units)

Central distribution of roots of random matrices (i) Wishart one sample and two samples cases (ii) MANOVA and (iii) Canonical correlation Problems, roots as maximal invariants. Non-central distribution of roots. Asymptotic representation of distribution of roots. Principal component and factor analysis problems. Categorized data.

STS717 – Advanced Theory of Queues (3 Units)

General arrival and general service queues. Heavy traffic approximation, diffusion, rush hour approximation. Approximation for G/GI queues, delay cycle, generalised busy periods, waiting time distribution, computer time sharing and multi-access systems. Computer communication networks. Matrix geometric techniques.

STS790 – Reading Course (3 Units)

DEM 701 - Advanced Demographic Techniques I (3 UNITS)

Evaluation and adjustment of demographic data: sources of data; general principle of evaluation of population data; sources of errors and biases; method of appraising data; adjustment of defective data, uses and limitations. Population models: stationary, stable and quasi-stable population models - characteristics, construction procedures and application in demographic analysis. Population projection: Vital statistics models, component

method, matrix, rate correlation method; projection of population segments, e.g. school age and enrollment, labor force, old age, etc

DEM 702- Advanced Demographic Techniques II (3 UNITS)

Fertility analysis: measures based on vital statistics- crude and specific, their uses and limitations; cohort and period fertility measures. Measures based on censuses and surveys. Methods of obtaining fertility measures from inadequate data – Brass technique, Coale-Demeny method, etc. Gross and net reproduction rates. Nuptiality. Mortality analysis: Measures based on vital statistics. Census and samples surveys- crude and specific. Mortality measures obtained from inadequate method. Construction of life tables. Model life tables and their uses. Migration analysis: Measures using information on birth place, duration of residence, place of last residence etc measures of migration streams

DEM 703 RESEARCH METHOD IN DEMOGRAPHY (3 UNITS)

Survey design: Basic scientific principles of social research; concept and hypothesis formulation and testing; organization of research; construction of questionnaire, observation of interview. Data processing including editing, coding, verification, tabulation and analysis of data, organization of report writing.

Sampling: Role of sampling in Data collection. Probability sampling: simple random sampling and its properties: simple, stratified multistage, systematic sampling. Clusters sampling, etc sampling and non sampling errors and biases. Precision and accuracy of sample estimates. Examples of demographic sample survey in Africa. Measures of sampling errors.

Demographic research methods of analyzing demographic data – analytical techniques; summarization of data (frequencies) tabulation and interpretation

DEM 704 POPULATION THEORY AND PATTERN (3 UNITS)

Population theories from pre-Malthusian to recent economic-demographic theories; need for population policies and programmes affecting components of population change

POSTGRADUATE DIPLOMA PROGRAMMES

The Department offers course work and research leading to the award of the following:

Postgraduate Diploma in Quality Management (PDQM)

Postgraduate Diploma in Statistics (PDS)

Postgraduate Diploma in Planning, Research and Statistics (PDPRS)

UNITS

STRUCTURE	PDQM	PDS	PDPRS
CORE COURSE	23	26	26
ELECTIVES	9	6	6
PROJECT	6	6	6
MINIMUM TOTAL	38	38	38

POSTGRADUATE DIPLOMA IN QUALITY MANAGEMENT

LIST OF COURSES

Course Code	Course Title	Units
COMPULSORY COURSES		
PDQ 701	Total Quality Management	2
PDQ 702	Standardization Processes	3
PDQ 704	Statistical Quality Control	3
PDQ 705	Reliability	3
PDS 702	Method of Statistical Inference and Design	3
PDS 703	Design and Analysis of Expts and Survey	3
PDS 710	Operations Research	3
PDC 701	Fundamentals of Computer Science	3
PDQ 799	Project	6
		29
ELECTIVES		
PDQ 706	Organization Theory and Behavior	3
PDS 705	Econometric Methods	3
PDP 703	Research Methods	3
		9
Including selections from other postgraduate Diploma Programmes		

POSTGRADUATE DIPLOMA IN STATISTICS

Course Code	Course Title	Units
COMPULSORY COURSES		
PDS 701	Probability and Distribution Theory	3
PDS 702	Method of Statistical Inference and Decision	3
PDS 703	Design and Analysis of Expts and Survey	3
PDS 704	Official Statistics	3
PDS 705	Econometric Methods	3
PDS 708	Multivariate Analysis	3
PDQ 701	Total Quality Management	3
PDQ 704	Statistical Quality Control	2
PDC 701	Fundamental of Computer Science	3
PDS 799	Project	6
		32
ELECTIVES		
PDS 706	Biometric Methods	3
PDS 710	Operation Research	3
PDQ 706	Organisation Theory and Behaviour	3
		9
Including selections from other Postgraduate Diploma Programmes		

POSTGRADUATE DIPLOMA IN PLANNING, RESEARCH AND STATISTICS

Course Code	Course Title	Units
COMPULSORY COURSES		
PDP 701	Applied Statistics	3
PDP 702	Project Management	3
PDP 703	Research Methods	3
PDS 703	Design and Analysis of Expts and Survey	3
PDS 704	Official Statistics	3
PDQ 701	Total Quality Management	2
PDQ 706	Organisation Theory and Behaviour	3
PDC 701	Fundamental of Computer Science	3
AEM 709	Project Appraisal and Planning	3
PDP 799	Project	6
		32
ELECTIVES		
PDS 702	Method of Statistical Inference and Decision	3
PDS 705	Econometric Methods	3
PDS 706	Biometric Methods	3
PDS 708	Multivariate Analysis	3
PDS 710	Operations Research	3
AEM 708	Agric. Development and Policy	3
		18
Including selections from other Postgraduate Diploma Programmes		

COURSE DESCRIPTIONS

PDQ 701- Total Quality Management (2 units)

The Japanese Quality Movement. Quality Control Practice in Japan. American and British recent Quality movements. Management-By-Objectives - its shortcomings including problems of performance appraisal. The Ishikawa tools. Quality in Administration. Complexity and real work measurements. Importance of quality management to company survival .

Cost of Quality, Profit from Quality Management, The Ishikawa seven tools. Quality circle activities. Case studies.

PDQ 702 – Standardisation Processes (3 units)

Company standardisation. Purpose and effects of company standardisation. Fundamental concepts of company standardisation. Methods of company standardisation/methods of arranging company standards. Main company standards and their management. Promotion of quality control and rules thereof. Standard organisations. Relevance of standard organizations to national development. Procedures for setting standards, company standards, national standards and international standards. Certification. American standards, British standards, Brazilian Standards, Indian standards, Case studies.

PDQ704 - Statistical Quality Control (3 units)

Objectives of statistical Quality, Control specifications and tolerance limits, control charts. Acceptance Sampling. Use of various military standards. Dodge Rooming systems for lot by lot Acceptance Sampling, AQL/AOQL criteria for Acceptance Sampling. One Stage, two stage, multi stage sampling. Inspections Plan. Case studies

PDQ 705 – Reliability (3 units)

Definitions and measurement of reliability. Customers requirements. Reliability and cost. Uses of reliability in Quality control jobs. Establishing the product reliability requirement. Reliability programmes failure mode, failure effects and critical analysis Physics of failure. Maintainability and evaluation of reliability plans. Reliability growth.

PDQ 706 – Organisational Theory and Behaviour (3 Units)

A survey of the major theoretical approaches to the study of organization. Critical review of the contribution of the major organisation/administrative theories. An examination of the analysis of organizations as systems with emphasis on the assessment of their operational effectiveness and efficiency. A discussion of the relevance of organization/administrative theories to public and private sectors, business administration with special reference to Nigeria and African experience.

PDP 701 – Applied Statistics (3 units)

Fundamental statistical concepts: probability and random variables, elementary probability distribution, binomial Poisson and normal, regression and correlation analysis, estimation point, confidence intervals for means and variance; statistical tests and hypotheses.

Control chart for within and between batch variability; industrial experimentation; experimenter errors, experimental design and analysis – fixed and random effects for both completely randomized and randomized blocks, Latin Lattice Square, factorial and split-plot designs. Non- parametric tests.

PDP 702 – Project Management (3 units)

Principles of Organization of project management, control systems and techniques, project monitoring and reporting systems, use and application of Linear programming, PERT, CPM and other scheduling techniques.

PDP703 – Research Methods (3 units)

Survey Design: basic scientific principles of social research; concepts and hypothesis formulation and testing. Organisation of research; construction of questionnaire, observation and interview. Data processing including editing, coding, verification, tabulation and analysis of data, organization of report writing.

Sampling: Role of sampling in Data collection. Probability sampling. Simple random sampling and its properties; Stratified, multi- stage, systematic sampling cluster etc. Sampling and non-sampling errors and biases. Precision and Accuracy of sample estimates. Examples of Demographic sample surveys in Africa. Measure of sampling errors.

PDS 701 – Probability and Distribution Theory (3 units)

Sample spaces, algebra of sets and events, axiomatic definition of probability. Conditional probability and independence. Bayes theorem. Random variables and their distribution. Moments, cumulant and probability generating functions. Some special distribution ; marginal and conditional distribution. Distribution of functions of random variables and some derived distributions. Limit Theorems and limiting distributions. Elements of stochastic processes

PDS 702 – Methods Of Statistical Inference and Decision (3 units)

Point and interval estimation method of estimation – maximum likelihood methods, least square methods. Criteria and properties of estimates unbiasedness, efficiency etc. Hypothesis testing; Neyman Pearson Lemmas, likelihood ratio and sequential tests, power functions. Correlation and regression analysis. Analysis of variance and Multivariate analysis.

PDS 703 – Design and Analysis of Experiments and Survey (3 units)

Analysis of standard designs: Complete and incomplete blocks designs. Latin square designs, nested and other crossed classification designs. Factorial experiment: confounding and fractional replication. Response surface design.

Properties and estimation of parameters under various sampling methods. E.g. simple random sampling, stratified and optimum allocation. Ratio and regression estimates. Problems in the planning and execution of sample surveys.

PDS 704 – Official Statistics (3 units)

Detailed study of sources and nature of official statistics like economic, social, population, education etc. Problems in the collection and analysis of these statistics. Statistical organizations

PDS 705 – Econometric Methods (3 units)

Linear and general economic model and multiple regression of economic situations. Single equation and non linear models. Simulation equations and economic models. Time series model, Application of models in production, consumption and other functions and models of the national economy.

PDS 708 – Multivariate Analysis (3 units)

Multivariate normal and related distributions and tests based on them; principal component, discriminant, factor, cluster analysis and other multivariate techniques.

PDS 710 – Operations Research (3 units)

Operations Research problems, models and criteria. The practice and context of Operations Research. Introduction to stock control, scheduling, queuing theory, replacement, critical path analysis, dynamics programming and simulation. Theory of games. Decision theory. replacement critical path analysis. Dynamic programming. Inventory control. Simulations.

PDS 799 – Project (6 Units)

ACADEMIC STAFF AND THEIR RESEARCH INTERESTS

Name	Rank	Qualification	Area of Specialisation
Asiribo, O. E	Professor	B.Sc (Zaria), M.Sc(Reading), Ph.D (Wisconsin)	Statistical Modelling & Experimental Design
Solarin, A.R.T	Professor	B.Sc, M.Sc, Ph.D (Ife)	Statistical Estimation Theory
Adelakun, A. A		B.Sc., M.Sc (Zaria), Ph.D (Ib)	Distribution Theory
Adebanji, A. O		B.Sc (Ilorin), M.Sc (Ib), Ph.D (Ib)	Multivariate Analysis

DEPARTMENT OF COMPUTER SCIENCE

Master of Science (M.Sc.) and Doctor OF PHILOSOPHY (Ph.D)

Types of Programmes

The Department offers course work and research leading to the award of M.Sc and Ph.D degrees in Computer Science. The M.Sc degree is a two-year programme, while in the Ph.D is a three-year programme. However, if the Master Degree was obtained from the University of Agriculture, Abeokuta or its equivalent elsewhere, minimum duration for the Ph.D shall be four and six semesters for full-time and part-time candidates respectively.

M.Sc IN COMPUTER SCIENCE

24 Units of relevant course work

6 Units of Dissertation

Two satisfactory seminars

Oral defence

STRUCTURE

Course Title	M.Sc Computer Science
Core courses	14
Electives	10
Dissertation	6
Minimum Total	30

Note: All courses taken must be passed.

Ph.D IN COMPUTER SCIENCE

The Ph.D programme is a six semester full-time programme (or eight semester part-time programme) consisting of:

Thesis:

Two satisfactory seminars

Oral defence

M.Sc COURSES AVAILABLE IN THE DEPARTMENT

Course No	Course Title	Units
Computer Science Compulsory Courses (14 Units Compulsory)		
CSC 701*	Use of Computer In Research	4
CSC 703	Algorithm & Complexity	3
CSC 705	Advanced Programming Languages	3
CSC 702	Advanced Database Technology	3
CSC 704	Network Programming	3
CSC 711	Advanced Operating systems: Principles and Design	2
		18
ELECTIVES (10 Units of electives)		
CSC 707	Theory of Computation	3
CSC 709	Current topics in computer science	2
CSC 713	Artificial Intelligence	2
CSC 715	Advanced Operations Research	3
CSC 708	Modeling and Scientific Computing	3
CSC 710	Reading Courses	2
CSC 712	Formal methods	2
CSC 714	Cryptography and Computer Security	3
CSC 715	Software Engineering Principles	3
CSC 716:	Web- based systems and Agent based Software Engineering	3
STS 701	Probability theory and statistics and processes	3
		29

* Compulsory University course for Non-Computer Science Major

DESCRIPTION OF COURSES

CSC 701*: Use of Computer In Research (4 Units)

Introduction to using computers in Research , Communication Networks; the internet, and the world-wide web, Productivity Software Applications for Researchers ; Application software , word processing, spreadsheet , Database and presentation/graphics software ,Use of statistical packages e.g. SPSS, SAS etc and Computer Programming .

CSC 703: Algorithms and Complexity (3 Units)

Basic algorithm analysis, computational tractability, order of growth, concept of efficient algorithms, algorithms design methods: Greedy algorithm , divide-and-conquer algorithm and dynamic programming, Network flow, Efficient Algorithms; Strassan, FFT Complexity times space NP Complete Problems

CSC 705: Advanced Programming Languages (3 Units)

Computer software development using any of the listed programming language for a wide range of information system applications. Structured programming data types, functions, arrays, pointers, linked lists, and recursion. Object structural programming, graphs, JPanel and Animation .Applications from areas of interest with JAVA SCRIPTS/C/C++/HTML..

CSC 702: Advanced Database Technology (3 Units)

An introduction to database design including physical / logical representation, Normalization, Report Generator, modeling, database systems, and implementation using SQL or ORACLE.

CSC 704: Network Programming (3 Units)

Client server model and software design program interface to protocols, algorithms and issues in client and server software design. Remote procedures call concepts, distributed program generation, PCP, UDP and IP.

CSC 706: Computer Graphics and Visualization (3 Units)

Methods of developing, modifying and rendering graphics displays. Emphasizes the design and writing of graphics software for both two-and three-dimensional displays. Knowledge of a structured high-level language is required, introduction to computer Graphics, Graphics primitives, Co-ordinate systems, shading models, digital representation-sampling and enhancement, The theory and development of interactive visual representations of abstract data for the purpose of amplifying cognition, visualization models and representational issues, perception, visual literacy, spatial abstraction, interactive issues, practical design of visualization system

CSC 707: Theory of Computation (3 Units)

Mathematical logic, alphabets and languages, finite automata, regular and non-regular expressions, and Kleene's theorem, regular grammars; pushdown automata and context-free grammars, Turing and Post machines, recursive and recursively enumerable languages, the Chomsky theorem

CSC 709: Current topics in Computer Sciences (2 Units)

In depth study of a topic taught in a seminar format. Topics will be posted in the department before registration.

CSC 711: Operating systems: Principles and Design (2 Units)

The functions and structure of computer operating systems. Processes, Processor, memory, and device management. Concurrency and process synchronization. Input/output handling, device drivers, and disk scheduling, file systems, operating system design philosophy with reference to MS-Windows/DOS/LINUX/UNIX

CSC 712: Formal Methods (2 Units)

Software Specification using a mathematically rigorous approach, formal methods, formal specification languages, algebraic and model-based specification, verification and validation. Initial algebra, reachable and unreachable algebra, CTL and Sort.

CSC 713: Artificial Intelligence (3 Units)

Meaning of AI, Expert System Design, Fuzzy Logic, Neural Network, Neuro-Fuzzy, Genetic Algorithm, Genetic Programming, Introduction to basic programming techniques of artificial Intelligence (AI). Symbol manipulation and AI problem – solving techniques. Practical, detailed design procedure and implementation of the mentioned AI techniques should be extensively treated.

CSC 714: Cryptography and Computer Security (3 Units)

Introduction to the fundamentals of cryptographic systems, Public-key infrastructure and cryptosystems-one way and trapdoor functions, primitives for applied cryptographic applications including hash functions, pseudorandom, fundamentals of computer and network security, systems and protocols for providing security services, secure mail, internet Protocol security, web security, and countermeasures via intrusion detection, virus countermeasures, access control and firewalls.

CSC 715: Software Engineering Principles (3 Units)

Components of Software Engineering, development models, prototyping, software Architecture, Software Engineering Process, software metrics, software testing, implementation and evaluation.

CSC 716: Web- based systems and Agent based Software Engineering (3 Units)

Fundamentals of web- based systems, Software Engineering methods and technologies for developing internet-based applications, distributed object systems, application servers, web technologies, quality assurance for web-based applications, design and code inspection, security issues for web-based systems

A. POSTGRADUATE DIPLOMA IN COMPUTER SCIENCE

The department offers course work and research leading to the award of postgraduate diploma in computer Science.

Structure	Units
Core courses	30
Electives	6
Project	6
Minimum Total	41

POSTGRADUTE DIPLOMA IN COMPUTER SCIENCE

Course Code	Course Title	Units
Compulsory Courses		
PDC 701	Fundamental of Computer Science	3
PDC 702	Systems analysis and Designs	3
PDC 703	Assembly Programming	3
PDC 705	Concepts of Programming language	3
PDC 714	Object-programming language	3
PDC 706	Introduction to Operating System	3
PDC 707	Data Structures and Algorithms	3
PDC 709	Compilers Techniques	3
PDC 710	Systems Engineering	3
PDC 716	Database Systems	3
PDC 799	Project	6
		36
Electives		
PDC 713	Computer Networks and Communications	2
PDC 712	Operations Research	3
AEM 711	Business Management	3
AEM 718	Business Finance	2
		10

PGD COMPUTER SCIENCE

PDC 701: Fundamentals of Computer Science (3 Units)

History of computer, general structure of a computer system, types, classification and characteristics of a computer system and environmental conditions. Internal representation of data, character representation, concept of data, record, file, basic models of files processing and their advantages, problem analysis, flowcharts, algorithms, symbolic names, subscripts, expressions and control statements, computer structures and machine language. Introduction to computer programming with special emphasis on BASIC and FORTRAN programming language, computer application.

PDC 702: Systems Analysis and Design (3 Units)

Scope of systems analysis, system investigation, input design. Output design. Review of design and organization of files. Design and documentation. Program design, feasibility study, systems analysis techniques, Management Information Systems, Systems Implementation and Conversion.

PDC 703: Assembly Programming (3 Units)

Assembly language programming; Instruction Formats, Study of Information representations and their relation to processing technique, file, list and string processing techniques. Use of system and support software, JCL, Assemblers and compilers, linking/loading/editing and libraries.

PDC 705: Concepts of Programming Languages

Fundamental of programming. Constants variables, Operations. Data types and expressions, assignment statements, arrays, subscripts, expressions and control statements

Decision steps: conditional – if statements, repetition and loops. Function and subroutine sub-programs. Format and files. String manipulations. Plotting functions. For practical work use BASIC/FORTRAN/PASCAL/C/C++

PDC 714: Object Programming Language (3 Units)

Object – Oriented Programming Vs Procedure oriented programming paradigms, OOP Features, OOP Languages, Programming in C++, OOP-PASCAL SMALL TALK, Object oriented analysis and design.

PDC 706: Introduction to Operating Systems (2 Units)

An overview of operating systems, structure and functions of operating systems, multiprogramming, multi tasking/multi-user, time-sharing process, state models and scheduling algorithms, memory protection and deadlock, sequential processes, con-current processes and real-time processes. Processor management. Design strategies and study of several operating systems.

PDC 707: Data Structures and Algorithms (3 Units)

Basic structures for data representation. Graphics and Network flows. Data definition languages. Sequential and linked storage allocation (for linear, multi-linked structures and string processing techniques). Tree implementation, Tree Traversal and the mathematical properties. Dynamic storage allocation (sorting, searching). Algorithm analysis.

PDC 709: compilers Techniques (2 Units)

Formal description of logarithmic languages, compilation techniques, synthetic analysis, code generation, syntax-directed compilers, compiler –building systems.

PDC 710: Systems Engineering (3 Units)

Fundamentals of hardware systems design, computer interfaces and configurations. Computer application modes, selection of computers for a given application – economic and technical considerations.

AEM 711: Business Management (3 Units)

The role of management in business. The structure of organization, Authority and Responsibility, Co-ordination; Forecasting, planning and formulation of Policy, Personnel Administration, Purchasing and stock control; The Role of Communication ,Industrial Relation; Control Management, Accounting and Efficiency, Research and Development.

PDC 712: Operations Research (3 Units)

Phases of operations research study , modeling, linear, dynamic and integer programming, probabilistic models, Decision theory and games, traffic flow, network flow project controls, inventory models, simulation

PDC 713: computer Network and Communications (2 Units)

Information and encoding, basic concepts of interactive computing, un interactive terminal devices protocol, direct links, communication channels, telecommunication links, simplex, duplex and hard duplex, multiplexer, circuit and packet switching; network and internet protocols, introduction to broadband multimedia networking, concentration, computer network, operating system for online processing scheduling algorithm, response time, reliability and security.

AEM 718: Business Finance (2 Units)

Ned and Role of Credit in Business Development; Sources of Business Finance; Decision Criteria in Business investments, Factors Affecting Supply and effective utilization of credits; classification of credits, credit Assessment(the 50's of credit)

PDC 716: Database Systems (2 Units)

Introduction to the concepts, approaches, tools and methodology of database design. The entity-relationship models, the model relational algebra, relational calculus, and commercial languages such as SQL, functional dependencies, normal forms, design theory, and optimization. Other topics may include concurrency control, distributed systems, security, knowledge base and concept of object –oriented database systems.

PDC 799: Project (6 Units)

Independent research work in Computer Science.

ACADEMIC STAFF AND THEIR RESEARCH INTERESTS

Name	Rank	Qualification	Area of Specialisation
Akinwale, A. T	Senior Lecturer	M.Sc, Ph.D (Poland)	Knowledge Databases
Folorunso, O	Senior Lecturer	M.Sc (UNAAB), M.Sc (Lagos), Ph.D (UNAAB)	Information Systems
Sodiya, A. S	Lecturer I	B.Sc (UNAAB), M.Sc (Lagos), Ph.D (UNAAB)	Network and Security
Adewole, A. P	Lecturer I	B.Sc (Benin), M.Sc (Lagos), Ph.D (UNAAB)	Graph Theory
**Sofoluwe, A. B	Professor	B.Sc (Lagos), M.Sc, Ph.D (U.K)	Numerical Computation
**Akinde, A. D	Professor	B.Sc (Ife), M.Sc(London), Ph.D (Sussex)	Computer Engineering

****Associate Lecturers**

DEPARTMENT OF PHYSICS

M.Sc. PHYSICS

Objectives

The programme is structured to provide conceptual and theoretical knowledge in the available fields of specializations. It provides an appropriate environment for the establishment of an advanced training programme in the basic areas of Physics that are very relevant to the establishment of the University of Agriculture.

Structure

The programme consists of core courses (covering the key areas of Physics), elective courses in the area of specialization and thesis research. Normally all course work is undertaken during the first session, while the research project is done during the second session.

Detailed structure

Course Title	Units
Core courses	13
Electives	12
Project	6
Seminar	2
Total	41

Course Code	Course Title	Units
CORE COURSE ULP		
PHS 701	Quantum Mechanics	3
PHS 703	Mathematical Physics	3
PHS 705	Electromagnetic Theory	3
PHS 707	Advanced Laboratory and Workshop Practice	2
PHS 709	Numerical and Computational Methods	2
PHS 740	M.Sc. Research Project	6
		19
ELECTIVES		
PHS 702	Solid State Physics 1	3
PHS 704	Solid State Physics 11	3
PHS 706	Statistical Thermodynamics	3
PHS 708	Analysis of Data	3
PHS 710	Application of Physics in Meteorology	3
PHS 712	Advanced Meteorology	3
PHS 714	Structure and Dynamics of the Upper Atmosphere	3
PHS 716	Health Physics	2
PHS 718	Advanced Nuclear Physics	3
PHS 720	Electronic Design and Analysis	2
PHS 722	Physical Instrumentation	3
PHS 724	Advanced Computational Physics	3
PHS 726	Physics of the Earth Interior	3
PHS 728	Methods of Techniques of Geophysical Prospecting	3
		37

Ph.D. PHYSICS

This is basically a research-based degree and the programme here would be concerned mostly with research in various fields of Physics. However, all Ph.D students will be expected to present seminars in the research area as approved by the supervisors. Registration for the Ph.D programme shall be on full time or part time basis.

STRUCTURE

Candidates may be required to take some course work depending on the background. The major emphasis, however, would be on the research thesis to be submitted at the end of the courses.

Areas of Specialisation at M.Sc., and Ph.D Levels.

1. Environmental Physics
2. Radiation and Health Physics
3. Condensed Matter Theoretical Physics
4. Instrumentation
5. Computational Physics
6. Solid Earth Geophysics

Detailed Course Description

PHS 701 - Quantum Mechanics (3 Units)

Symmetry in quantum mechanics. Fundamentals of quantum mechanics – operations in Hilbert space. Matrix formulation of quantum mechanics. Angular momentum theory in quantum mechanics approximation methods in collision theory, Many electron systems, Scattering theory.

PHS 702 - Solid State Physics 1 (3 Units)

Electrons and holes, phonons, magnons and exciton, theory of protons and lattice vibration X-ray and neutron scattering. Theory of reciprocal lattice and crystal diffraction. Defects in crystalline solids. Dislocations. Crystal growth.

PHS 703 - Mathematical Physics (3 Units)

Complex variables, Group Theory and applications, Introduction to partial differential equations and application. Wiener-Hopf method. Method of integral transform, and application to the solution of initial and boundary value problems, Green's functions Calculus of variations. Integral equations. Methods of Asymptotic expansion.

PHS 704 - Solid State Physics 11 (3 Units)

Basic ideas of quantum statistics many body theory, electrons in solids. Band theory of solids Electron theory in metals and Fermi-Dirac statistics. Super-conductivity and Super fluidity optical processes in solid, semi-conductor physics, theory of magnetism, magnet-optical properties of solids.

PHS 705 -Electromagnetic Theory (3 Units)

Electrostatic potential and magnetostatic problems, Poisson and Laplace's equations, method of images, Green theorem... Multiple Expansion, Magnetic Fields, Stoke's Theorem, Vector potential, Maxwell's equations, Electromagnetic fields, simple radiating systems and diffraction. Introductory magnetic hydro dynamics and plasma physics.

PHS 706 -Statistical Thermodynamics (3 Units)

Basic postgraduate of the thermodynamics of simple homogeneous systems, thermodynamic potentials and stability of thermodynamic system. Quantum statistical mechanics, ensembles and the density matrix. Non-

interacting Bose and Fermi systems, the ideal gas, Kinetic theory, Boltzmann transport equation, Transport Phenomena in solids, liquids and gases. Boltzmann motion and its applications, connections between transport coefficient and equilibrium statistics. Nyquist thermodynamic formulation, Onsager relations.

PHS 707 -Advanced Laboratory and Workshop Practice (2 Units)

Experiments to perform in Solid State Physics Device characterizations study of thin films, X-ray diffraction, superconductivity, Hall Effect, Nuclear and magnetic resonance. Atomic and Nuclear physics Measurement of em ratio for cathode rays, Geiger and Mardsen experiment for testing the angular dependence of particle scattering. Use of X-ray spectrometer.

Experiments to be performed in Radiation Physics Particle identification techniques, standard luminescence methods for the comparison of absorbed doses. Solid state dosimetry at high doses precision and accuracy in radiation. Safety precautions in the laboratory. Basic circuit synthesis and analysis, pulse circuits telemetry and use in remote control work instrumentation and measuring techniques, impedance matching.

PHS 708 -Analysis of Data (3 Units)

Nature of observation, Errors of observation, means and media as weighted and adjusted means precision and accuracy. Parameters of frequency distributions. Measure of dispersion, skewness, kurtosis standard errors of parameters, significance tests. Theory of errors. Binomial, Gaussian and Poisson distribution. Time series persistence periodicity, quasi-periodicity, harmonic analysis, simple correlation ratio, partial correlation.

Correlation smoothing and interpolation. Curve fitting methods t-distribution analysis, test of fit, X-square distribution students t-distribution analysis of variance and F-distribution, errors of correlation coefficients.

PHS 709 -Numerical and Computational Methods (2 Units)

Interpolation schemes, the Lagrangian representation, Aitken algorithm, least square fit. Solution of linear equations, Gaussian elimination and inversion of matrices. Fourier series and harmonic analysis, differential equations, various methods of numerical integration and differentiation. Solution of ODE using step by step methods, Runge Kutta predictor methods, numerical solution of partial differential equations, Hyperbolic method of relaxation and other iterative schemes applied to simultaneous equations, ill-conditioned equations, iterative methods of solving elliptic equations.

PHS 710 -Applications of Physics in Meteorology (2 Units)

Scales of motion. The structure and composition of the atmosphere. Its general circulation, energy sources and sinks, heat vapour the mean pressure field, Rossby waves, monsoon circulations, semi-permanent anticyclones. Synoptic scale features, cyclones and easterly waves, meso-scale phenomena formulation of precipitation.

PHS 712 -Advanced Meteorology (3 Units)

Motion and scales of motion on a rotating earth, conservation principle of fluids. Thermodynamics of the lower atmosphere, condensation and precipitation process, atmospheric electricity at atmospheric convection.

Circulation and vorticity, atmospheric waves and vortices. Turbulent transfer processes in the atmosphere, Micrometeorology. Tropical atmosphere motion systems. Principles of weather forecasting and weather forecasting techniques with particular attention to the tropics. Streamlines and trajectories. Formulation of mathematical models, large scale atmospheric models, large scale atmospheric models complex numerical weather prediction models.

PHS 714 - Structure and Dynamics of the Upper Atmosphere (3 Units)

Atmospheric nomenclature. Hydrostatic equations of atmospheric structure, Scale height. He had balance in the thermosphere dissociation and diffusion. Production and loss process of ions and electrons. Chaptman theory. Attitude distribution and temporal variation of neutral and ionized constituents, temperature and collision frequency in the mesosphere and thermosphere.

Winds and tidal oscillations. Gravity waves. Draft motions of irregularities. E-region electric current and the dynamics of the ionosphere. Measuring techniques for the parameters of the neutral constituents. Opms and electrons, winds and drifts of irregularities and temperature with special emphasis on those used locally.

PHS 716 -Health Physics (2 Units)

Introduction to atomic and nuclear structure, atomic, optical microwave and radio-frequency radiation. Radiation exposures and its effects on living cells particularly the human body. Biomedical instrumentation and techniques, Radiation protection, uses of radiation biomedical applications, Nuclear Power and its production.

PHS 718 -Advanced Nuclear Physics (3 Units)

Review of nucleon-nucleon interactions two-nuclear problem, phenomenology of the two nucleon interaction. Nuclear forces, Nuclear structure. Phenomenological models and microscope theories. The Nuclear shell models, unified collection methods of many body treatment of the nucleus. Fundamental Particles, accelerators.

PHS 702 -Electronic Design and Analysis (2 Units)

Circuit theory, network synthesis and analysis. Basic theory of amplifiers, feedback systems and application, Equivalent electrical circuits for physical and biological systems stability and oscillations. Operational amplifiers, integrated circuits and analog systems, linear and non-linear analogue systems, integrated linear and non-linear digital systems.

PHS 722 -Physical Instrumentation (3 Units)

The Electronics of Instrumentation. Circuit element laws and network. Signal amplification and noise elimination. Operational amplifiers and applications. Methods and techniques of scientific measurements.

Sensor processors storage and retrieval systems. Display and recoding of signals. Basic principles of the D'Arsonval meter UTU'M, the generalized meter and the C.R.O. Automatic synchronizations mechanics and stability. Analogue and digital recording systems and converters. Computer compatible data logging D. C. and bridges. Electrical transducers and applications in instrumentation (the application will involve the design of instrument prototypes).

PHS 724 -Advanced Computational Physics (3 Units)

Numerical techniques-differentiation integral solution of different equations, matrix algebra, simulation methods molecular dynamics Monte Carlo techniques, slow iterative algorithms, Application to quantum and statistical mechanics, lattice models, integrating many particle systems, non-linear dynamics, field theoretical models, electronics structure calculations.

PHS 726 -Physics of the Earth Interior (3 Units)

The composition of the earth. The physical characteristics of earth's materials mechanical, electrical and magnetic properties. Earth's gravity and the earth's figure and interior. Further evidence from seismology, geothermal state and geomagnetism. Geodynamics – Global picture of the dynamic earth. Plate theory and rheology of the earth's interior. Evidence from geomagnetic reversals. Mechanism of earthquakes and the new global tectonics. Field and laboratory investigations, especially high pressure geophysics.

PHS 728 -Methods and Techniques of Geophysical Prospecting (3 Units)

A classification of geophysical techniques for investigating the earth crust. Unified approach to geophysical data acquisition, analysis and interpretation Planning, Staking, mapping, presentation of results, analysis and interpretation techniques. Gravity methods, Seismic refraction and reflection techniques. Magnetics and Geoelectrics. Field and laboratory techniques. Generalised interpretation techniques and geophysical instrumentation. (Instrumentation will involve particular geophysical instrument which will be selected every year).

PHS 740 -M.Sc. Project (6 Units)

STAFF LIST

Name	Rank	Qualification	Area of Specialisation
Akinyemi, O. D	Senior Lecturer	B.Sc., M.Sc., Ph.D (Ibadan)	Solid Earth Physics
Olowofela, J. A	Reader	B.Sc (Jos), M.Sc., Ph.D (Ibadan)	Solid Earth Physics
Njah, A. N	Senior Lecturer	B.Sc. (Jos), M.Sc., Ph.D (Ibadan)	Theoretical Physics
Badmus, B. S	Senior Lecturer	B.Sc, M.Sc, (Ibadan) Ph.D (Lagos)	Solid Earth Physics
Olufunmilayo Alatise	Lecturer I	B.Sc, M.Sc (Ibadan), Ph.D (UNAAB)	Health Physics
Adebayo, G. A	Lecturer I	B.Sc., M.Sc., Ph.D (Ibadan)	Condensed Matter Physics