# Department of Medical Biochemistry

## MSc and PhD Degree Programmes

### Philosophy

Biochemical concepts have all been explained at molecular level. Medical Biochemistry employs these concepts in the elucidation of the molecular basis of Medicine. Research activities in the Department of Medical Biochemistry, UNEC, in the past and present are directed at the achievement of this aim. Research themes in the Department cut across areas of relevance to community needs, and include Biochemical and molecular parasitology, Enzymology, Micronutrients and molecular toxicology, Molecular nutrition and food research, and Clinical Biochemistry. Research in these areas is carried out by staff of the Department in collaboration with staff in other Departments of the University of Nigeria, in other Universities in Nigeria and in Universities outside the Country.

### Objective

In line with the philosophy of the University of Nigeria, the postgraduate programmes of the Department of Medical Biochemistry are designed to produce graduates who will be research leaders within the country and all around the world. Our postgraduate students may carry out research and thereafter specialize in any of the afore-mentioned areas of specialization. After graduation, they are therefore qualified to be employed as Lecturers, Researchers in research institutes, Heads of research and Development in Companies, Medical scientist in diagnostic laboratories, etc.

### Entry requirements

* Candidates for admission into the Master’s degree programme of the Department of Medical Biochemistry, UNEC, must hold a BSc degree in Biochemistry or Medical Biochemistry, with CGPA of at least 2.50 on a 5-point scale. Combined Biological Science (Biochemistry/Microbiology) graduates, with CGPA of at least 2.50 on a 5-point scale, may be required by the Departmental Academic Board to do some remedial courses before proceeding with the MSc programme. Medical graduates (holders of MBBS or BDS) must have passed Medical Biochemistry at **one** sitting in the First MBBS/BDS Professional Examination to qualify for admission into the MSc programme in Medical Biochemistry.
* Candidates for admission into the PhD programme of the Department of Medical Biochemistry, UNEC, must hold an MSc in Biochemistry or Medical Biochemistry with a CGPA of at least 4.0 on a 5-point scale.
* Holders of a First class honours degree in Biochemistry or Medical Biochemistry may be admitted into the Master’s/Doctoral degree programme of the Department of Medical Biochemistry, UNEC. Candidates admitted into the Master’s/Doctoral degree programme of the Department of Medical Biochemistry could be allowed to proceed with the PhD programme on completion of the MSc coursework if the candidate attains a CGPA of 3.5 and above in the MSc coursework.

### Duration of study

The maximum and minimum durations for the MSc programme of the Department of Medical Biochemistry are as follows:

* Full time: A minimum of 3 semesters (18 months)

A maximum of 5 semesters (2 years and 6 months)

* Part time: A minimum of 4 semesters (2 years)

A maximum of 6 semesters (3 years)

The duration for Master’s/Doctoral studies in the Department of Medical Biochemistry, UNEC, are as follows:

* Full time: A minimum of 8 semesters (4 years)

A maximum of 12 semesters (6 years)

* Part time: A minimum of 10 semesters (5 years)

A maximum of 14 semesters (7 years)

The duration for Doctoral programme (after MSc) in the Department of Medical Biochemistry, UNEC, are as follows:

* Full time: A minimum of 6 semesters (3 years)

A maximum of 10 semesters (5 years)

* Part time: A minimum of 8 semesters (4 years)

A maximum of 12 semesters (6 years)

The first two semesters of either the Doctoral or the Master’s shall be devoted to course work and written examinations; the remaining semesters of the Doctoral programme shall be for research, preparation of thesis and oral examination, while the remaining semesters of the MSc programme shall be used for research, preparation of project report and oral examination.

### Course Outline for Master’s Degree Programme of Medical Biochemistry Department, UNEC.

**Course No. Title Units**

Md. Bchm. 702 Enzymes, Enzyme kinetics and mechanism of 3 enzyme action

Md. Bchm. 710 Biochemical Thermodynamics (Bioenergetics) 3 and biological oxidations

Md. Bchm. 720 Protein synthesis and Biochemical genetics 3

Md. Bchm. 722 Metabolic and genetic diseases 3

Md. Bchm. 730 Hormones and Hormone action 3

Md. Bchm. 732 Metabolic regulations and interrelationship 3

Md. Bchm. 740 Modern nutrition concepts and nutritional 3 diseases

Md. Bchm. 742 Applied nutrition 3

Md. Bchm. 750 Basic neurochemistry 3

Md. Bchm. 760 Biological buffers 3

Md. Bchm. 770 Biochemical instrumentation & techniques 3

Md. Bchm. 771 Seminars 3

Md. Bchm. 790 Research projects – MSc Project 8

Md. Bchm. 734 Metabolism of foreign compounds 3

Md. Bchm. 752 Advanced neurochemistry 3

Md. Bchm. 762 Clinical Biochemistry 3

Md. Bchm. 780 Immunochemistry 3

PGC. 601 Research Methodology and Application of ICT in

 Research 3

**Total Credit for Master’s degree programme in Medical Biochemistry 59**

### Course Outline for Doctoral Degree Programme of Medical Biochemistry Department, UNEC.

**Course No. Title Units**

Md. Bchm. 801 Practical skills review 3

Md. Bchm. 805 Immunochemical methods 4

Md. Bchm. 811 Molecular Biology methods 4

Md. Bchm. 815 Radioisotope techniques 3

Md. Bchm. 825 Environmental Biochemistry 3

Md. Bchm. 810 Advanced topics in Medical Biochemistry 3

Md. Bchm. 871 Advanced Seminar in Biochemistry 3

Md. Bchm. 802 Proteomics 3

Md. Bchm. 830 Computational Biochemistry 3

Md. Bchm. 890 PhD Thesis 12

PGC 701 Synopsis and Grant Writing 3

**Total Credit for Doctoral degree programme in Medical Biochemistry 44**

### Course Description (MSc Degree programme).

**Md. Bchm. 702: Enzymes, Enzyme Kinetics and Mechanisms of Enzyme action**

Regulation of enzyme synthesis and activity; Metabolic pathways as integrated Enzymatic reactions; Enzyme structure and reactions; Nature and mechanisms of enzyme catalysis; Quantitative analyses of enzyme kinetics from concentration and reaction velocities; kinetic analysis of enzyme inhibition; clinically important enzymes; Enzyme inhibitors and their modes of action.

**Md. Bchm. 710: Biochemical Thermodynamics (Bioenergetics) & Biological oxidation**

Laws of thermodynamics as applied to biochemical systems; Concepts of free energy and entropy of a system; Equilibrium and standard free energy changes; coupling of exo- and endo-thermic reactions; oxidative phosphorylation and other energy transduction processes; the role of ATP and other high energy compounds in the biological system. Biochemical nature and mode of action of biological oxidation systems; Biological oxidations and conservation of energy; use of uncouplers and inhibitors in the study of biological oxidations.

**Md. Bchm. 720: Protein synthesis and Biochemical genetics**

A detailed analysis of the nature and properties of the genetic material; Mechanism underlying gene replication, repair and recombination; Protein synthesis and its controland regulation theories.

**Md. Bchm. 722: Metabolic and Genetic Diseases**

Human genetics; molecular features of infective disease.Investigation of the molecular basis of disease. Survey of some common metabolic and genetic diseases (in-born errors) associated with metabolism of carbohydrates, proteins/amino acids, lipids and nucleic acids; Basic tools of molecular analysis; modern molecular methods in human diseases; prospects of genetherapy.

**Md. Bchm. 730: Hormones and Hormone action.**

Endocrine glands, hormones and target tissues; Hormonal Secretion and Regulation Postulateed Mechanism of Hormone action; Chemistry, mechanism of action, Metabolic effects and regulation in respect of the following: the peptide hormones and amino acid-derived hormones; the steroid hormones – corticosteroids; gonadal hormones; the gastro-intestinal hormones.

**Md. Bchm. 732 Metabolic Regulations and Inter-Relationships.**

General aspects of biochemical control mechanism; discussion on the type of control mechanisms such as genetic; structural, enzymic, feedback, and pace-maker mediated; regulation and control of specific metabolic processes such as those of carbohydrates, lipids, proteins and nucleic acids; control and regulation of energy metabolism; metabolic inter-relationships among the various cellular components and metabolites.

**Md. Bchm. 734 Metabolism of Foreign Compounds.**

Definition of enzyme systems involved; Mechanism of intoxication and detoxification; structure/activity relationship; factors affecting metabolism of foreign compounds.Phase I and Phase II reactionsof xenobiotics.

**Md. Bchm. 740 Modern Nutrition Concepts and Nutritional diseases.**

General survey of nutritional aspects and roles of major food constituents-protein, lipid, Carbohydrates, vitamins and minerals and trace elements.Food and nutrition security. Concept of nutrition through the life cycle: infancy to elderly nutrition requirements; energy content of food and requirements; Breast milk and exclusive breast feeding, benefits; Multinutrient malnutrition – kwashiorkor, marasmus and Micronutrient deficiencies (“Hidden hunger”), obesity – indices and management. Vegetarianism – advantages and disadvantages; Barkers Hypothesis (IUGR and Adult diseases), concept of “1000 – days window of opportunity”; Diet and genetic basis of diabetes, atherosclerosis and CVD; Food fortification and nutraceuticals.

**Md. Bchm 742 Applied nutrition**

Focus will be placed on pre-natal and post-natal nutritional requirements; infant feeding, adolescent feeding, role of diet in the pathogenesis and management of cancer and the degenerative diseases; measurement of nutritional status – anthropometry. Dietary diversification, protein complementation and food fortification and nutraceuticals; functional foods, role of probiotics and prebiotics.

**Md. Bchm 750 Basic Neurochemistry.**

Survey of membrane biochemistry; Transport mechanisms across the membrane - active transport (Properties of Na+/K+ATPases).Functions of neuronal membranes; axonic and synaptic transmissions and neuromuscular junctions.Resting and action potentials.Definition and classification of neurotransmitters.Metabolism of the neurotransmitters (excitatory and inhibitory) –The GABA shunt. G-protein linked receptors and the concept and mechanismof action of second messengers such as phosphatidylinositols; other relevant disciplines of neuroscience; Function of neural membranes; Synaptic function; brain metabolism neuro-endocrinology; biochemistry of vision.

**Md. Bchm. 752 Advanced Neurochemistry.**

General overview of neurosciences; neuroanatomy; neurophysiology; and neurobiochemistry.Brief explanation and neuropharmacology of axonal and synaptic transmission.Definition, classification and synthesis of neurotransmitters and their action.Biochemistry of agonists and antagonists and their medical importance.The concept of structure and function of classical receptors (muscarinic and nicotinic receptors) and their medical significance.Modern approaches to the study of receptors, neurotransmitters and neurotransmitter enzymes, neuropharmacology, neuroendocrinology ; The biochemistry of neurological and psychiatric disorders such as Parkinson’s disease, epilepsy, depression schizophrenia etc.

**Md. Bchm 760 Biological Buffers.**

General concepts of pH, buffers, buffer capacity; Significance of acid-base balance in the living system; Buffer systems of tissue and body fluids; Roles of tissues and organs such as RBC, lungs and kidneys in maintaining and regulating the activity of the body fluids and tissues, Water and electrolyte metabolism.

**Md. Bchm 762 Clinical Biochemistry**

Blood:Composition and functions; urine: formation and composition, normal and abnormal constituents of urine and metabolism of major urinary excretory products; function tests: Renal, hepatic, gastric and thyroid function tests and their use (and interpretation), evaluation of the dysfuction of these organs; water and electrolyte balance and imbalance; cerebrospinal fluid – their chemistry and clinical significance; Radioactivity, its hazard and protective mechanisms, diagnostic and therapeutic uses in medicine; Composition and characteristics of faeces – Clinical and diagnostic significance.

**Md. Bchm 770 Biochemical Instrumentation and Techniques.**

Isotopic Techniques, Chromatographic Techniques; the use of the Amino Acid Analyser, Spectrophotometric Techniques, Radio-Immunoassay Techniques, Radio-Immunoassay procedures, Micro-analytical and Diffusion Techniques, Ultracentifugation and Electrophoresis,etc

**Md. Bchm 771 Seminars**To be arranged.

**MdBchm 780 Immunochemistry (Elective)**

Structure and function of immunoglobulins; antigen – antibody interactions; molecular basis of immune reactions; immunological tests and their clinical relevance and immunological basis of immunizations inclucingseroepidemiology tests applicable to communicable diseases.

**Md. Bchm 790 Research Project – M.Sc Project.**

**PGC 601: Research Methodology and Application of ICT in Research 3 Unit**

In-depth research work aimed at acquiring full knowledge and presentations in scholarly writing of the concepts, issues, trends in the definition and development of the study are from African and Western perspectives. Major steps in research: Selection of problem, Literature review, Design, Data collection, analysis and interpretation, Conclusions. Study of various research designs, Historical, Case Studies, Surveys, Descriptive, Cross sectional, Experimental, etc. Analysis, surveys and synthesis of conceptual and philosophical foundations of different disciplines. Identification of research problems and development of research questions and or hypotheses. Detailed treatment of methods of collecting relevant research data and the format for presenting research results (from designing the table of contents to referencing, bibliography and appendix). Data analysis and result presentation in different disciplines using appropriate analytical tools. Methods of project/dissertation writing. Application of appropriate advanced ICT tools relevant in every discipline for data gathering, analysis and result presentation. Essentials of Spreadsheets, Internet technology, and Internet search engines. All registered Masters Degree students must attend a solution-based interactive workshop to be organized by the School of Postgraduate Studies for a practical demonstration and application of the knowledge acquired from the course, conducted by selected experts.

# Course Description (PhD Degree programme)

**Md. Bchm. 801 Review**

Practical aspects of chromatography, Electrophoresis and cell organelle extraction skills, etc.

**Md. Bchm.805 Immunochemical Methods**

Radioimmunoassay (RIA), Enzyme-Linked Immunosorbent Assay (ELISA), Fluorescent Immunoassay (FIA), Acidin-Biotin mediated Immunoassay and Particle counting Immunoassay (PACIA)

**Md. Bchm. 811 Molecular Biology Methods**

Isolation and characterization of nucleic acids.Sequencing of DNA, Isolation of specific DNA sequences-Polymerase chain Reaction (PCR).Enzymes in genetic manipulation, cloning vectors.

**Md. Bchm. 815 Radioisotope Techniques**

Nature and measurement of radioactivity.Application of radioisotopes in biochemical research; Autoradiography.

**Md. Bchm. 825 Environmental Biochemistry.**

Pollution – toxic wastes and radiation hazards. Bioremediation; Management and disposal of radioactive and toxic wastes.

**Md. Bchm. 810 Advanced Topics in Medical Biochemistry**

Contemporary issues in Medical Biochemistry, Biotechnology, Molecular Biology and Advanced Human Nutrition.

**Md. Bchm. 802 PROTEOMICS.**

Introduction, tools of proteomics, mining, protein expression, profiling protein networking and mapping of protein modifications.

**Md. Bchm. 830 COMPUTATIONAL BIOCHEMISTRY**

Introduction, data bases of nucleic acids, proteins and others, Molecular graphics, proteomic analyses, phylogenetic analyses.

**Md. Bchm 890 Ph.D Thesis.**

**Md. Bchm 871 Advanced Seminar in Biochemistry** (To be arranged).

**PGC 701: Synopsis and Grant Writing**

Identification of types and nature of grant and grant writing; mining of grants application class on the internet. Determining appropriate strategy for each rant application. Study of various grant application structures and contents and writing of concept notes, detailed project description, budgeting and budget defense. Study of sample grant writings in various forms and writing of mock research and other grants. Identification of University of Nigeria synopsis structure and requirements, (Introduction, Methodology and Results). Determining the content of each sub-unit of the synopsis. Steps in writing of synopsis from the Dissertation/Thesis document. Structural and language issues. Common errors in synopsis writing and strategies for avoiding them. The roles of the student and the supervisor in the production of a synopsis. Writing of mock synopsis. All registered Ph.D students must attend a solution-based interactive workshop to be organized by the School of Postgraduate Studies for a practical demonstration and application of the knowledge acquired from the course, conducted by selected experts.

### List of Approved/Available Supervisors.

 **Staff** **Specialty**

* Prof P O J Ogbunude Molecular and Biochemical

BSc (Hons; Ibadan), MSc (Alberta), PhD (ABU). Parasitology.

* Prof I E Ezeagu Public Health Nutrition and Food

BSc (Hons), MSc, MPhil, PhD (Ibadan). Research, Diet, Chronic disease prevention Nutrition

* Prof F E Ejezie Micronutrients and Molecular BSc (Hons), MSc (Nig.), PhD. Toxicology
* Dr A AEze Genomics and Biochemical

BSc (Hons; Nig.), MSc (Port Harcourt), Parasitology; Clinical

PhD (Glasgow). Enzymology& immunology

* Dr C O Ezeh Genomics & Clinical Enzymology;

BSc (Hons; Nig.), MSc, PhD (Port Harcourt). Biochemical toxicology, Proteomics

* Mrs J E Ikekpeazu Genomics, Clinical Biochemistry

BSc (Hons), MSc (Nig), PGDE, AIMLS. andMolecular diagnostics

* Dr D M Ibegbu Biochemical toxicology and Nano BSc (Hons), MSc (Ibadan), PhD (Portsmouth) . Drug delivery