



**FEDERAL UNIVERSITY OF TECHNOLOGY  
AKURE, ONDO STATE  
NIGERIA**

**DEPARTMENT OF BIOCHEMISTRY**

**BCH 201 & 202: GENERAL BIOCHEMISTRY I & II: (6 UNITS)**

Chemistry of amino acids, proteins and their derivatives, methods of isolation and identification acidity and alkalinity, pH and pK a values and their effects on cellular activities, Buffers Chemistry/Structures of Carbohydrates, lipids and nucleic acids, Primary, Secondary, tertiary and quaternary structures. Nomenclature of nucleosides, and nucleotides, effects of acid and alkali on hydrolysis of nucleic acids. Structures and functions of major cell components, prokaryotic versus eukaryotic organisms.

**BCH 301: FOOD BIOCHEMISTRY: (1 UNIT)**

An introduction to the theory and application of physical and chemical methods of determining the constituents of food. Food processing, preservation and storage of traditional foods roots and stem tubers, fruits and fruit drinks, seeds and grains, green and vegetables. Food poisoning and intoxication: prevention and cure.

**BCH 302: METABOLISM OF CARBOHYDRATES: (2 UNITS)**

Degradation and digestion of carbohydrates-sugars, storage polysaccharides and cell walls. Reactions of sugars, Glycolysis, the Tricarboxylic acid cycle, the phosphogluconate pathway, the glyoxylate pathway, the pentose phosphate pathway the Cori cycle, the Calvin cycle. Gluconeogenesis and glycogenolysis. Disorders of carbohydrate metabolism.

**BCH 303: MEMBRANE BIOCHEMISTRY (1 UNIT)**

Structure, composition and functions of biological membranes. Isolation, characterization and classification of membranes. Chemistry and biosynthesis of membranes. Molecular organization of membrane components. Natural and artificial membrane bilayers - the unit membrane hypothesis. Membrane transport system: active versus passive transport systems. Transport of sugars, amino acids and ionophores.

**BCH 304: METABOLISMS OF AMINO ACIDS & PROTEINS (2 UNITS)**

Amino acids as building blocks of proteins: covalent backbone of proteins; Protein isolation, fractionation, purification and characterization. Biological functions of protein. Oxidative degradation of amino acids and metabolism of one carbon unit. Biosynthesis of amino acids and some derivatives. the urea cycle, metabolism of inorganic nitrogen. Disorders of amino acid metabolism.

**BCH 305: NUTRITIONAL BIOCHEMISTRY: (1 UNIT)**

Food nutrients, Energy values of foods and energy expenditure by mammals. Nutritive value of foods: carbohydrates, fats, proteins, vitamins, mineral elements and water. Nutritional disorders: prevention and therapy. Nutritional status and nutrient requirements. Recommended dietary allowances. Assessment of nutritional status. Nutrient requirements, in relation to Physical activity and ageing, diet and disease obesity and under nutrition.

**BCH 306: METHODS IN BIOCHEMISTRY (1 UNIT)**

Principles of instrumentation; Principles, methodologies and applications of electrophoresis, Chromatography, thin layer chromatography, Spectroscopy and Spectrophotometry, centrifugation and isotopic techniques. (Pre-Requisite -BCH 201)

**BCH 308: METABOLISM OF NUCLEIC ACIDS (2 UNITS)**

Genome organization and biosynthesis of proteins, Metabolism of purines and pyrimidines, nucleosides and nucleotides, abnormalities in nucleic acid metabolism-xeroderma pigmentation and skin cancer.

**BCH 310: METABOLISM OF LIPIDS (2 UNITS)**

Classification of lipids - fatty acids, triglycerides, glycosylglycerols, phospholipids, waxes, prostaglandins. Lipid micelles, monolayers and bilayers Lipoprotein. Oxidation and synthesis of fatty acids; cholesterol synthesis. Formation of ketone bodies. Integration of lipid metabolism. Acetic acid as a central precursor for biosynthesis of lipids.

**BCH 312: ENZYMOLOGY: (3 UNITS)**

Vitamins and co-enzymes: Fat and water soluble vitamins, structures and functions. of vitamins and co-enzymes. Classification and nomenclature of enzymes. Kinetics of enzymes and inhibition. Mechanisms of enzyme-catalysed reactions. Effects of temperature, PH, ions and inhibitors on enzyme catalysed reactions. Michaelis-Menten Equation, Allosteric! Regulatory enzymes. Active sites of enzymes. Estimation of kinetic parameters of enzyme activities  $K_m$ ,  $V_{max}$ ,  $K_i$  etc. Zymogen activation, digestive enzymes etc. Production, isolation purification and characterization of enzymes. Recent advances in enzymology.

**BCH 314: BIO-ENERGETICS(1 UNIT)**

High-energy compounds, chemical potentials, electrochemical potentials, Electron transport system and oxidative phosphorylation; Regulation of ATP production. Chemical thermodynamics, Oxidations reductions.

**BCH 316: GENERAL BIOCHEMICAL METHODS (PRACTICAL) (2 UNITS)**

Practical Laboratory Exercises in areas of interest of academic staff to cut across a wide spectrum of general biochemistry. Laboratory practical may be arranged on the basis of 6 hours per week or 3 hours per week for a second semester.

**BCH 401: ADVANCE ENZYMOLOGY (2 UNITS)**

Steady state enzyme kinetics. Transient kinetic methods. Chemistry of enzyme catalysis. Regulatory enzymes. Molecular models for allosterism. Multienzyme complexes. Enzyme assays. Criteria for determining purity of enzymes. Enzyme reconstitution. Regulation of enzyme activity and synthesis.  
(Pre-requisite BCH 312).

**BCH 402, 404, 406: STUDENT INDUSTRIAL WORK EXPERIENCES (SIWES) (10 UNITS)**

Students will be attached to some industrial organizations for 6 months, the exact period being determined by the institution.

**BCH 403: BIOCHEMICAL TOXICOLOGY 1 (3 UNITS)**

Biochemical toxicology, definition and scope, absorption and distribution, toxicokinetics, metabolism of toxicants, comparative toxicology; physiological factors affecting metabolism of xenobiotics, chemical and environmental factors affecting metabolism of xenobiotics, elimination of toxicants and their metabolites, toxicant-receptor interactions, genetic poisons' chemical

carcinogenesis, trace element toxicity, hepatotoxicity.

**BCH 405: PLANT BIOCHEMISTRY (2 UNITS)**

Organization of Plant cells, Photosynthesis, alkaloids and flavonoids; Plant hormones, Biosynthesis of carotenoid Pigments, Biochemistry of Plants Development. The plant cell wall structure, formation and growth, Lignin formation. Free amino acids, pyrimidines, purines and nucleosides in plants. Metabolism of auxins, gibberellins and cytokinins. Synthetic growth regulators and herbicides. Structure function relationship of plant hormones.

**BCH 407: BIOSYNTHESIS OF MACROMOLECULES (1 UNIT)**

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

**BCH 409: ADVANCED BIOCHEMICAL METHODS (PRACTICAL) (2 UNITS)**

The purpose of this course is to familiarize students with operations of latest biochemical equipment and with methods of assimilation and dissemination of information. Students will therefore go round lecturers and laboratories housing specialized equipment with aim of exposing them to such equipment under the supervision of Lecturer. Part of the course will also cover the effective use of the Library, preparation of dissertations or theses, papers for journal publication and journal reviews. Special assignments and essays will be given to students.

**BCH 411: BIO-INORGANIC CHEMISTRY (1 UNIT)**

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

**BCH 413: GENETIC ENGINEERING: (1 UNIT)**

Replication, transcription and translation a brief review. The genetic code and its relationship to cellular functions. DNA replication in a cell-free system. Genetic transformation, transduction and conjugation. Gene mutation, mutation, mutagenic agents and their applications to gene transfer. Gene mapping. Structure of eucaryotic genome. Recombinant DNA and its application. Hybridomas.

**BCH 415: BIOCHEMICAL REASONING (1 UNIT)**

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

**BCH 417: BIOCHEMISTRY OF PARASITES (2 UNITS)**

Survey of different types of parasites. Host-parasite relation. Metabolism in selected parasites. Parasitism versus symbiosis. Genetics of parasites. In vitro cultivation of selected parasites. Immunology of parasites, chemotherapeutical control of parasites.

**BCH 501: METABOLIC REGULATIONS (2 UNITS)**

The relationship of Krebs Cycle to protein, carbohydrate, lipid and nucleic acids metabolism. Integration of metabolic pathways. Turnover rates and metabolic pools. Regulation of enzymes of metabolic pathways-feed back inhibition versus enzyme synthesis catabolite repression, end product repression, the lactose operon and arabinose operon. Identification of different regulatory mechanism in metabolic pathways.

**BCH 502: BIOCHEMICAL TOXICOLOGY II (2 UNITS)**

Resistance and tolerance to toxicants, natural toxins, chronic testing in animals, short term tests for mutagenicity in the toxicological evaluation of chemicals, drug metabolite isolation and structural identification, biochemical modes of action of pesticides, enzymatic basis of detoxication.

**BCH 503: PHARMACOLOGICAL BIOCHEMISTRY (2 UNITS)**

Cellular metabolism in infected cells. Biochemical aspects of host-parasite relationships. Metabolic factors affecting chemotherapeutic agents. Theories of the mechanism of drug action. Drug resistances and other factors affecting drug efficacy. The physiological and biochemical action of some selected drugs. Nigerian traditional medicinal plants in the management and therapy of common ailments in Nigeria - malaria, sickle cell anemia, common cold, hepatitis etc.

**BCH 504: ADVANCED BIOTECHNOLOGY (3 UNITS)**

Coordination of microbial metabolism, biosynthesis of metabolites, media and air sterilization power requirements in fermentation vessels, mass transfer in fermentation vessels, instrumentation and control of fermentation processes, computers in fermentation processes; theory application and technique of continuous culture. Chemicals and fuel via fermentation, oxygen transfer and scaleup; production of antibiotics, cellulose, and starch hydrolysis (mechanisms and applications).

**BCH 505: ENZYME BIOTECHNOLOGY (3 UNITS)**

Principles of industrial large scale production of enzymes (techniques in fermentations). Large-scale extraction and purification. Principles and Design of immobilized enzyme reactors. Characteristics of free versus immobilized enzymes. Immobilized coenzymes and cells. Enzyme utilization in industrial processes.

**BCH 506: BIOMASS UTILIZATION (2 UNITS)**

The concept of biomass for energy and fuels: now and in the future. . Food, chemical, feedstocks. Raw materials and preparation - forest inventories, agricultural perspectives, aquatic source, municipal solid waste production of microalgae, hydrogen from water, structure and chemical composition of biomass, anatomy, ultra-structure and chemical composition of wood cellulose. Structural characteristics of acidhydrolysis of lignin. Conversion methods of biomass-biological and thermochemical Cellulose and their applications.

**BCH 507: INDUSTRIAL BIOCHEMISTRY (3 UNITS)**

A short review of microbial physiology and genetics. A review of general metabolic pathway, control and application in industrial processes. Continuous culture methods, principles and applications. The chemostat and its application in industrial fermentations. Fermentations-alcoholic, amino acids, antibiotics and its and other secondary metabolites. Primary and secondary metabolism. Process evaluation and development. Over production of metabolites - amino acids, taste enhancers, organisms of industrial importance. Induction of mutation in micro-organisms and plants for the purpose of over production. Strain selection/development and enhancement. Gene dosage and its application in industrial processes.

**BCH 508: SPECIAL TOPICS/SEMINARS IN BIOCHEMISTRY (2 UNITS)**

Hormones, immunochemistry, oncology, brain biochemistry, monoclonal antibodies. These may be taught or seminars may be given by academic staff and students.

**BCH 50: BIOPHYSICS (2 UNITS)**

Some instrumental methods in biophysics, chemical energy, structures and behaviours of macromolecules in solution. Reaction Kinetics. Mechanism in biophysics, sensory function of the nervous system.

**BCH 510: TISSUE BIOCHEMISTRY (1 UNIT)**

Biochemistry of muscles, kidney, liver, and adipose tissues. General metabolism of the brain and neuronal biochemistry. Biochemistry of reproductive tissues. Detoxification and excretion in tissues.

**BCH 511: STUDENT PROJECTS (6 UNITS)**

Independent research findings into selected areas/topics of interest to the academics staff. Students will be required to carry out literature survey on the topics, perform experiments and produce short reports (preferably at the end of second semester). Students will be subjected to both seminar and oral examination on the projects undertaken.

**BCH 512: PROCESS BIOCHEMISTRY (3 UNITS)**

Basic concepts of anaerobic metabolism, isolation, cultivation and identification of anaerobes Thermophilic anaerobes and their unique features. Survey of useful products manufactured by microorganisms, culture of yeasts, mould, bacteria actinomycetes, mammalian cells, genetic programming of industrial microorganisms. Microbial production of beer, wine, bread, and cheese. Microbiological production of pharmaceuticals (hormones and interferon) and industrial chemicals. Methanogenesis mechanism and application for waste treatment, production methods in industrial microbiology School Courses).