SYNOPSIS OF BIOCHEMISTRY COURSES OFFERED IN THE DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

BCH 201: GENERAL BIOCHEMISTRY I (2 UNITS) L:2 T:0 P:0

BCH 202: GENERAL BIOCHEMISTRY II (2 UNITS) L:2 T:0 P:0
Methods of studying metabolism. Metabolism of carbohydrates, lipids and proteins; Metabolism of purines, pyrimidines and nucleotides. Effects of acid and alkali on hydrolysis of nucleic acids. Structures and function of major cell components – prokaryotes versus eukaryotic organisms photosynthesis. (Pre-requisites BCH 201).

BCH 301: METABOLISM OF CARBOHYDRATES (2 UNITS) L:2 T:0 P:0
Digestion and degradation of carbohydrates – sugars, storage polysaccharides and cell walls. Reactions of sugars – Glycolysis, the tricarboxylic acid cycle, the pentosephosphosphate pathway, the Cori cycle, the Calvin pathway, gluconeogenesis and the disorders of carbohydrate metabolism (Pre-requisites BCH 201, 202).

BCH 303: METABOLISM OF LIPIDS (2 UNITS) L:2 T:0 P:0
A survey of structure, functions, biosynthesis and catabolism of different classes of lipids. The regulatory aspects of biosynthesis and catabolism of the lipids, especially in relation to homeostasis in the organism will be stressed. The lipids include: fatty acids, glycerides, phosphoglycerides, waxes, prostaglandins, terpenoids and steroids such as bile acids, steroid hormones, carotenoids and vitamin A, vitamin D and terpenoid quinones. Biological membranes. (Pre-requisites BCH 201, 202).
**BCH 305: METABOLISM OF AMINO ACIDS AND PROTEINS (2 UNITS) L:2 T:0 P:0**


**BCH 307: METABOLISM OF NUCLEIC ACIDS (2 UNITS) L:2 T:0 P:0**


**BCH 309: BIOCHEMISTRY METHODS (2 UNITS) L:2 T:0 P:0**

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

**BCH 311: BIOENERGETICS (2 UNITS) L:1 T:1 P:0**


**BCH 313: EXPERIMENTAL BIOCHEMISTRY (1 UNIT) L:0 T:0 P:1**
Practical classes in Biochemistry to cover most of the theories taught in class-metabolism, energetics, etc.

**BCH 388: SEMINAR (2 UNITS) L:2 T:0 P:0**
Seminars to be given by students on selected topics.

**BCH 317: ENZYMEOLOGY (2 UNITS) L:2 T:0 P:0**

**BCH 388: SEMINAR (2 UNITS)**

**BCH 398: INDUSTRIAL ATTACHMENT (6 UNITS)**
Students will be attached to some industrial organizations for 24 weeks

**BCH 401: ADVANCED BIOCHEMICAL METHODS (2 UNITS) L:0 T:0 P:2**
The purpose of this course is to familiarize students with operations of latest biochemical equipments and with methods of research assimilation and dissemination of information. Students will therefore go round lecturers and laboratories housing specialized equipments with the aim of exposing them to such equipment under the supervision of the lecturer. Part of the course will also cover the effective use of the library, preparation of dissertations or theses, papers for journal publications and journal review. Special assignments and essays will be given to students. (Pre-requisites BCH 309)

**BCH 403: BIOSYNTHESIS OF MACROMOLECULES (2 UNITS) L:2 T:0 P:0**
Structure and functions of macromolecules. Storage and structural polysaccharides; mucopolysaccharides, glycoproteins, bacterial cell wall. Synthesis of complex lipids, lipoproteins and nucleic acids (Pre-requisites BCH 301, 303).
BCH 404: INDUSTRIAL BIOCHEMISTRY (2 UNITS) L:2 T:0 P:0

BCH 405: REGULATION OF METABOLIC PROCESSES (2 UNITS) L:2 T:0 P:0
The relationship of Kreb’s cycle to protein, carbohydrate, lipid and nucleic acid metabolism. Integration of metabolic pathways. Illustration of regulation of linear and branched metabolic pathways using specific examples. Turnover rates and metabolic pools. Catabolite repression, end-product repression, the lactose and arabinose operons. Identification of different regulatory mechanisms in metabolic pathways. (Pre-requisites BCH 301, 303, 304)

BCH 406: PHARMACOLOGICAL BIOCHEMISTRY (2 UNITS) L:2 T:0 P:0
BCH 407: GENETIC ENGINEERING (2 UNITS) L:2 T:0 P:0

BCH 408: IMMUNOCHEMISTRY (4UNITS) L:3T:1 P:0

BCH 409: ADVANCED ENZYMEOLOGY (2 UNITS) L:2 T:0 P:0

BCH 412: PLANT BIOCHEMISTRY (2 UNITS) L:2 T:0 P:0

**BCH 414: BIOINORGANIC CHEMISTRY (1 UNIT) L:1 T:0 P:0**
Relationship between the physico-chemical properties and biological functions of inorganic ions. Ligand complexes and their biochemical significance. Electrolyte metabolism. Nitrogen fixation and sulphur cycle. (Pre-requisites CHE 211, 312)

**BCH 415: FUNCTIONAL BIOCHEMISTRY (2 UNITS) L:2 T:0 P:0**

**BCH 416: INTRODUCTORY BIOTECHNOLOGY (2 UNITS) L:0 T:0 P:0**
Definition, history and evolution of biotechnology.
Scope (different areas) of biotechnology Genes and Genetic engineering, Tools and Practice of genetic engineering (Restriction and other enzymes, vectors, DNA cutting and ligation, cloning in prokaryotic cells etc.).
BCH 417: EXPERIMENTAL BIOCHEMISTRY II (1 UNIT) L:0 T:0 P:1
Practical classes in Biochemistry to cover metabolism of nutrients in normal and disease conditions, molecular biology, toxicology, etc.

BCH 419: NUTRITIONAL BIOCHEMISTRY (2 UNITS) L:2 T:0 P:0

BCH 421: FOOD BIOCHEMISTRY (2 UNITS) L:2 T:0 P:0
Food Constituents. An introduction to the theory and application of physical and chemical methods for determining the constituents of food; processing, preservation and storage of traditional foods – root and stem tubers, fruit and fruit drinks, seeds and grains, greens and vegetable. Food poisoning and intoxication, prevention and cure. Chemical changes in foods, food enzymes and their uses.

BCH 423: INTRODUCTORY TOXICOLOGY (2 UNITS) L:2 T:0 P:0
History of Toxicology, Absorption, Distribution and Elimination of Toxicants. Detoxication mechanisms. The biochemical modes of action of pesticides and herbicides. Toxicological effects of expired drugs. Side effects of drugs as a result of use and/or misuse. Allergy and its biochemical basis. Toxins in processed foods and beverages. Screening for toxic pollutants in food, water, etc. biochemistry of aflatoxins and mycotoxins. Toxicological studies of food additives and food preservatives.
**BCH 425: MEMEBRANE BIOCHEMISTRY (1 UNIT) L:1 T:0 P:0**
Structure, composition and functions of biological membranes. Isolation, characterization and classification of membrane bilayers e.g. the unit membrane hypothesis; Membrane transport system-active versus passive transport of sugars and amino acids ionophores.

**BCH 499: RESEARCH PROJECTS (6 UNITS)**
Independent research into selected areas/topics of interest to the academic staff. Students will be required to carry out literature survey on the topics, perform experiments and produce short reports. Students will be subjected to both seminar and oral examination on the projects undertaken.

**SYNOPSIS OF CHEMISTRY AND INDUSTRIAL CHEMISTRY COURSES OFFERED IN THE DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY**

The units of Number of Lectures, Tutorials and Practical per course are indicated after each course title.

**CHE 101: Physical Chemistry I**

**CHE 102: Inorganic chemistry I**
Electronic configuration periodicity and building up of the periodic table. Hybridization and shapes of simple molecules. Extraction of metals. Comparative chemistry of group IA, IIA and IVA and IVA elements. Introduction to transition metal chemistry and nuclear chemistry.

**CHE 103: Organic Chemistry I**
Tetravalency of carbon, structure, molecular composition and variety of carbon compounds functional group classes of carbon compounds, Reaction mechanism and kinetics. Skeletal classification of carbon compounds. The chemistry of alkenes and petroleum, alkenes including ozonolysis, , alkynes, benzene, alcohols including phenols, ethers, aldehydes, ketones, carboxylic acids and derivatives and amines, structure of simple sugars, starch and cellulose, peptides and proteins, Synthetic polymers from various classes of compounds. Mechanisms of reaction discussed in all cases and uses of compounds.

**CHE 191 : Experimental chemistry I**

**CHE 192 : Experimental chemistry II**
CHE: 201  Analytical Chemistry I  2-0-0  2 Units
The mole concept, Chemical Equation and constants, stoichiometry and Chemical arithmetic, units of concentration and analytical Data Management, Presentation and Interpretation of Results.

CHE 202:  Analytical Chemistry II  2-0-0  2 Units
Titrimetric Analysis Acid/Base, Redox, complexometric and Precipitation. Gravimetric techniques; contamination and handling of Precipitates.

CHE 203:  Physical Chemistry II  2-0-0  2 units

CHE 204:  Organic Chemistry II  2-0-0  2 Units

CHE 206:  Inorganic Chemistry II  2-0-0  2 Units

CHE 208:  Environmental Chemistry II  2-0-0  2 Units

CHE 213:  General Chemistry for Life Sciences I  2-0-0  2 units

CHE 214:  General Chemistry for Life Sciences II  2-0-0  2 units
Structure and properties of the atom. Build up of the periodic table. Block element properties. Inorganic applications in agriculture, medicine and industry. Comparison of aromatic compounds with their aliphatic counterparts. Bifunctional compounds. Naturally occurring compounds –
fatty acids, sugar, Carbohydrates, Amino acids, Peptides, terpenes, alkaloids and nucleic acids pesticides, plant and insect hormones.

ICH 201: Industrial Chemistry I 2-0-0 2 Units
Inventory, state and convertability of Nigeria’s natural resources. Ore processing for selected metals. Their uses and reactions. The chlor-alkali process in details. Industrial gases; purification and uses.

ICH 202: Industrial Chemistry II 2-0-0 2 Units

ICH 203: Large Scale Chemistry 2-0-0 2 Units
Introductory course, Economic and technical factors in scaling-up of laboratory experiments, Reactor design and optimization. Unit operations, fluid dynamics. Heat and material transfer, Fire and explosion hazards, toxicity, Qualities of construction materials. Instrumentation, control and the scale-up plant.

ICH 208: Petrochemicals and Utilization of Wastes 2-1-0 3 Units

ICH 210: Heavy Inorganic Chemicals 2-0-0 2 Units
The Nitrogen based manufacturing industries including acids, fertilizers urea and methanol-Formaldehyde. Sulphur dioxide and Sulphuric acid industry. Potash extraction process; sylvite, local ores and Dead Sea sources. The phosphorous industry, borax industry and glass cement and asbestos industry chemical plant materials.

CHE 291: Experimental chemistry III 0-0-2 2 Units
CHE 292: Experimental chemistry IV 0-0-2 2 Units
CHE 295: Practical Chemistry for Life Sciences 0-0-1 1 unit
CHE 301: Physical Chemistry III 2-1-0 3 Units
Wave mechanics and application of boundary conditions Bohr’s theory of atomic spectra and its limitations. The uncertainty principle. Operators and postulates of quantum mechanics. Term symbols schroedinger equation (for H and He atoms, hydrogen molecular ion and hydrogen
molecule) and application in the interpretation of spectra. Introductory molecular orbital theories for chemical bonding.


**CHE 303: Analytical Chemistry III**

2-1-0  3 Units


**CHE 305: Organic Chemistry III**

2-1-0  3 Units

Infra red and UV-Visible spectra in organic analysis 3, 4, 5 and 6-membered rings, N, and heterocyclic compounds (aromatic and non aromatic). Aromatic rules. Selected arrangement reaction e.g. Beckmann, etc, to illustrate various reactions mechanisms and types, reactive intermediates. Classes of naturally occurring compounds and isolation, Terpenoids - classification and non-terpenoids.

**CHE 306: Analytical Chemistry for Non-majors II**

2-1-0  3 Units


**CHE 307: Inorganic Chemistry III**

2-1-0  3 Units

Descriptive chemistry of transition metals series, Introduction to coordination chemistry, Nomenclature of inorganic compounds, Chemistry of non-metals in groups VIA and VIIA, Introduction to organo- metallic chemistry, e.g. Metal Role of metals in living systems.

**CHE 309: Organic Chemistry IV-Macromolecules**

2-0-0  2 Units


**CHE 317: Inorganic Chemistry for Life Sciences**

2-0-0  3 Units

Introduction to coordination chemistry and bioinorganic chemistry, Introduction to nuclear chemistry and application of the isotopes. Selected topics in inorganic chemistry such as Fertilizers. Water and Corrosion.

**ICH 303: Unit Operation I Momentum Transfer**

2-0-0  2 Units

ICH 312: Industrial Attachment for 24 weeks  6 units
CHE 395: Experimental chemistry V  2 units

CHE 398: Chemistry Seminar  2 units
Five assessed and discussed essays on chemistry and society with titles selected from wide spread areas, e.g. Agriculture, Industries, Health and Medicine, the judiciary, the Military; etc.

CHE 401: Organic Chemistry V  2-1-0  3 units:

CHE 402: Symmetry, Group Theory and Electrochemistry I  2-1-0  3 Units

CHE 403: Advanced Analytical Chemistry and Applications:  2-1-0  3 Units
Steps in Chemical Analysis, Data Treatment, Analysis of Water, Air, clinical samples, Foods, Drugs, soils and Rocks.

CHE 404: Quantum Mechanical treatment of chemical Building and Kinetics  2-1-0  3 Units
Quantum mechanical description of molecular orbitals. Wave functions and energies of homo- and heteronuclear diatomic molecules correlation diagrams, ground and excited state potential energy diagrams molecules. Hybridization and stereochemical relations in simple polyatomic molecules, M. O. theories of unsaturated polyatomic (up to four atoms) molecules. Brief discussion of the theories of chain reactions combustion explosions and fast reaction in solution and gas phase.

CHE 406: Environmental Chemistry  2-1-0  3 Units

CHE 407: Inorganic Chemistry IV  2-1-0  3 Units

CHE 409: Applied spectroscopy 2-1-0 3 Units

CHE 410: Advanced Chemical Kinetics 2-1-0 3 Units
Experimental methods in gas phase and fast reaction of solution. Theoretical Interpretation of reaction rates and applications-van’t Hoff equation for chemical equilibria and forcing functions, chemical relaxation times, amplitudes and enthalpies. Temperature jump spectrophotometry.

CHE 411: Nuclear and Radio-Chemistry and Heavy Transition Metals 2-1-0 3 Units
CHE 412: Synthetic Methods 2-1-0 3 Units
Organic synthetic strategies illustrated by the synthesis of three or more complex natural products survey of general synthetic reactions and methods.

CHE 413: Molecular spectroscopy 2-1-0 3 Units
Application of quantum theory to the interpretation of absorption and emission spectra in terms of molecular properties theory of electronic absorption and emission (fluorescence and phosphorescence), spectral intensities, energies, and polarization of transitions. Theory of vibrational and rotational spectra-IR, Raman Resonance Raman, F. s. R. and N. M. R. Hyperfine splitting and g-factor, Simple magnetic resonance spectra.

CHE 415: Colloid, Surface Chemistry and Advanced Electrochemistry 2-1-0 3 Units
Lyophobic/hydrophilic and lyophilic/hydrophobic Colloids, polydispersity, Size; shape and behavior of the various colloidal dispersion, colloidal electrolytes; polyelectrolytes, Surface active agents, absorption on solid surfaces. Electrochemistry of charged and polarized layers. Equilibrium properties of the electrochemical diffuse plane double layers. Charge transfer, electrocatalysis, and electrochemical energy conversion. Determination of surface area and porosity.

CHE 416: Photochemistry and Biologically Active Natural Products 2-1-0 3 Units
Rules of Photochemical reactions Fluorescence and Phosphorescence, Photo reactions of major functional groups and industrial phytochemistry; steroidal hormones; plant hormones & pesticides, glycosides, carciotonic glycoside, Penicillins, alkaloids and terpenoids. Selected synthesis reactions e.g. writing Birch reduction, complex hydrides, oxidation etc.

CHE 417: X-ray Crystallography 2-1-0 3 Units

ICH 401: Unit Operation II 2-1-0 3 Units
ICH 402: SPECIAL Topics in Industrial Chemistry 2-1-0 3 Units
ICH 414: Process Chemistry 2-1-0 3 Units
CHE/ICH 499: Research Project 6 Units
Experimental Investigation of chemical research problems

CHE 495: Experimental chemistry VI 0-0-2 2 units