



**BABCOCK UNIVERSITY**  
**ILISHAN-REMO, OGUN STATE, NIGERIA**

**SCHOOL OF BASIC MEDICAL SCIENCES**  
**DEPARTMENT OF BIOCHEMISTRY**  
**BABCOCK UNIVERSITY**  
**ILISHAN REMO**  
**OGUN STATE**  
**NIGERIA**

WEBSITE: [www.babcock.edu.ng](http://www.babcock.edu.ng)

**Bachelor of Science (BSc) Biochemistry Programme**

**2023 - 2027**

## **B.Sc. Biochemistry**

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### **Overview**

Biochemistry programme is designed to enable graduates acquire broad based knowledge on chemical processes in living organisms ranging from single to multi- cellular organisms, both plants and animals. The first year of the programme is designed to prepare the students to acquire sound background knowledge of relevant science subjects, which would be a foundation to prepare them for specialized knowledge of Biochemistry. During the second and third year, the programme will expose the students to fundamental constituents (macro and micro) that constitute life processes and their dynamics. This will prepare them to appreciate the consequences of various deviations from normal during the final year.

### **Philosophy**

Biochemistry programme provides broad based education that explains chemical processes that take place in living organisms and the causes of various deviations, which can invariably lead to pathological conditions. It also provides basis for manipulation of normal processes to achieve desired outcome. Products of the programme will be suitable for employment in health, food and related industries. They can also be self- employed.

### **Objectives**

The main objectives of the degree programme in biochemistry would be to:

1. provide students with a broad and balanced foundation of biochemical knowledge and practical skills;
2. develop in students the ability to apply knowledge and skills to solving theoretical and practical problems in biochemistry;
3. develop in students, a range of transferable skills that are of value in biochemical and non-biochemical employment
4. provide students with knowledge and skills base from which they can proceed to further

studies in specialised areas of biochemistry or multi-disciplinary areas involving biochemistry;

5. provide, through training and orientation, an appreciation of the rewards of inter- and multi-disciplinary approach to the solution of complex life problems; and
6. generate in students an appreciation of the importance of biochemistry in industrial, economic, environmental, technological and social development.

### **Unique Features of the Programme**

The unique features of the programme include:

1. development, in the students, of high cognitive abilities and skills related to biochemistry and other life sciences;
2. students would be introduced to properties of flora and fauna, which are abundant in the tropics that may enable their use as candidates for drug development;
3. graduates would be capable of exhibiting practical skills in biochemistry, including knowledge of safety issues in laboratories and instrumentation;
4. graduates would be able to develop scientific information literacy skills to support independent learning and industrial knowledge; and
5. graduates would be able to demonstrate critical thinking skill to solve problems relating to biochemistry and other life sciences.

## **Employability Skills**

1. Graduates would be familiar with various biochemical processes used in industries.
2. They will imbibe a sense of enthusiasm for biochemistry as central to other life sciences.
3. Appreciation of biochemical application in different other related fields.
4. They can be self-employed by establishing relevant small and medium scale enterprises.

## **21<sup>st</sup> Century Skills**

1. Critical thinking, problem solving, reasoning, analysis, interpretation and synthesizing information.
2. Predictability skills without using live specimen.
3. Creativity, imagination, innovation and personal expression.
4. Research skill and practices and interrogative questioning.
5. Oral and written communication.
6. ICT literacy, data interpretation and analysis.

## **Admission and Graduation Requirements**

### **Admission Requirements**

1. The entry requirements for a four-year degree programme shall be senior secondary certificate (SSC) credit passes (WASC; NECO or equivalent) in five subjects at not more than two sittings. Such subjects shall include English language, Mathematics, Biology, Chemistry and Physics. In addition, an acceptable pass in the Unified Tertiary Matriculation Examination (UTME) is required for admission into 100 Level.
2. Candidates with five SSCE (or equivalent) credit passes with at least two at the GCE Advanced Level or IJMB or JUPEB in Biology and Chemistry, may be considered for admission into 200 Level.

### **Graduation Requirements**

Expected duration for UTME candidates shall be 4 years and students are required to pass a minimum of 120 units, while for direct entry students, expected duration for graduation shall be 3 years and would be expected to pass a minimum of 90 units which must include all compulsory courses.

## DEPARTMENT OF BIOCHEMISTRY (B.Sc., Biochemistry)



Abolanle A. A. Kayode, Ph.D.  
**HEAD OF DEPARTMENT**

### List of Faculty

<b>NAME</b>	<b>RANK</b>	<b>QUALIFICATIONS</b>
ADEBAWO Olugbenga. O.*	Professor	Ph.D, M.Sc., BSc
OLAGUNJI Joseph A.*	Professor	Ph.D, M.Sc., BSc
ANYASOR Godswill Nduka***	Professor	Ph.D, M.Sc., BSc
SHOKUNBI Olutayo S.	Professor	Ph.D, M.Sc., BSc
AKANDE Idowu**	Professor	Ph.D, M.Sc., BSc
OSONIYI Omolaja**	Professor	Ph.D, M.Sc., BSc
KAYODE Abolanle A. A	Assoc. Professor	Ph.D, M.Sc., BSc
FAPONLE Abayomi**	Senior Lecturer	Ph.D, M.Sc., BSc
ESIABA Ijeoma	Lecturer I	Ph.D, M.Sc., BSc
AMAH Gogonte Hezekiah	Lecturer I	Ph.D, M.Sc., BSc
AKINNAWO, Omowumi***	Lecturer II	Ph.D, M.Sc., BSc
ADETAYO Modupe Olusola***	Lecturer II	Ph.D, M.Sc., BSc
ADETUNJI, Oluwaseyi***	Lecturer II	Ph.D, M.Sc., BSc
OGUNBIYI Babafemi Tosin	Lecturer II	Ph.D, M.Sc., BSc
FADUNSIN Moromoke Sope	Lecturer II	Ph.D, M.Sc., BSc
ADEWOLE Oluwaseun Adetayo	Lecturer II	M.Sc., BSc
OLAJIDE Laide Omoyiola	Lecturer II	M.Sc., BSc
UKANGWA Ngozi Angela	Assistant Lecturer	M.Sc., BSc
OGBONNAYA Faith Chidiebube	Assistant Lecturer	M.Sc., BSc

ADEOYE Bayo Olufunso	Assistant Lecturer	M.Sc., BSc
EGBULE Mercy Nwakamaswor	Assistant Lecturer	M.Sc., BSc
ACHOR Corniluis Bangsi	Assistant Lecturer	M.Sc., BSc
FADIPE Abel B	Assistant Lecturer	M.Sc., BSc

\* Sabbatical

\*\* Adjunct Lecturer

\*\*\* Leave of Absence

## SUMMARY PAGES

### 100 Level

Course Code	Course Title	Status	SEMESTER	
			1 <sup>ST</sup>	2 <sup>ND</sup>
BU-GST 011	Citizenship Orientation		0	
BU-GST 012	Citizenship Orientation			0
BU-GST 105	Use of library and Study Skills	C	2	
BU-GST 120	ICT Fundamentals and Office Productivity Management	C	1	
BU-GST 126	Life And Teachings of Christ the Messiah	C		3
BU-GST 112	Health Principles	C		1
GST 112	Nigerian Peoples and Culture	C		2
GST 111	Communication In English		2	
MTH 101	Elementary Mathematics I	C	2	
MTH 102	Elementary Mathematics II	C		2
COS 101	Introduction to Computing Science	C	3	
BIO 101	General Biology I	C	2	
BIO 102	General Biology II	C		2
BIO 107	General Biology Practical I	C	1	
BIO 108	General Biology Practical II	C		1

CHM 101	General Chemistry I	C	2	
CHM 102	General Chemistry II	C		2
CHM 107	General Chemistry Practical I	C	1	
CHM 108	General Chemistry Practical II	C		1
PHY 101	General Physics I	C	2	
PHY 102	General Physics II	C		2
PHY 107	General Physics Practical I	C	1	
PHY 108	General Physics Practical II	C		1
	<b>Total (36 Credits)</b>		<b>19</b>	<b>17</b>

## 200 Level

Course Code	Course Title	Status	SEMESTER	
			1 <sup>ST</sup>	2 <sup>ND</sup>
BU-GST 021	Citizenship Orientation		0	
BU-GST 022	Citizenship Orientation			0
BU-GST 221	INTRODUCTION TO AGRICULTURE	C	1	
BU-GST 290	Introduction to Data Analytics	C	1	
BU-GST 215	Adventist Heritage	C	3	
GST 212	Philosophy, Logic and Human Existence	C		2

BU-GST 200	Communication in French	C		1
BU-GST 220	Origins and Science	C		1
CHM 210	Physical Chemistry I	C		2
CHM 211	Organic Chemistry I	C	2	
CHM 212	Inorganic Chemistry I	C		2
CHM 213	Analytical Chemistry I	C	2	
CHM 214	Structure and Bonding	C		2
BIO 201	Genetics I	C	2	
MCB 221	General Microbiology	C	2	
PIO 201	Introductory Physiology & Blood	C	2	
BU-BCH 218	Basic Clinical Biochemistry	C		3
BU-BCH 224	Functional Biochemistry	C		3
ENT 211	Entrepreneurship and Innovation	C	2	
BCH 201	General Biochemistry I	C	2	
BCH 202	General Biochemistry II	C		2
BCH 203	General Biochemistry Practical	C	1	
STA 201	Statistics for Agriculture & Biological Sciences	C	3	
	<b>Total (41 Credits)</b>		<b>23</b>	<b>18</b>

### 300 Level

Course Code	Course Title	Status	SEMESTER	
			1 <sup>ST</sup>	2 <sup>ND</sup>
BU-GST 031	Citizenship Orientation		0	
BU-GST 032	Citizenship Orientation			0
BU- GST 310	Data Analysis Using Advanced Excel   SPSS   POWER BI   TABLEAU	C	1	
BU-GST 317	Fundamentals of Christian Faith	C	3	
BU-GST 312	Introduction to Family Life Education	C		1
BU-BCH 307	Immunochemistry	C	3	
BU-BCH 311	Nutritional and Food Biochemistry	C	3	
BU-BCH 315	Xenobiotic Metabolism and Toxicology	C	3	
GST 312	Peace and conflict Resolution	C		2
ENT 312	Venture Creation	C		2
BCH 301	Enzymology	C	2	
BCH 302	Metabolism of Carbohydrates	C		2
BCH 303	Metabolism of Lipids	C	2	
BCH 304	Metabolism of Amino Acids and Proteins	C		2

BCH 305	Metabolism of Nucleic Acids	C	2	
BCH 306	Analytical Methods in Biochemistry	C		3
BCH 307	Membrane Biochemistry	C	2	
BCH 308	Bioenergetics	C		1
BCH 309	Inorganic Biochemistry	C	1	
BCH 350	Industrial Attachment	C		6
	<b>Total (40 Credits)</b>		<b>22</b>	<b>19</b>

#### 400 Level

Course Code	Course Title	Status	SEMESTER	
			1 <sup>ST</sup>	2 <sup>ND</sup>
BU-GST 041	Citizenship Orientation		0	
BU-GST 042	Citizenship Orientation			0
BU-GST 440	E-Project Management and Simulation	C	1	
BU-GST 400	Religion and Social Ethics	C		3
BU-BCH 410	Biochemical Pharmacology	C	3	
BU-BCH 424	Computational Biochemistry and Drug Discovery	C		1
BU-BCH 430	Forensic Biochemistry	C		2
BU-BCH 432	Hormonal Biochemistry	C		2

BU-BCH 433	Biochemistry of Nutrition and Healthful Lifestyle	C	2	
BU-BCH 435	Biochemistry Seminar	C	2	
BU-BCH 437	Biochemistry of Viruses and Parasites	C	2	
BCH 401	Advanced Enzymology	C	2	
BCH 402	Molecular Biochemistry	C		2
BCH 403	Metabolic Regulations	C	2	
BCH 404	Biochemical Reasoning	C		1
BCH 405	Plant Biochemistry	C	2	
BCH 490	Research Project	C		6
BCH 407	Bioinformatics	C	2	
BCH 408	Biochemical Entrepreneurship	C		2
	<b>Total (36 Credits)</b>		<b>18</b>	<b>19</b>

## Course Contents and Learning Outcomes

## **100 Level**

### **GST 111: Communication in English**

**(2 Units C: LH 15; PH 45)**

#### **Learning Outcomes**

At the end of this course, students should be able to:

1. identify possible sound patterns in English language;
2. list notable language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

#### **Course Contents**

Sound patterns in English language (vowels and consonants, phonetics and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages and collocations). Sentence in English (types, structural and functional, simple and complex). Grammar and usage (tense, mood, modality, concord and aspects of language use in everyday life). Logical and critical thinking and reasoning methods (logic and syllogism, inductive and deductive argument and reasoning methods, analogy, generalisation and explanations). Ethical considerations, copyright rules and infringements. Writing activities: (Pre-writing, writing, post writing, editing and proofreading, brainstorming, outlining, paragraphing, types of writing, summary, essays, letter, curriculum vitae, report writing, note making and mechanics of writing). Comprehension strategies (reading and types of reading, comprehension skills, 3RsQ). Information and communication technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

**Learning Outcomes**

At the end of the course, students should be able to:

1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of trade, economic and self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards nation building;
6. analyse the role of the Judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria; and
8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

**Course Contents**

Nigerian history, culture, and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria and colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914, formation of political parties in Nigeria, nationalist movement and struggle for independence). Nigeria and challenges of nation building (military intervention in Nigerian politics and Nigerian Civil War). Concept of trade and economics of self-reliance (indigenous trade and market system, indigenous apprenticeship system among Nigeria people, trade, skill acquisition and self-reliance). Social justices and national development (law definition and classification. judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition, citizenship and civic responsibilities, indigenous languages, usage and development, negative attitudes and conducts, cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's –Reconstruction, Rehabilitation and Re-orientation; re-orientation strategies: Operation Feed the Nation (OFN), Green Revolution, Austerity Measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilization for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

## **MTH 101: Elementary Mathematics I (Algebra and Trigonometry)(2**

**Units C: LH 30)**

### **Learning Outcomes**

At the end of the course, students should be able to:

1. explain basic definition of set, subset, union, intersection, complements and use of venn diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. identify the various types of numbers; and
5. solve some problems using binomial theorem.

### **Course Contents**

Elementary set theory, subsets, union, intersection, complements and venn diagrams. Real numbers, integers, rational and irrational numbers, mathematical induction, real sequences and

series, theory of quadratic equations and binomial theorem. Complex numbers, algebra of complex numbers and the argand diagram. De-Moivre's theorem, nth roots of unity. circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

### **MTH 102: Elementary Mathematics II (Calculus)**

**(2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, students should be able to:

1. identify the types of rules in differentiation and integration;
2. describe the meaning of function of a real variable, graphs, limits and continuity; and
3. solve some applications of definite integrals in areas and volumes.

#### **Course Contents**

Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching, integration as an inverse of differentiation. Methods of integration and definite integrals. Application to areas and volumes.

### **COS 101: Introduction to Computing Sciences**

**(3 Units C: LH 30; PH 45)**

#### **Learning Outcomes**

At the end of the course, students should be able to:

1. explain basic components of computers and other computing devices;
2. describe the various applications of computers;
3. explain information processing and its roles in the society;
4. describe the Internet, its various applications and its impact;
5. explain the different areas of the computing discipline and its specializations; and
6. demonstrate practical skills on using computers and the internet.

#### **Course Contents**

Brief history of computing. Description of the basic components of a computer/computing device. Input/Output devices and peripherals. Hardware, software and human ware. Diverse and growing computer/digital applications. Information processing and its roles in society. The Internet, its applications and its impact on the world today. The different areas/programs of the computing discipline. The job specializations for computing professionals. The future of computing.

**Lab Work:** Practical demonstration of the basic parts of a computer. Illustration of different operating systems of different computing devices including desktops, laptops, tablets, smart boards and smart phones. Demonstration of commonly used applications such as word processors, spreadsheets, presentation software and graphics. Illustration of input and output devices including printers, scanners, projectors and smartboards. Practical demonstration of the Internet and its various applications. Illustration of browsers and search engines. How to access online resources.

**BIO 101: General Biology I**

**(2 Units C: LH 30)**

**Learning Outcomes**

At the end of this course, students should be able to:

1. explain cell structure and organizations;

2. summarize functions of cellular organelles;
3. characterize living organisms and state their general reproduction;
4. describe the interrelationship that exists between organisms;
5. discuss the concept of heredity and evolution; and
6. enumerate habitat types and their characteristics.

### **Course Contents**

Cell structure and organisation, functions of cellular organelles, characteristics and classification of living things, chromosomes, genes their relationships and importance, general reproduction, interrelationships of organisms (competitions, parasitism, predation, symbiosis, commensalisms, mutualism, saprophytism); heredity and evolution (introduction to Darwinism and Lamarkism, Mendelian laws, explanation of key genetic terms), elements of ecology and types of habitat.

### **BIO 102: General Biology II**

**(2 Units C: LH 30)**

### **Learning Outcomes**

At the end of the lectures, students should be able to:

1. list the characteristics, methods of identification and classification of Viruses, bacteria and fungi;
2. state the unique characteristics of plant and animal kingdoms;
3. describe ecological adaptations in the plant and animal kingdoms;
4. explain nutrition, respiration, excretion and reproduction in plants and animals; and
5. describe growth and development in plants and animals.

### **Course Contents**

Basic characteristics, identification and classification of viruses, bacteria and fungi.

A generalized survey of the plant and animal kingdoms based mainly on the study of similarities and differences in the external features. Ecological adaptations. Briefs on physiology to include nutrition, respiration, circulatory systems, excretion, reproduction, growth and development.

### **BIO 107: General Biology Practical I**

**(1 Unit C: PH 45)**

### **Learning Outcomes**

At the end of the course, students should be able to:

1. outline common laboratory hazards;

2. provide precautions on laboratory hazards;
3. state the functions of the different parts of microscope;
4. use the microscope and describe its maintenance;
5. draw biological diagrams and illustrations; and
6. apply scaling and proportion to biological diagrams.

### **Course Contents**

Common laboratory hazards. prevention and first aid. measurements in biology. uses and care of microscope. compound and dissecting microscope. Biological drawings and illustration, scaling, accuracy and proportion. use of common laboratory apparatus and laboratory experiments designed to illustrate the topics covered in **BIO 101**.

## **BIO 108: General Biology Practical II**

**(1 Unit C: PH 45)**

### **Learning Outcomes**

At the end of the course, students should be able to:

1. describe the anatomy of flowering plants;
2. ---differentiate types of fruit and seeds;
3. state ways of handling and caring for biological wares;
4. describe the basic histology of animal tissues; and
5. identify various groups in the animal kingdom.

### **Course Contents**

Anatomy of flowering plants, primary vegetative body. stem, leaf and root to show the mature tissues namely parenchyma, collenchyma, sclerenchyma, xylem and phloem. Types of fruits and seeds. Care and use of dissecting kits and other biological wares. Dissection and general histology of animal tissues based on vertebrate forms. Morphology and functions of epithelial, muscular, nervous and connective tissues. Examination of various groups of lower invertebrates under microscopes, identification of various groups of organisms in Animal Kingdom. And any experiment designed to emphasize the practical aspects of topics in BIO 102.

## **CHM 101: General Chemistry I**

**(2 Units C: LH 30)**

### **Learning Outcomes**

At the end of this course, students should be able to:

1. define atom, molecules and chemical reactions;
2. discuss the modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;
4. justify the trends of atomic radii, ionization energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation – reduction equation and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridized orbitals;
7. identify the characteristics of acids, bases and salts and solve problems based on their quantitative relationship;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict

the effect of concentration, pressure and temperature changes on equilibrium mixtures;

9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. determine rates of reactions and its dependence on concentration, time and temperature.

### **Course Contents**

Atoms, molecules, elements, compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridization and shapes of simple molecules. Valence forces and structure of solids. Chemical equations and stoichiometry, chemical bonding and intermolecular forces and kinetic theory of matter. Elementary thermochemistry, rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

## **CHM 102: General Chemistry II**

**(2 Units C: LH 30)**

### **Learning Outcomes**

At the end of this course, students should be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;
7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of transition metals.

### **Course Contents**

Historical survey of the development and importance of organic chemistry, fullerenes as fourth allotrope of carbon, uses as nanotubes, nanostructures and nano chemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The Chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

## **CHM 107: General Chemistry Practical I**

**(1 Unit C: PH 45)**

### **Learning Outcomes**

At the end of this course, students should be able to:

1. describe the general laboratory rules and safety procedures;
2. collect scientific data and correctly carrying out Chemical experiment;
3. identify the basic glassware and equipment in the laboratory;
4. tell the differences between primary and secondary standards;

5. perform redox titration;
6. record observations and measurements in the laboratory notebooks; and
7. analyse data to arrive at scientific conclusions.

### **Course Contents**

Laboratory experiments designed to reflect topics presented in courses CHM 101 and CHM 102. These include acid-base titrations, qualitative analysis, redox reactions, gravimetric analysis, data analysis and presentation.

### **CHM 108: General Chemistry Practical II**

**(1 Unit C: PH 45)**

### **Learning Outcomes**

At the end of this course, the students should be able to:

1. identify the general laboratory rules and safety procedures;
2. collect scientific data and correctly carry out chemical experiments;
3. identify the basic glassware and equipment in the laboratory;

4. identify and carry out preliminary tests which includes ignition, boiling point, melting point, test on known and unknown organic compounds;
5. execute solubility tests on known and unknown organic compounds;
6. execute elemental tests on known and unknown compounds; and
7. conduct functional group/confirmatory test on known and unknown compounds which could be acidic/basic/neutral organic compounds.

### **Course Contents**

Continuation of CHM 107. Additional laboratory experiments to include functional group analysis, quantitative analysis using volumetric methods.

### **PHY 101: General Physics I (Mechanics)**

**(2 Units C: LH 30)**

### **Learning Outcomes**

On completion of the course, students should be able to:

1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars;
3. describe and evaluate motion of systems on the basis of the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

### **Course Contents**

Space and time. units and dimension. vectors and scalars. differentiation of vectors: displacement, velocity and acceleration. Kinematics. Newton laws of motion (Inertial frames, Impulse, force and action at a distance, momentum conservation). relative motion. Application of Newtonian mechanics. equations of motion. conservation principles in physics, conservative forces, conservation of linear momentum, Kinetic energy and work, Potential energy, System of particles, Centre of mass. Rotational motion. torque, vector product, moment, rotation of coordinate axes and angular

momentum, polar coordinates. conservation of angular momentum; Circular motion. Moments of inertia, gyroscopes and precession. gravitation: Newton's Law of Gravitation, Kepler's Laws of Planetary Motion, Gravitational Potential Energy, Escape velocity, Satellites motion and orbits.

**PHY 102: General Physics II (Electricity & Magnetism) (2 Units C: LH 30)**

**Learning Outcomes**

On completion of the course, students should be able to:

1. describe the electric field and potential and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distribution using Coulomb's law, Gauss's law and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;

5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters; and
8. determine the characteristics of ac voltages and currents in resistors, capacitors and inductors.

### **Course Contents**

Forces in nature, electrostatics, electric charge and its properties, methods of charging, Coulomb's law and superposition, electric field and potential, Gauss's law, capacitance, electric dipoles, energy in electric fields, conductors and insulators, current, voltage and resistance, Ohm's law and analysis of DC circuits, magnetic fields, Lorentz force, Biot-Savart and Ampère's laws, magnetic dipoles, dielectrics, energy in magnetic fields, electromotive force, electromagnetic induction, self and mutual inductances, Faraday and Lenz's laws, step up and step down transformers. Maxwell's equations, electromagnetic oscillations and waves, AC voltages and currents applied to inductors, capacitors, resistance and combinations.

### **PHY 107: General Practical Physics I**

**(1 Unit C: PH 45)**

#### **Learning Outcomes**

On Completion of the course, students should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs; and
5. draw conclusions from numerical and graphical analysis of data.

#### **Course Contents**

This introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat and viscosity covered in PHY 101. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

## **PHY 108: General Practical Physics II**

**(1 Unit C: PH 45)**

### **Learning Outcomes**

On Completion of the course, students should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs; and
5. draw conclusions from numerical and graphical analysis of data.

### **Course Contents**

This introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity and many more, covered in PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

### **Course Contents and Learning Outcomes**

#### **200 Level**

### **CHM 210: Physical Chemistry I (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course, the students should be able to:

1. state the kinetic theory of gases and solve problems related to ideal and real gases;
2. derive the formula for molecular velocity of gases and use the derived formula to solve problems;
3. describe and explain the fundamental concepts of physical chemistry including those of statistical mechanics, chemical Kinetics, quantum mechanics and spectroscopy;
4. apply simple models to predict properties of chemical systems;
5. define and state type of solutions; define different concentration terms which include molarity,

normality etc. explain vapour pressure lowering of the solvent, boiling point elevation of solutions, freezing point depression of solution and measurement of osmotic pressure;

6. apply numerical or computational methods to calculate physical properties of Chemical systems and assess the appropriateness of different computational techniques and numerical approximations for solving chemistry problems;
7. design and plan an investigation by selecting and applying appropriate practical, theoretical, and/or computational techniques or tools; and
8. states Ohms law and describe the electrolytic conduction, states the Faraday's Law and Conductance Law of solution and calculation on electrical conductance on different electrolyte solution.

### **Course Contents**

Kinetic theory of gases; science of real gases; the laws of thermodynamics; entropy and free energy; reactions and phase equilibria; reaction rates; rate laws; mechanism and theories of elementary processes; photochemical reactions; basic electrochemistry.

### **CHM 211: Organic Chemistry I (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course, the students should be able to:

1. describe and solve problems in chemistry of aromatic compounds;
2. describe the structures of simple sugars, starch and cellulose, peptides and proteins and show the difference in their conformation structure;
3. describe and solve problems in chemistry of bifunctional compounds;
4. explain the mechanisms of substitution, elimination, addition and rearrangement reactions;
5. describe stereochemistry and its application;
6. describe condition and pathways of the following organic reactions - Grignard reaction, Aldol and related reactions; and
7. describe simple alicyclic carbon compounds and their synthesis.

#### **Course Contents**

Chemistry of aromatic compounds. Structures of simple sugars, starch and cellulose, peptides, and proteins. Chemistry of bifunctional compounds. Energetics, kinetics, and the investigation of reaction mechanisms. Mechanisms of substitution, elimination, addition, and rearrangement

reactions. Stereochemistry. Examples of various named organic reactions e.g., Grignard reaction, Aldol and related reactions. Simple alicyclic carbon compounds and their synthesis.

### **CHM 212: Inorganic Chemistry I (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course, the students should be able to:

1. list the first-row transition elements and explain their characteristics and properties;
2. explain crystal field theory (CFT) and draw the diagram to illustrate with examples of coordination compounds;
3. state the advantages of CFT over other bonding theories;
4. discuss the comparative Chemistry of the following elements. ( I) Ga, In, Tl (II). Ge, Sn, Pb (III). As, Sb, Bi (IV). Se, Te, Po;
5. define organometallic chemistry;
6. give relevant examples with illustrations;
7. classify organometallic compounds with examples;
8. list the roles of metals in biochemical systems;
9. discuss the concepts of hard and soft acids and bases.
10. list examples of item 9 above;
11. explain oxidation and reduction reaction; and
12. illustrate the above (11) with appropriate reactions.

#### **Course Contents**

Chemistry of first row transition metals. Introduction to coordination chemistry including elementary treatment of crystal field theory. Comparative Chemistry of the following elements: (a) Ga, In, Tl, (b) Ge, Sn, Pb, (c) As, Sb, Bi (d) Se, Te, Po.

Elementary introduction to organometallic chemistry. Role of metals in biochemical systems. Concepts of hard and soft acids and bases. Oxidation and reduction reactions.

### **CHM 213: Analytical Chemistry I (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course, the students should be able to:

1. explain analytical processes which include description of chemist as a problem solver;

2. describe and differentiate forms of error;
3. explain its implication on laboratory analysis;
4. state different statistical tool use in treatment of data;
5. solve practical problems using the statistical tools;
6. define sampling and give reasons for sampling in field work;
7. state and describe different sampling techniques;
8. state different forms of sample collection and processing;
9. describe volumetric method of analysis and solve some practical problems; and
10. describe gravimetric method of analysis and solve some practical problems.

### **Course Contents**

Theory of errors; and statistical treatment of data: Theory of sampling. Chemical methods of analysis including volumetric, gravimetric, data analysis and presentation. and. Physicochemical methods, Optical methods of analysis; separation methods.

### **CHM 214: Structure and Bonding (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course, the students will be able to:

1. explain the idea of quantum states, orbital, shape and energy;
2. explain simple valency theory, electron repulsion theory and atomic spectra;
3. explain Symmetry, molecular geometry and structure, and molecular orbital theory of bonding;
4. sketch to illustrate with specific examples for item (3) above;
5. express how molecular orbital theory of bounding explains the magnetic properties in main group compounds;
6. explain the methods used in the determination of molecular shapes. Bond lengths and angles; and
7. explain with the use model the structure and chemistry of some of the representatives of main group elements.

#### **Course Contents**

Idea of quantum states, orbitals, shape; and energy. Simple valence theory, electron repulsion theory, atomic spectra. Symmetry, molecular geometry and structure, molecular orbital theory of

bonding. Methods of determining molecular shape, bond lengths and angles. The structure and chemistry of some representative main group element compounds.

### **BIO 201: Genetics I (2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of this course, students should be able to:

1. distinguish between heritable and non-heritable characteristics;
2. explain the likelihood of genetic events (probability) and how well those events (results) fit into a set of observation;
3. discuss polygenic variations; and
4. describe concepts in population genetics.

#### **Course Contents**

Heritable and non-heritable characteristics. Probability and tests of goodness of fit.

Quantitative inheritance. variation in genome structure. introduction to population genetics.

### **MCB 221: General Microbiology (2 Units C: LH 15; PH 45)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain the basic concepts and scope of microbiology;
2. describe the layout of a microbiology laboratory, equipment and reagents in a microbiology laboratory; and
3. discuss the theory behind basic protocols in a microbiology laboratory.

#### **Course Contents**

History of the Science of Microbiology. Classification of organisms into prokaryotes and eukaryotes. Classification of prokaryotes into archaea and eubacteria. Anatomy and cytochemistry of bacteria and fungi; shapes, groupings and colonial morphology of bacteria and fungi. Structure of viruses. Sterilization and disinfection. Structure, ecology and reproduction of representative microbial genera. Culture of micro-organisms. Isolation of micro-organisms. Isolation of bacteria, viruses fungi (yeasts and moulds, nutrition and biochemical activities of micro-organisms. Antigens and antibodies. Identification and economic importance of selected microbial groups. Microbial variation and heredity. Study of laboratory equipment. Introduction to microbiology of

air food, milk, dairy products, water and soil. Staining techniques, antibiotic sensitivity tests, serological tests, antimicrobial agents.

### **PIO 201: Introductory Physiology and Blood (2 Units C: LH 30)**

#### **Learning Outcomes**

On completion of this course, students should be able to:

1. describe the composition of a cell membrane;
2. explain how a potential difference across a membrane will influence the distribution of a cation and an anion;
3. describe how transport rates of certain molecules and ions are accelerated by specific membrane transport proteins;
4. distinguish between active (primary and secondary) transport, facilitated diffusion, and passive diffusion based on energy source and carrier protein involvement;
5. identify the mechanisms and role of selective transporters for amino acids, neurotransmitters, nutrients, etc.;
6. understand the general concepts of homeostasis and the principles of positive and negative feedback in physiological systems;
7. identify the site of erythropoietin production, the stimulus for its release, and the target tissue for erythropoietin action;
8. discuss the normal balance of red blood cell synthesis and destruction, including how imbalances in each lead to anemia or polycythemia;
9. list and differentiate the various types of leukocytes;
10. describe the role of thrombocytes in haemostasis; and
11. list clotting factors and the discuss the mechanism of anti-coagulants.

#### **Course Contents**

Introduction and history of physiology. Structure and functions of cell membranes. Transport process. Special transport mechanism in amphibian bladder, kidney, gall bladder, intestine, astrocytes and exocrine glands. Biophysical principles. Homeostasis and control systems including temperature regulation. Biological rhythms. Composition and functions of blood. Haemopoiesis. WBC and differential count. Plasma proteins Coagulation, fibrinolysis and platelet functions. Blood groups –ABO system – Rh system. Blood transfusion – indication for

collection and storage of blood, hazards of blood transfusions. Reticulo- endothelial system.

Immunity and immunodeficiency disease and HIV.

**ENT 211: Entrepreneurship and Innovation**

**(2 Units C: LH 15; PH 45)**

**Learning Outcomes**

At the end of this course, students should be able to:

1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa and the rest of the world; and
8. state the basic principles of e-commerce.

## **Course Contents**

Concept of entrepreneurship (entrepreneurship, intrapreneurship /corporate entrepreneurship). Theories, rationale and relevance of entrepreneurship (schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of entrepreneurs (opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (critical thinking, reflective thinking, and creative thinking). Innovation (concept of innovation, dimensions of innovation, change and innovation, knowledge and innovation). Enterprise formation, partnership and networking (basics of business plan, forms of business ownership, business registration and forming alliances and joint ventures). Contemporary entrepreneurship issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (biography of inspirational entrepreneurs, youth and women entrepreneurship, entrepreneurship support institutions, youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

## **BCH 201: General Biochemistry I**

**(2 Units C: LH 30)**

### **Learning Outcomes**

At the end of the course, students should be able to:

1. explain the structure of different macromolecules in biological system;
2. identify types of chemical reactions involving these macromolecules;
3. explain the various methods of isolation of these macromolecules;
4. estimate the effects of acids and alkalis on the macromolecules;
5. describe purification of macromolecules; and
6. discuss quantification of the various macromolecules.

## **Course Contents**

Introductory chemistry of amino acids, their properties, reactions and biological functions. Classification of amino acids: neutral, basic and acidic; polar and non-polar; essential and non-essential amino acids. Peptides. Introductory chemistry and classification of proteins. Biological functions of proteins. Methods of their isolation, purification and identification. Primary, secondary, tertiary and quaternary structures of proteins. Basic principles of tests for proteins and amino acids.

Introductory chemistry of carbohydrates, lipids and nucleic acids. Nomenclature of nucleosides and nucleotides, effects of acid and alkali on hydrolysis of nucleic acids.

## **BCH 202: General Biochemistry II**

**(2 Units C: LH 30)**

### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain the structure of the cell including its components;
2. discuss the interrelationship between different organelles of the cell;
3. recognize the differences between plant and animal cells;
4. isolate the various organelles of both plant and animal cells; and
5. describe the influence of hydrogen ion concentration on cellular function.

### **Course Contents**

The cell theory. Structures and functions of major cell components. Cell types, constancy and diversity. Cell organelles of prokaryotes and eukaryotes. Chemical composition of cells.

Centrifugation and methods of cell fractionation. Structure, function and fractionation of extra-cellular organelles. Water, total body water and its distribution. Regulation of water and electrolyte balance. Disorder of water and electrolyte balance. Acidity and alkalinity, pH and pK values and their effects on cellular activities.

## **GST 212: Philosophy, Logic and Human Existence**

**(2 Units C: LH 30)**

### **Learning Outcomes**

A student who has successfully gone through this course should be able to:

1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically assess the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge; and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

### **Course Contents**

Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding and many more

## **BCH 203: General Biochemistry Practical**

**(1 Unit C: PH 45)**

### **Learning Outcomes**

At the end of the course, students will be able to understand the various laboratory procedures used

in the study of various biochemical processes described in BCH 201 and 202.

### **Course Contents**

Laboratory experiments designed to reflect the topics covered in BCH 201 and BCH 202.

Introduction to laboratory methods and procedures employed in studying biochemical processes.

### **STA 201: Statistics for Agriculture and Biological Sciences (3 Units C: LH 45) Learning**

#### **Outcomes**

At the end of the course, students should be able to:

1. explain the scope for statistical methods in biology and agriculture;
2. define the measures of location, partition and dispersion;
3. explain the elements of probability; probability distributions: binomial, poisson, geometric, hypergeometric, negative binomial and normal, Student's t and chi-square distributions;
4. differentiate point from interval estimation and could be able to tests for hypotheses concerning population means, proportions and variances;
5. compute for regression and correlation as well as conduct some Non-parametric tests with reference to Contingency table analysis; and
6. explain the elements of design of experiments and Analysis of variance.

### **Course Contents**

Scope for statistical method in Biology and Agriculture. Measures of location, partition and dispersion. Elements of probability. Probability distributions: binomial, Poisson, geometric, hypergeometric, negative binomial and normal, Student's t and chi-square distributions. Estimation (point and interval) and tests of hypotheses concerning population means, proportions and variances. Regression and correlation. Non-parametric tests. Contingency table analysis. Introduction to design of experiments. Analysis of variance.

**Babcock University (BU)**

**Sciences**

**Biochemistry**

**B.Sc. Biochemistry**

**BU-BCH 218 Basic Clinical Biochemistry (3 Units; Core, L=30; P= 45)**

**Senate-approved relevance**

Non-communicable diseases account for a great percentage of morbidity and mortality globally. These diseases are usually associated with derangements in biochemical metabolisms. The knowledge of clinical biochemistry will provide a mechanistic basis to understand how to unravel these menaces. This is in agreement with Babcock University's mission and vision statements to train servant leaders who excel in their calling and positively impact their communities.

**Overview**

Non-communicable diseases which are biochemical derangements account for over two-thirds of deaths globally and reduced productivity and work hours. In addition, the excessive cost of treatment and ignorance especially in developing countries can lead to poor management of the disease conditions. To achieve the United Nations Sustainable Development Goal 3, it is imperative to understand the underlying and predisposing factors to non-communicable diseases through the lens of clinical biochemistry.

This course will enable students to critically appraise the nature and diagnosis of diseases in terms of abnormalities in the biochemical and molecular aspects of cellular metabolisms. It will also prepare students for advanced research in related biomedical sciences.

**Objectives**

The objectives of the course are to:

1. Identify the types of samples and analyses in the biochemistry laboratory.
2. Explain biochemical metabolisms that affect pH and their impact on health.
3. Describe the distribution of water and electrolytes in different body fluids.
4. Evaluate the impact of disruptions in biomolecule metabolisms on health.

5. Distinguish the biomarkers for liver, kidney, and cardiac functions.
6. Relate the functions of clinically important enzymes, hormones, and vitamins.
7. Demonstrate procedures for monitoring biomarkers in biological samples.

### **Learning Outcomes**

After completing the course, the student should be able to:

1. Identify five (5) types of samples and analyses used in the biochemistry laboratory.
2. Explain at least two (2) biochemical changes associated with metabolic and respiratory acidosis/alkalosis.
3. State at least three (3) causes of plasma sodium and potassium imbalances.
4. Recall biochemical derangements in two (2) named disorders of metabolisms.
5. Describe the biochemistry of three (3) biomarkers associated with liver, kidney, and cardiac malfunctions.
6. Explain the role of five (5) enzymes and hormones in disease diagnosis and treatment.
7. Experiment on at least eight (8) biochemical procedures for monitoring the levels of biomarkers in biological samples.

### **Course Contents**

Sample analysis and test reporting. Acid-base balance. Water and electrolyte imbalance. Disorders of carbohydrate metabolism. Disorders of lipid metabolism. Disorders of protein metabolism. Enzymes in diagnosis. Endocrine function disorders. Liver function tests. Kidney function tests. Biomarkers of cardiac function. Biomarkers of bone diseases. Disorders of vitamin and mineral metabolisms. Molecular genetics in diseases. Tumour markers. Clinical toxicology. Analysis of biomarkers in biological samples.

### **Minimum Academic Standards**

Practical laboratory space.

**Biochemistry**  
**B.Sc. Biochemistry**

**BU-BCHM 224 Functional Biochemistry** (2 Units; Core, L = 30; P = Nil)

**Senate-approved relevance**

The quality of metabolic processes determines the vitality of the body tissues. Consequently, metabolic aberrations in body tissues underlie various diseases. Therefore, the knowledge of normal metabolisms is requisite to understanding any form of deviation from the healthy state, and for interventions to manage dysfunctions in the body tissues. This aligns with Babcock University's vision and mission of raising servant leaders that would contribute meaningfully to the achievement of a healthier society. Biochemistry graduates equipped with the knowledge of functional biochemistry will be better prepared to address issues of health from a functional perspective.

**Overview**

Functional biochemistry offers an in-depth knowledge of the metabolic processes taking place in tissues of the human body systems to determine health status. It also identifies the key metabolites that could serve as effective therapeutic targets in the event to manage metabolic derangements.

It provides detailed insight into pathological infringements that could serve as early indicators, thereby promoting quality diagnoses and efficient clinical and industrial experiences. This course will expose the student to researchable gaps and provides a better understanding of the functions of body tissues in healthy and diseased states.

**Objectives**

The objectives of the course are to:

1. Describe the principles underlying the basic physiological functions of body tissues.
2. Explain the metabolic functions of body tissues.
3. Evaluate the metabolic changes orchestrating biochemical abnormalities.
4. Describe the effectiveness of metabolites essential to bodily functions as indicators of disease progression.

5. Estimate the efficiency of therapeutic targets in the event of metabolic disorders influencing the functioning of body tissues.

### **Learning Outcomes**

On completion of the course, students should be able to:

1. Recall the metabolic processes underlying two (2) tissue functions.
2. Describe the structures of five (5) ligands that participate in metabolic functions in the body.
3. Identify five (5) metabolic changes responsible for biochemical aberrations.
4. Explain how at least five (5) metabolites could improve the investigation of tissue functions related to diseases.
5. State five (5) metabolic processes that are targets for improved management of related disease conditions.

### **Course Contents**

Biochemistry of vision. Metabolic basis for colour and dark visions. Metabolic basis for muscle contraction. Metabolic changes in muscle injury. Biochemistry of liver functions. Metabolic changes in liver dysfunction. Blood biochemistry. Aberrations in haem metabolism. Biochemistry of adipose tissue. General metabolism of the brain. Biochemistry of reproductive tissues. Nervous system. Neuronal biochemistry. Chemical and nerve impulse transmission. Action potential. Neurotransmitters and their classification. Biosynthesis of neurotransmitters.

### **Minimum Academic Standards**

## **Course Contents and Learning Outcomes**

### **300 Level**

**Babcock University (BU)**

**Sciences**

**Biochemistry**

**B.Sc. Biochemistry**

**BU-BCH 307 Immunochemistry (3 Units; Core, L=45; P= Nil)**

#### **Senate-approved relevance**

The study of immunochemistry is vital in this era of emerging and sustained infections that can rapidly attain pandemic proportions. Biochemistry graduates with good knowledge of the intricate workings of the immune system and applications of immunochemical techniques will be well-equipped for advanced biomedical research against infectious diseases. This is congruent with Babcock University's mission and vision of training excellent servant leaders who will be competent in providing solutions against infectious and other related diseases.

#### **Overview**

The course immunochemistry provides a basic understanding of the interactions between the immune system and invading agents in the body. The immune system is a key factor in the prevention and subsequent elimination of infectious agents. It also plays a key role in cancer development and immunopathology.

This course will enable students to recognise the intricate workings of the immune system and prepare to play leading roles in such areas as vaccine development, the discovery of immunomodulatory agents, and research into the mechanisms, prevention, and treatment of various infectious diseases and immunopathologic conditions.

#### **Objectives**

The objectives of the course are to:

1. Differentiate the roles of different components of the immune system.

2. Explain the synergy of immune components in the prevention and elimination of infectious diseases.
3. Discuss the genetic basis of immunological diversity and immune regulations.
4. Explain mechanisms tumour cells employ to evade the immune system.
5. Evaluate the impact of the immune system on tissue transplantation.
6. Describe modern immunochemical techniques in diagnosis and research.

### **Learning Outcomes**

After completing the course, the student should be able to:

1. Differentiate at least three (3) components of the immune system.
2. Explain five (5) mechanisms employed by pathogens and tumours to either evade or hijack the immune system.
3. Describe the structures and function of the five (5) classes of immunoglobulins.
4. Identify at least two (2) genetic bases for immunological diversity.
5. Evaluate three (3) components of the immune system and transplantation.
6. Enumerate three (3) bases for immunological tolerance, inflammation, autoimmunity, and allergic diseases.
7. Review at least two (2) immunochemical techniques.
8. Explain two (2) principles governing vaccination against infectious diseases.

### **Course Contents**

Immunology. Antigens. Innate immune responses. Complement system. Inflammatory responses. Structure and classification of immunoglobulins and antibodies. Antigen and antibody interactions. Structure and activation of the T-cell antigen receptor. Immunoglobulin and T cell receptor genes. Regulatory mechanisms of an immune response. Immune responses to pathogens. Cancer immunology. Immunopathology. Hypersensitivity. Autoimmunity. Transplantation immunology. Immunochemical techniques.

### **Minimum Academic Standards**

**Babcock University (BU)**

**Sciences**

**Biochemistry**

**B.Sc. Biochemistry**

**BU-BCH 311 Nutritional and Food Biochemistry (3 Units; Core, L = 30; P = 45)**

**Senate-approved relevance**

Nutritional and Food Biochemistry will provide broad nutritional science knowledge and practice with molecular and public health dimensions to students. As a Seventh-day Adventist institution of higher learning, the vision and mission of the University are to provide holistic education that would prepare healthy servant-leaders who would positively impact society. This would also enable the achievement of goals two (zero hunger) and three (good health and well-being) of the sustainable development goals.

**Overview**

This course will introduce students to various dimensions of nutritional biochemistry to optimize human health and drastically reduce the risk of disease occurrence. It will describe in detail the various nutritive and non-nutritive components of foods and how they interact with the biological systems to enhance or limit biochemical processes.

In addition, it will equip students with the knowledge of principles and best practices of nourishment at various stages of the human life cycle. It will train students on appropriate dietary modifications and the effect of food processing on the nutrient composition of different foods. It will further introduce the concepts of nutrigenomics.

## **Objectives**

The objectives of the course are to:

1. Explain the basics of nutritional and food biochemistry.
2. Relate the concept of nutrigenomics to health and disease.
3. Identify the roles of proteins, carbohydrates, and lipids in the body.
4. Evaluate the vegetarian dietary pattern and how best to practice it.
5. Relate the impact of alcohol metabolism on nutrition and health.
6. Outline the roles of vitamins in biochemical processes.
7. Identify the roles of water and essential minerals in biochemical processes.
8. Explain dietary requirements and practices for optimal health.
9. Describe the roles of food preservation and processing for optimal nourishment.

## **Learning Outcomes**

On completion of the course, students should be able to:

1. Explain at least two (2) basics of nutritional and food biochemistry.
2. Describe at least three (3) ways nutrigenomics influence health and disease.
3. Describe at least five (5) factors that influence nutrient metabolism for optimal health.
4. Outline three (3) main vegetarian dietary patterns.
5. Explain three (3) health implications of alcohol metabolism.
6. Identify thirteen (13) vitamins and their associated biochemical effects.
7. Enumerate three (3) dietary requirements and practices for optimal health.
8. State five (5) major ways food preservation and processing can ensure optimal nourishment of consumers.

## **Course Contents**

Nutritional biochemistry. Nutritional requirements. Nutrigenomics. Carbohydrates and optimal health. Lipids and optimal health. Protein and optimal health. Vegetarian dietary patterns. Alcohol metabolism. Water and fat-soluble vitamins. Metabolic roles of water. Essential minerals. Dietary requirements and practices for optimal health in various life stages. Food preservation. Food processing. Genetically modified foods. Food contaminants. Anti-nutrients.

## **Minimum Academic Standards**

Practical laboratory space.

**Babcock University (BU)**

**Sciences**

**Biochemistry**

**B.Sc. Biochemistry**

**BU-BCH 315 Xenobiotic Metabolism and Toxicology** (3 Units; Core, L=45; P = Nil)

### **Senate-approved relevance**

Xenobiotic Metabolism and Toxicology will equip students with knowledge about how foreign compounds and toxins from natural and synthetic sources interact with biochemical targets to elicit toxic responses. Students will also understand the mechanisms of chemical detoxification and its industrial applications. This aligns with the senate's mission and vision geared towards the promotion of a healthy society.

### **Overview**

Xenobiotic metabolism deals with the biochemical changes of foreign compounds by drug-metabolizing enzymes with resultant effects on the termination of activity, and eventual elimination of foreign compounds and their metabolites from the body. These foreign compounds may include drugs, food additives, agricultural, and industrial chemicals.

Humans are in contact with a wide variety of foreign compounds (xenobiotics) and environmental contaminants. These xenobiotics interact with critical biochemical targets in the body thereby eliciting toxic and/or beneficial effects. It is imperative to understand how humans inadvertently contact with xenobiotics and how the pharmaceutical industry could modify toxic compounds into beneficial products.

### **Objectives**

The objectives of the course are to:

1. Describe xenobiotics, sources of xenobiotics, and toxicokinetic properties.

2. Discuss toxicology, history of toxicology and the roles of toxicologists.
3. Evaluate xenobiotic metabolisms and factors influencing xenobiotic metabolisms.
4. Explain xenobiotics metabolic enzymes and classifications system.
5. Evaluate drug-induced tissue damage and oxidative stress.
6. Design a toxicity study to evaluate any specified products.
7. Appraise the 3R bioethics principles involved with animal handling.

### **Learning Outcomes**

On completion of the course, students should be able to:

1. State three (3) differences between xenobiotics and nutritional compounds.
2. List ten (10) sources of xenobiotics from natural and synthetic sources.
3. Outline at least two (2) histories and applications of toxicology.
4. Describe at least two (2) relevance of absorption, distribution, metabolism, and excretion dispositions of xenobiotics to human health.
5. Recall five (5) xenobiotic metabolic enzymes and their classification systems.
6. Design one (1) toxicity study for preclinical investigations.
7. Apply three (3) ethical principles of animal handling to research.

### **Course Contents**

Xenobiotics. Sources of xenobiotics. Toxicokinetic of xenobiotics. Mechanism of xenobiotics toxicity. Oxidative stress-induced tissue damage. Principles and history of toxicology. Applications of toxicology and types of toxicologists. Xenobiotic disposition. Toxicity testing procedures. Dose-response relationships. Median lethal dose and toxicity ranking. Xenobiotic metabolism. Microsomal and non-microsomal enzymes. Classification of cytochrome P450s family. Factors influencing xenobiotic metabolism. Biochemistry of genotoxicity and immunotoxicity. Design of a toxicity study.

### **Minimum Academic Standards**

#### **GST 312: Peace and Conflict Resolution**

**(2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, students should be able to:

1. analyse the concepts of peace, conflict and security;
2. list major forms, types and root causes of conflict and violence;
3. differentiate between conflict and terrorism;
4. enumerate security and peace building strategies; and
5. describe roles of international organisations, media and traditional institutions in peace building.

## **Course Contents**

Concepts of peace, conflict and security in a multi-ethnic nation. Types and theories of conflicts: ethnic, religious, economic, geo-political conflicts; structural conflict theory, realist theory of conflict and frustration-aggression conflict theory. Root causes of conflict and violence in Africa: indigene and settlers phenomenon; boundaries/boarder disputes; political disputes; ethnic disputes and rivalries; economic inequalities; social disputes; nationalist movements and agitations; selected conflict case studies – Tiv-Junkun; Zango Kartaf, chieftaincy and land disputes many more. Peace building, management of conflicts and Security, peace and human development. Approaches to peace & conflict management-(religious, government, community leaders and many more). Elements of peace studies and conflict resolution: conflict dynamics assessment scales, constructive and destructive. Justice and legal framework: concepts of social justice. The Nigeria legal system. Insurgency and terrorism. Peace mediation and peace keeping. Peace & security council (international, national and local levels). Agents of conflict resolution: conventions, treaties, community policing, evolution and imperatives. Alternative Dispute Resolution (ADR) : a). Dialogue b). Arbitration, c). Negotiation d). Collaboration and many more Roles of International Organisations in conflict resolution: (a). The United Nations, UN and its conflict resolution organs; (b). The African Union & Peace Security Council (c). ECOWAS in peace keeping. Media and traditional institutions in peace building. Managing post-conflict situations/crisis: refugees, internally displaced persons (IDPs). The role of NGOs in post-conflict situations/crisis.

## **ENT 312: Venture Creation**

**(2 Units C: LH 15; PH 45)**

### **Learning Outcomes**

At the end of this course, students, through case study and practical approaches, should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises;

7. conduct entrepreneurial marketing and e-commerce;
8. apply a wide variety of emerging technological solutions to entrepreneurship; and
9. appreciate why ventures fail due to lack of planning and poor implementation.

### **Course Contents**

Opportunity identification (sources of business opportunities in Nigeria, environmental scanning, demand and supply gap/unmet needs/market gaps/market research, unutilised resources, social and climate conditions and technology adoption gap). New business development (business planning and market research). Entrepreneurial finance (venture capital, equity finance, micro finance, personal savings, small business investment organisations and business plan competition). Entrepreneurial marketing and e-commerce (principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, e-commerce business models and successful e-commerce companies). Small business management/family business, leadership & management, basic bookkeeping, nature of family

business and family business growth model. Negotiation and business communication (strategy and tactics of negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution and emerging technologies, business applications of new technologies - Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things(IoTs), Blockchain, Cloud Computing, Renewable Energy and many more. Digital Business and E-Commerce Strategies).

### **BCH 301: Enzymology**

**(2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. discuss why enzymes are grouped into different classes;
2. explain the basis of classification of enzyme;
3. identify the role vitamins in the cellular system;
4. illustrate the basis and mechanism of enzyme- catalysed reactions;
5. derive equations governing enzyme reactions in cellular systems; and
6. explain the effect of various factors on enzyme reactions.

#### **Course Contents**

Discovery, classification and nomenclature of enzymes. Vitamins: fat and water soluble vitamins and co-enzymes, minerals in enzyme biochemistry. Structures and functions of vitamins and co-enzymes. Kinetics of enzymes. Mechanisms of enzyme-catalysed reactions. Effects of temperature, pH, ions and inhibitors on enzyme catalysed reactions. Enzyme inhibition. Derivation and significance of Michaelis-Menten equation. Allosteric/Regulatory enzymes. Active sites of enzymes. Estimation of kinetic parameters of enzyme activities. Zymogen activation, digestive enzymes and many more. Production, isolation, purification and characterization of enzymes. Marker enzymes. Recent advances in enzymology.

## **BCH 302: Metabolism of Carbohydrates**

**(2 Units C: LH 30)**

### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain the structure and functions of various polysaccharides;
2. describe the various pathways polysaccharides could be broken down in cellular systems;
3. discuss how the end product of carbohydrate metabolism is attained;
4. explain the central importance of TCA cycle in cellular metabolism; and
5. predict consequences of disorders of carbohydrate metabolism.

### **Course Contents**

Chemistry and function, isolation and purification of polysaccharides. Molecular weight determination and analytical methods for structural determination of polysaccharides. Biochemistry of important disaccharides, oligosaccharides and polysaccharides; degradation and digestion of carbohydrates - sugars, storage polysaccharides and cell walls. Glycolysis, the tricarboxylic acid cycle, the phosphogluconate pathway, the glyoxylate pathway; the pentose phosphate pathway and the cori cycle, the calvin pathway. Gluconeogenesis and glycogenesis,

glycogenolysis, metabolism of fructose, Polyol pathway. Regulation of carbohydrate metabolism. Disorders of carbohydrate metabolism.

### **BCH 303: Metabolism of Lipids**

**(2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. describe how various types of lipids (fats and oil) are synthesized;
2. discuss the implication of unsaturation in lipids and oils;
3. explain the mechanism of their degradation;
4. describe the importance of the various pathways of lipid metabolism; and
5. explain the implication of disorder in metabolism to the cellular systems.

#### **Course Contents**

Classification of lipids - fatty acids, triglycerides, glycosylglycerols, phospholipids, waxes, prostaglandins. lipid micelles, monolayers and bilayers. Oxidation of fatty acids. Microsomal peroxidation of polyunsaturated fatty acids. Metabolism of unsaturated fatty acids: essential and non-essential. Metabolism of acylglycerols. Metabolism of phospholipids. Cholesterol biosynthesis and breakdown. Metabolism of ketone bodies. Integration of lipid metabolism. Acetic acid as a central precursor for biosynthesis of lipids. Lipoprotein metabolism and transport of lipids. Adipose tissue metabolism.

### **BCH 304: Metabolism of Amino Acids & Proteins**

**(2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. illustrate why and how proteins are broken in cellular systems;
2. explain how to determine the molecular weight of proteins;
3. recognise the relationship between the urea cycle and other pathways of protein metabolism;
4. describe the differences between ketogenic and glucogenic amino acids; and
5. identify the role of inorganic nitrogen in protein synthesis and breakdown.

## **Course Contents**

Amino acids as building blocks of proteins and the peptide bond as covalent backbone of proteins. Forces involved in the stabilization of protein structure. Protein isolation, fractionation, purification and characterization. Amino acid analysis of peptides and proteins. Methods for the determination of the sequence of amino acids in proteins. Protein biosynthesis, molecular weight determination of proteins. Techniques in protein biochemistry. Oxidative degradation of amino acids and metabolism of one carbon units. Ammonia toxicity and urea formation. Ketogenic and glucogenic amino acids. Biosynthesis of amino acids and some derivatives, the urea cycle; metabolism of inorganic nitrogen. Disorders of amino acid metabolism and polyamines.

## **BCH 305: Metabolism of Nucleic Acids**

**(2 Units C: LH 30)**

### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain the levels of organisation of nucleic acids;
2. discuss the three- dimensional structure of nucleic acids;

3. interpret how information encoded in genes are able to direct protein synthesis;
4. describe the structure of proteins from nucleic acid composition of the gene; and
5. identify the various implications of disorders in nucleic acid metabolism.

### **Course Contents**

Structure and function of nucleic acids. The genetic code and protein synthesis. Metabolism of purines and pyrimidines, nucleosides and nucleotides. Degradation of purine and pyrimidine nucleotides. DNA replication and DNA repairs. Disorders and abnormalities of nucleic acid metabolism-gout, Lesch-Nyhan syndrome, hypouricaemia, orotic aciduria, Reye's syndrome, Xeroderma pigmentosus and skin cancer.

### **BCH 306: Analytical Methods in Biochemistry**

**(3 Units C: LH 30; PH 45)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain the principles of instrumentation in biochemistry;
2. describe how the level of precision attained in analysis is dependent on the method employed;
3. discuss why a method is preferred in a particular biochemical investigation;
4. explain the theoretical basis of major instruments used in biochemical analyses; and
5. perform some specific analytical investigations.

### **Course Contents**

Tissue and cell culture techniques, immunoassays, blotting and isotopic techniques. Principles, methodologies, instrumentation and applications of electrophoresis, manometry and centrifugation techniques. Chromatographic techniques including paper, thin layer, column, gas, and high-performance chromatographic techniques. Spectroscopic techniques including uv-visible, infra-red, nuclear magnetic resonance and mass spectrometry. Fluorimetry, polarographic including potentiometric and electrometric measurements. State-of-the-art equipment: gas chromatography-mass spectrometry, thermocycler, high performance liquid chromatography, nuclear magnetic resonance, fourier-transform infrared spectroscopy. This course includes laboratory practical classes, which will provide students the opportunity to practice the various techniques and familiarise

themselves with the types of equipment used for the techniques.

### **BCH 307: Membrane Biochemistry**

**(2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain the role of membrane as gatekeeper of cells;
2. describe the make-up of membranes;
3. identify the models used to explain the arrangement of molecules contained in membranes;  
and
4. discuss the mechanism of transportation of molecules into and out of cells.

#### **Course Contents**

Structure, composition and functions of biological membranes. Isolation, characterization and classification of membranes; chemistry and biosynthesis of membranes. Molecular organisation of membrane components. Natural and artificial membrane bilayers - the unit membrane

hypothesis and fluid mosaic model. Membrane transport system - active versus passive transport systems. Transport of sugars and amino acids.

### **BCH 308: Bioenergetics**

**(1 Unit C: LH 15)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. illustrate how biological energy is generated in the cells;
2. explain the concept of 'fuel molecules'; and
3. imbibe comprehensive knowledge of biological energy transformation and utilisation.

#### **Course Contents**

High-energy compounds. Chemical thermodynamics, Oxidations and reductions. Chemical potentials, Electrochemical potentials, Electron transport system and oxidative phosphorylation. Uncouplers of oxidative phosphorylation. Shuttle systems for oxidation of extra-mitochondrial NADH, ATP Cycle, Regulation of ATP production.

### **BCH 309: Inorganic Biochemistry**

**(1 Unit C: LH 15)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain the roles of inorganic ions in biological systems;
2. discuss the functions of ions in enzyme actions; and
3. describe the importance of nitrogen and sulphur cycles in living systems.

#### **Course Contents**

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

## **BCH 399: Industrial Attachment (For 4 year Programme - 12 weeks)(3**

**Units C: PH 135)**

### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain how theoretical principles in biochemistry are employed in industrial production; and
2. describe the clinical application of various metabolic abnormalities for those in clinicallaboratories.

### **Course Contents**

Students should be attached to some relevant industrial organisations for 12 Weeks at the end of 300 Level during the long vacation before commencement of 400 Level. Assessment to be based on seminar presentation, report and assessment by their industry and university supervisors.

## **Course Contents and Learning Outcomes**

### **400 Level**

**Babcock University (BU)**

**Sciences**

**Biochemistry**

**B.Sc. Biochemistry**

**BU-BCH 410 Biochemical Pharmacology** (3 Units; Core, L = 45; P = Nil)

#### **Senate-approved relevance**

Biochemical Pharmacology will equip students with the knowledge of the therapeutic and side effects of drugs. The applications of biochemical pharmacology are vital for the pharmaceutical industry to study and elucidate the mechanism of action of drugs to resolve diseases. This is in line with the vision and mission of the senate to equip students with the proper knowledge and skills to elucidate mechanisms of pharmacotherapy and diseases.

#### **Overview**

Biochemical Pharmacology will introduce the critical concepts of pharmacology with an emphasis on the drugs and sources of drugs from natural and synthetic origins. It will also cover the mechanisms of action of drugs, multi-drug resistance and pharmacotherapy in treating debilitating diseases including respiratory disorders, cancers, diabetes, gastrointestinal disorders, and malaria.

Furthermore, it will cover the basic concepts of drug-receptor interactions, absorption, distribution, metabolism and excretion processes and biochemical effects of drugs on ion channels and G protein-coupled receptors. In addition, it will explore pharmacotherapy against selected debilitating diseases in Nigeria and the global community.

## **Objectives**

The objectives of the course are to:

1. Outline the concept of drugs, sources of drugs and biochemical drug targets.
2. Describe drug-receptor interaction and pharmacokinetics.
3. State the mechanism of drug actions and drug resistance.
4. Explain the molecular basis of cancer chemotherapy.
5. Evaluate the physiological and biochemical actions of selected classes of drugs, including drugs from Nigerian traditional medicine, used in the management and therapy of ailments.
6. Explain the principles and ethical values in the pharmacotherapy of drugs.

## **Learning Outcomes**

On completion of the course, students should be able to:

1. Enumerate at least five (5) applications of drugs to industries.
2. Identify ten (10) sources of drugs from natural and synthetic sources.
3. State five (5) influences of absorption, distribution, metabolism, and excretion on drug actions.
4. Describe two (2) biochemical effects of drugs on G protein-coupled receptors.
5. Evaluate the mechanisms of action of two (2) named drugs on biochemical targets associated with communicable and non-communicable diseases.
6. Discuss at least two (2) ethical guidelines associated with the pharmacotherapy of drugs.

## **Course Contents**

Introduction to biochemical pharmacology. Sources of drugs. Drug targets and receptor interactions. Drug disposition. Mechanism of multi-drug resistance. Factors influencing drug efficacy. Drugs and ion channels. Drugs and G protein-coupled receptors. Drugs and respiratory disorders. Anti-cancer drugs. Diabetic drugs. Drugs and GIT disorders. Malaria drugs. Drugs and sickle cell anaemia. Drugs and common cold. Antihyperlipidemic drugs. Antihypertensive drugs. Herbal drugs. Ethics and pharmacotherapy of drugs.

## **Minimum Academic Standards**

**Babcock University (BU)**  
**Sciences**  
**Biochemistry**  
**B.Sc. Biochemistry**

**BU-BCH 424 Computational Biochemistry and Drug Discovery (1 Unit; Core, P = 45)**

**Senate-approved relevance**

Computational Biochemistry and Drug Discovery applications are essential knowledge and skills vital for the 21st-century pharmaceutical industry to tackle the debilitating diseases affecting human health. This is in line with the vision and mission of the University to train first-class servant leaders that are well-equipped to discover and design suitable drugs in a shorter and less expensive process using computer accelerated approach.

**Overview**

Computational Biochemistry and Drug Discovery will expose students to skills and knowledge on modern drug discovery approach using computational tools. This approach can speed up the process of drug design and discovery with enhanced drug target specificity, reduced cost, and predict the pharmacokinetic property of drugs.

Furthermore, this course will prepare students with the computer-aided methods and skills required to design drugs *de novo*, virtual screenings, molecular recognition and docking, ligand-receptor interactions, pharmacophore searching, molecular modelling, and molecular dynamics.

**Objectives**

The objectives of the course are to:

1. Describe the computer-aided drug discovery and development pipeline.
2. Discuss hit and lead candidates, and lead optimization.
3. Analyse the 3-D structures of ligands and targets from online databases.

4. Demonstrate molecular protein-ligand recognition, docking and molecular dynamics.
5. Illustrate *de novo*, structure and ligand-based designs, and virtual screenings.
6. Demonstrate protein sequence search and protein modelling.
7. Predict drug-like properties using pharmacokinetics and physicochemical properties.
8. Apply software programs and web-based interfaces for drug design and discovery.

### **Learning Outcomes**

On completion of the course, students should be able to:

1. Describe two (2) processes involved in drug development using computer-aided drug design and discovery tools.
2. State at least five (5) applications of computer-aided drug design in the pharmaceutical industry.
3. Apply molecular protein-ligand docking and molecular dynamics to elucidate at least two (2) drug-receptor interactions.
4. Illustrate ligand and protein search sequences from at least two (2) databases.
5. Develop at least two (2) key competencies such as molecular docking and *in silico* predictions in the practical methods and techniques of drug discovery.

### **Course Contents**

Drug discovery. Natural products. Modern drug discovery. Computer-aided drug design. Pharmacophore. Lock-key principle and induced fit theory. Molecular docking. Target identification and validation. Protein-ligand interactions. Molecular mechanics and force fields. Protein modelling. Virtual screening. *de novo* designs. Protein and chemical databanks. Hit/lead discovery and optimization. Structure-based design. Ligand-based drug design. Pharmacokinetic prediction. Protein structure prediction.

### **Minimum Academic Standards**

Computer Laboratory (mini), Internet connectivity

**Babcock University (BU)**

**Sciences**

**Biochemistry**

**B.Sc. Biochemistry**

**BU-BCH 430 Forensic Biochemistry (2 Units; Core, L = 30; P = Nil)**

**Senate-approved relevance**

Forensic Biochemistry will expose the students to essential knowledge required to analyse forensic evidence and provide scientific verifications. This is in line with the University's vision and mission statements to prepare graduates for excellence in service delivery in dispute resolution and forensic evidence.

**Overview**

Forensic biochemistry will expose students to the biochemical techniques employed in addressing legal questions. The course will cover the basis of tracing the origin of a particular substance, determining the paternity or relatedness of humans or animals, or tracking the spread of disease.

This course will prepare the students with the forensic methods and skills needed for relevant identification such as body fluids with an in-depth focus on the techniques and instrumentation used to extract, quantify, and analyse DNA and other samples.

**Objectives**

The objectives of this course are to:

1. Describe forensic biochemistry, its history, methods, and applications.
2. Relate basic genetics and population genetics to forensic biochemistry.
3. Describe human and non-human DNA typing techniques and DNA instrumentation.
4. Evaluate critical thinking and problem-solving approaches in forensic biochemistry.
5. Explain the theory and applications of relatedness in forensic investigations.

6. Describe the regulatory guidelines of forensic analyses.

### **Learning Outcomes**

On completion of the course, students should be able to:

1. Describe at least two (2) techniques used in forensic biochemistry.
2. State at least two (2) applications of genetics and population genetics to forensic biochemistry.
3. Interpret at least two (2) forensic biochemistry experimental data and laboratory reports.
4. Describe at least two (2) applications of DNA typing and fingerprinting.
5. Review at least fifteen (15) research articles on relevant forensic investigations.

### **Course Contents**

Introduction to forensic biochemistry. Historical aspects of forensic biochemistry. Cells and chromosomes. DNA replication. Serology. Presumptive and confirmatory testing. Forensic DNA extraction and quantification. Mitochondrial DNA. Forensic polymerase chain reaction and electrophoresis. Analysis of DNA by polymerase chain reaction techniques. Introduction to DNA markers. Genome organization. Introduction to DNA profiling and fingerprinting. Forensic questions. Evaluation of DNA profiling. Forensic Databases. Quality assurance and quality control.

### **Minimum Academic Standards**

**Babcock University (BU)**  
**Sciences**  
**Biochemistry**  
**B.Sc. Biochemistry**

**BU-BCH 432 Hormonal Biochemistry (2 Units; Core, L = 30, P = Nil)**

**Senate-approved relevance**

Hormonal Biochemistry will equip the students with the basic knowledge of endocrinology to better understand hormone actions and how to better tackle hormone-associated disorders. The aims of this course align with the vision and mission of the University to train first-class servant leaders that are well-suited to investigate and proffer solutions to diseases associated with hormonal dysfunctions.

**Overview**

Hormonal Biochemistry will expose students to the mechanisms of action of chemicals called hormones, secreted by ductless endocrine glands in response to a biochemical signal received. Hormones play a vital role in the effective communication between different organs to adapt to changes in the environment.

The course will also introduce basic concepts of endocrinology and hormonal regulations. In addition, it will explain the classes of hormones, biosynthesis of amino acid-derived, steroid and polypeptide hormones and the role of intracellular mediators of hormonal signals and biochemical responses.

**Objectives**

The objectives of the course are to:

1. Explain endocrinology and the endocrine system.
2. Identify the classes and control of hormonal secretions, structures, and functions.
3. Explain the basic mechanism of hormonal actions and receptors.
4. Describe the molecular mechanism of steroids, thyroid, and polypeptide hormones.

5. State the biochemical roles of cAMP, glycogen phosphorylase, calcium ion, calcium-binding proteins, nitric oxide, inositol 1,4,5 triphosphate and diacylglycerol as intracellular second messengers.
6. Explain hormone agonists, partial agonists, and GTP-binding proteins.
7. Illustrate the biosynthesis of amino acids derived and steroid hormones.

### **Learning Outcomes**

On completion of the course, students should be able to:

1. Outline three (3) classes, controls, structures, and functions of hormones.
2. Illustrate at least two (2) signal transduction pathways associated with hormone-receptor actions.
3. Review at least two (2) biochemical roles of hormone agonists and partial agonists.
4. Explain at least two (2) actions of heterotrimeric GTP-binding proteins in signal transduction.
5. Explain at least one (1) pathway required for the synthesis of amino acid-derived, polypeptide and steroid hormones.

### **Course Contents**

Endocrinology and endocrine system. Hormonal Classes and functions. Control/regulation of hormonal secretions. The basic mechanism of hormonal actions and signal transduction. Hormone receptors. Molecular mechanism of hormones. Kinetic binding mode of action of hormones. Biochemical roles of cAMP. Glycogen phosphorylase. Calcium and calcium-binding proteins. Nitric oxide. Inositol 1,4,5 triphosphate and diacylglycerol. Hormone agonists and partial agonists. Heterotrimeric GTP-binding proteins. Phospholipases and protein kinases. Protein modules. Biosynthesis of hormones.

**Babcock University (BU)**

**Sciences**

**Biochemistry**

**B.Sc. Biochemistry**

**BU-BCH 433 Biochemistry of Nutrition and Healthful Lifestyle (2 Units; Core, L = 30, P = Nil)**

## **Senate-approved relevance**

Biochemistry of Nutrition and Healthful Lifestyle will expose the students to the molecular impact of food choices and healthful lifestyles on human health and well-being. The course will cover the different food components, food contaminants, heavy metals, and environmental pollutants that affect metabolism in the body. This is congruent with the vision and mission statements of the University to provide holistic education to prepare healthy students for servant-leader roles.

## **Overview**

The biochemistry of nutrition and healthful living will expose students to crucial data regarding the roles of nutrition and healthful lifestyle choices in the onset, progression, and prognosis of diseases. Moreover, lifestyle choices play a significant role in determining the state of mental, social, physical, or spiritual well-being.

This course will also deepen the understanding of students on the influence of healthful lifestyle choices on metabolism. It will also elucidate the link associating nutrition, healthful lifestyle choices, epigenetics, and genetics in metabolisms on health outcomes and disease progression.

## **Objectives**

The objectives of the course are to:

1. Review the biochemical components and contaminants in foods.
2. Evaluate the impact of food choices (such as vegetarianism) on health.
3. Describe the biochemical benefits of physical exercises in health and disease.
4. Explain the biochemical functions of water in health and disease.
5. Describe the effect of sunlight and ultraviolet light on metabolism in the body.
6. Review the relationships between rest and body metabolism.
7. Explain the mechanisms of action of selected lifestyle choices (active and sedentary) on metabolism and how it influences genetics.
8. Demonstrate the impacts of food choices and healthful lifestyle choices on human metabolism.

## **Learning Outcomes**

On completion of the course, students should be able to:

1. Enumerate at least five (5) food components and contaminants.

2. Demonstrate the impact of food choices on at least two (2) named metabolic processes.
3. State at least five (5) benefits of water, sunlight, and exercise on human metabolism.
4. Recall at least five (5) consequences of food choices, and active-sedentary lifestyles on human metabolism and genetics.
5. Design at least one (1) program on impacts of food choices, and lifestyle on health and diseases.

### **Course Contents**

Food components. Biological contaminants. Chemical contaminants. Food choices. Impact of hygiene. Impact of lifestyle. Physical exercises. Water. Visible light and metabolism. Ultraviolet light and metabolism. Oxygen and metabolisms. Nitrogen and metabolisms. Metabolic effects of fasting and resting states. Active lifestyle choices and metabolism. Sedentary lifestyle choices and metabolism. Design a program on food choices and metabolism. Design a program on lifestyle choices and metabolism.

### **Minimum Academic Standards**

**Babcock University (BU)**  
**Sciences**  
**Biochemistry**  
**B.Sc. Biochemistry**

**BU-BCH 435 Biochemistry Seminar** (2 Units; Core, L = 30; P = Nil)

### **Senate-approved relevance**

The Biochemistry Seminar course will equip students with skills in scientific literature search, analysis, interpretation, writing and presentation. This is in line with the vision and mission of Babcock University to train first-class servant leaders, who are articulate scientific communicators to shape the world for the benefit of humanity.

### **Overview**

The Biochemistry Seminar course is under the supervision of a faculty member and each student will choose a contemporary topic for detailed study based on a literature search. The course will include a demonstration by a faculty member on identifying validated biochemical information and communicating effectively in writing and presentations.

This course will familiarize students with scientific methods in publications, hypotheses, experiments, interpretations, and contextualizing current knowledge in the field. It will also introduce requisite competence in scientific writing, public speaking, question handling, interviewing, and informed discussion on current biochemical topics, as an invaluable career, and public relations skills.

### **Objectives**

The objectives of the course are to:

1. Identify seminal biochemical problems and emerging issues in biochemistry.
2. Assess scientific literature from journals, databases, and textbook resources.
3. Evaluate the quality of scientific materials, citations, and references.
4. Explain the ethics in scientific writing, plagiarism, and grammar.
5. Develop scientific information in written and oral presentation formats.
6. Prepare a scientific abstract.
7. Defend the scientific findings in seminar and conference environments.
8. Evaluate the scientific presentations and provide constructive feedback.

### **Learning Outcomes**

On completion of the course, students should be able to:

1. Identify one (1) seminal biochemistry topic.
2. Analyse fifteen (15) scientific works of literature from indexed journals, databases, and textbook resources.
3. Determine the quality and recency of fifteen (15) scientific literature as applicable.
4. Apply one (1) anti-plagiarism tool and grammar checker in scientific writings.
5. Apply one (1) citation/reference manager to organize scientific literature.
6. Systematically construct one (1) scientific argument.

7. Develop at least one (1) scientifically organised seminal topic in the following categories: abstract, written seminar report and PowerPoint slides.
8. Demonstrate at least five (5) communication skills in scientific presentations.
9. Practice five (5) constructive feedback to question handling and inquiry.

### **Course Contents**

Seminal biochemistry topics. Scientific literature search. Journals and databases. Reference textbooks. Responsible conduct in research. Ethics of scientific writings. Plagiarism and anti-plagiarism tools. Word Processing. Grammar and use of tenses. Citations and references. Critical analysis of scientific data. Constructive feedback. Data interpretation and inferences. Scientific communication and logical reasoning. Preparation of PowerPoint. Abstract preparation. Preparation of seminar report.

### **Minimum Academic Standards**

**Babcock University (BU)**  
**Sciences**  
**Biochemistry**  
**B.Sc. Biochemistry**

**BU-BCH 437 Biochemistry of Viruses and Parasites (2 Units; Core, L = 30; P = Nil)**

#### **Senate-approved relevance**

The knowledge of the biochemistry of viruses and parasites is highly imperative in the development of new pharmacological agents against pathogenic organisms. It will prepare the students to take various leadership positions in the development of drugs and vaccines for the prevention and control of infectious diseases. The promotion of a healthy society is a significant part of the vision and mission of Babcock University.

#### **Overview**

The course will cover the biochemistry of viruses and parasites and how specific mechanisms lead to a disease condition. It will also discuss the mechanism of interactions between the hosts and viruses or parasites and the biochemical basis of vaccine development and the applications of viruses and parasites as research tools.

The course will also give a synopsis of viral taxonomy, replication strategies, pathogenicity, diagnosis, prevention, treatment, antiviral immunity, and evasive mechanisms. Similarly, it will cover the pathophysiology and biochemistry of tropical parasitic diseases, mechanisms of host-parasite interactions and the molecular basis for chemotherapeutics against parasites.

## **Objectives**

The objectives of the course are to:

1. State the concept of epidemiology.
2. Outline the structural properties of different classes of viruses.
3. Explain viral multiplication mechanisms.
4. Illustrate the control of viral replication.
5. Describe the metabolism of biomolecules in parasites.
6. Explain host-parasite interactions and parasite nutrient needs.
7. Describe drug action against parasites and defence mechanisms in parasitism.
8. Explain the biochemical basis for parasitic infections.

## **Learning Outcomes**

On completion of the course, students should be able to:

1. State the basics of epidemiology for two (2) infectious diseases.
2. Outline the structural properties of at least one (1) example of each of the different classes of viruses.
3. Describe the multiplication mechanisms of at least two (2) viruses.
4. Recall the control of viral replication using two (2) examples.
5. Illustrate the metabolism of biomolecules in at least two (2) parasites.
6. Describe host-parasite interactions using at least two (2) specific examples.
7. Relate drug actions against parasites and defence mechanisms in parasitism using three (3) specific examples.
8. Explain the biochemical basis for at least one (1) parasitic infection.

## **Course Contents**

Epidemiology. Structural properties of viruses. Viral multiplication mechanisms. Viral replication control.

Antiviral immunity and viral evasion. Interferons. Metabolism of biomolecules in parasites. Host-parasite interactions. Parasite nutrient needs. Biochemical mechanisms of drug actions against parasites. Defence mechanisms in parasitism. Membranes of parasites. Malaria. Trypanosomiasis. Filariasis. Schistosomiasis. Gastrointestinal worm infestations.

## **Minimum Academic Standard**

### **Course Contents**

Chemistry of enzyme catalysis. Steady state enzyme kinetics. Transient kinetic methods. Ligand binding and its application to enzymology. Kinetics of multiple binding sites. Mechanisms of two substrate systems. Molecular models of allosterism. Enzyme models of allosterism. Multi-enzyme complexes. Enzyme assays and techniques in enzymology. Criteria for determining purity of enzymes. Enzyme reconstitution. Regulation of enzyme activity and synthesis.

## **BCH 401: Advanced Enzymology (2 Units C: LH 30)**

### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain the concept and necessity for multi- enzyme actions;
2. describe the chemistry of catalysis;
3. discuss the role of active sites in enzymatic reactions;
4. illustrate various methods that could be used for enzyme assays; and
5. relate the mechanism of regulation of enzyme action and its synthesis.

### **Course Contents**

Chemistry of enzyme catalysis. Steady state enzyme kinetics. Transient kinetic methods.

Ligand

binding and its application to enzymology. Kinetics of multiple binding sites. Mechanisms of two

substrate systems. Molecular models of allosterism. Enzyme models of allosterism. Multi-enzyme

complexes. Enzyme assays and techniques in enzymology. Criteria for determining purity of

enzymes. Enzyme reconstitution. Regulation of enzyme activity and synthesis.

### **BCH 402: Molecular Biochemistry**

**(2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain how genes can be sequenced to determine the structure of DNA contained therein;
2. illustrate the mechanism of replication of DNA in both procaryotic and eucaryotic organisms;
3. describe how genes can be influenced to obtain a pre-determined outcome;
4. discuss the mechanism of action of gene- specific chemical compounds; and
5. explain the bias of human genome project.

#### **Course Contents**

Gene structure and function. Nucleic acid function and biological function. DNA sequencing and restriction endonucleases. DNA repair mechanisms. Nucleic acid replication. Regulation of nucleic acid synthesis. Genetic code and gene-protein relationship. Eukaryotic transcription. Control of gene expression. Functional analysis of the replicator structure of bacteriophage DNA. Drug- nucleic acid interactions. Initiation factor for viral DNA replication. Genetic control of viral replication. Model systems used for studying embryology at the molecular level. Model systems in differentiation studies. Cell cycle, Control of cell proliferation. Genetic engineering and recombinant DNA Technology. Polymerase chain reaction, human genome project and gene therapy.

### **BCH 403: Metabolic Regulations**

**(2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain the central role of Kreb's cycle in macromolecular metabolism;
2. identify the inter-relationship between metabolic pathways of macromolecules;
3. describe how a product of one cycle can inhibit another pathway; and
4. identify the need to regulate various metabolic pathways and how the cell does it.

### **Course Contents**

The relationship of Krebs' Cycle to protein, carbohydrate, lipid and nucleic acid metabolism. Integration of metabolic pathways. Turn-over rates and metabolic pools. Regulation of enzymes of metabolic pathways-feedback inhibition versus enzyme synthesis. Catabolite repression, end product repression. Identification of different regulatory mechanisms in metabolic pathways.

### **BCH 404: Biochemical Reasoning**

**(1 Unit: C LH 15)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. apply their broad knowledge of biochemistry to explain any problem they confront; and
2. write scientific papers for conferences and publication.

### **Course Contents**

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

### **BCH 405: Plant Biochemistry**

**(2 Units C: LH 30)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. describe the metabolic pathways that are peculiar to plants;
2. explain the concept of secondary metabolites and their application for medicinal purposes;
3. discuss the chemical processes involved in photosynthesis as basis of life; and
4. identify the importance of hormones of plant origin.

### **Course Contents**

Organisation of plant cells. The plant cell wall structure, formation and growth. Biochemistry of plant development. Lignin formation. The biochemistry of important plant processes and metabolic pathways. Photosynthesis. Secondary metabolites. Plant hormones and structure- activity relationship of plant hormones. Biosynthesis of carotenoid pigments. Synthetic growth regulators and herbicides.

Indigenous plants of medicinal importance. Recent advances in medicinal plant biochemistry.

### **BCH 406 Research Projects**

**(6 Units C: PH 270)**

#### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain laboratory procedures including safety precautions;
2. carry out independent researches that will lead to tangible outcomes; and
3. present outcome of their researches in seminars and conferences.

#### **Course Contents**

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

## **BCH 407: Bioinformatics**

**(2 Units C: LH 30)**

### **Learning Outcomes**

At the end of the course, students will be able to:

1. identify the use of computational methods to predict life processes; and
2. explain various programmes applicable to life sciences.

### **Course Contents**

An overview of bioinformatics, history of bioinformatics, genome sequencing projects, database searching algorithms (BLAST, FAST A), pair wise and multiple sequence alignments, phylogenetic analysis, data mining in novel genomes, current topics in bioinformatics and use of perl to facilitate biological analysis.

## **BCH 408: Biochemical Entrepreneurship**

**(2 Units C: LH 30)**

### **Learning Outcomes**

At the end of the course, students will be able to:

1. explain how to apply their theoretical knowledge to start small/ medium scale production facilities;
2. describe the application of enzymes in industrial processes; and
3. discuss the importance of value chain in biochemical processes.

### **Course Contents**

Entrepreneurship skills related to biochemistry, creation of new ventures/business, writing and designing business plans, feasibility studies, financial planning and management, production of local diagnostic kits, soap/detergents, crude commercial enzymes, quality vegetable oils, bread, confectionery, food processing/packaging and preservation, production of ointments and medicinal plant extracts. Students will be grouped in areas of interest.

## **Minimum Academic Standards**

### **Equipment**

1. Water Bath (Thermostatic)
2. Drying Oven (Thermostatic)
3. Spectrophotometers and Colorimeters
4. pH Meters
5. Electrophoresis Units
6. Centrifuges (Bench- Top & High Speed)
7. Incubators
8. Hot Plates and Heaters
9. Test-Tube Mixers
10. Gas Cylinders, Valves and Tubings
11. Distillers (All Glass)
12. Deionizers
13. Fraction Collector
14. Micro-Kedhjal Apparatus
15. Column Chromatography Equipment
16. Thin Layer Chromatography Equipment
17. Rotary Evaporator
18. Glass wares

### **Staffing**

Professor/Reader	1
Senior Lecturer	2
Lecturers 1 and below	3 (at least 2 with PhD)
Laboratory Technologist	2
Laboratory Assistant	3
Laboratory Attendants	3
Secretary	1

Office Assistant

1

### **Library**

The University Library is expected to stock at least 3 copies each hard-copy text books on biochemistry (both general and specialized), depending on number of students on the programme. There should also be hard copies of subject specific journals, both national and international. The library is also expected to subscribe to data bases that will make numerous text books and journals on biochemistry available as e-resources.

### **Classrooms, Laboratories, Workshops and Office Space**

The NUC recommends the following physical space requirements:

<b>Description</b>		<b>Size m<sup>2</sup></b>
Professor's Office	-	18.50

Head of Department's Office	-	18.50
Tutorial Teaching Staff's Office	-	13.50
Other Teaching Staff Space	-	7.00
Technical Staff Space	-	7.00
Secretarial Space	-	7.00
Research Laboratory	-	16.50
Seminar Space/per student	-	1.85
Laboratory Space per FTE	-	7.50
Conference Room	-	37.0

