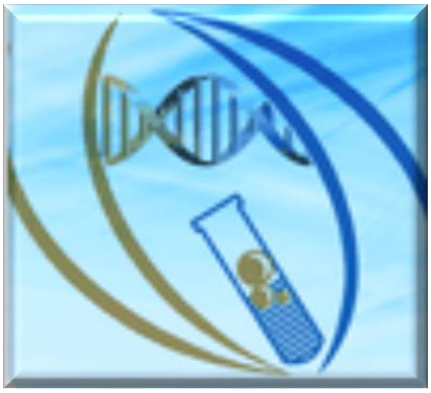
Biochemical Study Plan



Biochemistry Department

1434هـ - 2013م

Biochemical Study Plan

1st Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect.- Exre.-Pract.)
CI 140	Learning, Thinking and Research Skills	-	-	3 (3+0+0)
CHS 150	Health and Fitness (2)	-	-	1 (1+0+0)
ENG 140	English Language (1) **(E)**	-	-	8 (8+0+0)
MATH 140	Introduction to Mathematics **(E)**	-	-	2 (1+1+0)
Total of Credit Hours				**14**

2nd Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect.- Exre.-Pract.)
CT 140	Computer Skills **(E)**	-	-	3 (0+0+3)
MC 140	Communication Skills	-	-	2 (2+0+0)
ENG 150	English Language (2) **(E)**	ENG 140	-	8 (8+0+0)
MATH 150	Differential Calculus **(E)**	MATH 140	-	3 (2+1+0)
ENT 101	Entrepreunership	-	-	1 (1+0+0)
Total of Credit Hours				**17**

3th Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect.- Exre.-Pract.)
CHEM 101	General Chemistry	-	-	4 (3+0+1)
ZOOL 103	Principles of general Zoology	-	-	3 (2+0+1)
MBIO 140	Microbiology	-	-	3 (2+0+1)
STAT 106	Biostatistics	-	-	2 (1+0+1)
University Requirement			-	2 (2+0+0)
University Requirement			-	2 (2+0+0)
Total of Credit Hours				**16**

4th Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect.- Exre.-Pract.)
PHYS 102	General Physics (2)	-	-	4 (3+0+1)
CHEM 108	Introduction to Organic Chemistry	-	-	4 (3+0+1)
BCH 201	General Biochemistry (1)	-	CHEM 108	3 (3+0+0)
CHEM 231	Chemical Thermodynamic	-	-	2 (2+0+0)
University Requirement			-	2 (2+0+0)
University Requirement			-	2 (2+0+0)
Total of Credit Hours				**17**

5th Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect.- Exre.-Pract.)
BCH 312	Biochemical Calculations	BCH 201	-	3 (2+0+1)
CHEM 251	Analytical Chemistry	-	-	3 (2+0+1)
BCH 302	General Biochemistry (2)	BCH 201	-	4 (3+0+1)
BCH 320	Enzymes		BCH 302 BCH 312	3 (3+0+0)
BCH 322	Experiments in Enzymology		BCH 320 BCH 312	2 (0+0+2)
BCH 102 ZOOL 352	Cellular Biochemistry ***OR*** Principles of Genetics	-	-	2 (1+0+1)
CHEM 341	Heterocyclic Organic Chemistry	CHEM 108	-	2 (2+0+0)
Total of Credit Hours				**19**

6th Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect.- Exre.-Pract.)
BCH 332	Biophysical Biochemistry	BCH 302 BCH 312	-	3 (3+0+0)
BCH 333	Experiments in Biophysical Biochemistry		BCH 322	2 (2+0+0)
BCH 340	Metabolism-1	BCH 320	-	3 (3+0+0)
BCH 361	Molecular Biology	BCH 302	-	4 (3+0+1)
MBIO 450 MBIO 460	Medical Virology ***OR*** Medical Bacteriology	-	-	3 (2+0+1)
BCH 471	Biochemistry of Blood	BCH 320	-	3 (2+0+1)
Total of Credit Hours				**18**

7th Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect.- Exre.-Pract.)
BCH 440	Metabolism-2	BCH 340	-	3 (3+0+0)
BCH 450 BCH 441 BCH 434	Biochem. Specialized Tissues ***OR*** Bioenergetics ***OR*** Biophysics	BCH 340 BCH 332	- BCH 440	2 (2+0+0)
BCH 452	Biomembranes and Cell Signaling	BCH 302	-	2 (2+0+0)
BCH 462	Biotechnology & Genetic engineering	BCH 361	-	4 (2+0+2)
BCH 472 BCH 473	Biochemistry of Biological Fluids ***OR*** Biomarkers in Health & Diseases	BCH 320 BCH 340 BCH 471	-	3 (2+0+1)
BCH 485	Training in the principles and scientific research skills	BCH 333 BCH 361 BCH 471	-	2 (0+0+2)
BCH 447	Practical Metabolism	BCH 340	BCH 440	2 (0+0+2)
Total of Credit Hours				**18**

8th Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect.- Exre.-Pract.)
BCH 463	Bioinformatics	BCH 361	-	3 (1+0+2)
BCH 436 BCH 464	Nanotechnology ***OR*** Gene Expression	BCH 302 BCH 332	-	2 (2+0+0)
BCH 465	***OR*** Biochemical Genetics	BCH 361		
BCH 445	Nutritional Biochemistry	BCH 302	-	3 (2+0+1)
BCH 453	Hormones	BCH 340 BCH 452	-	2 (2+0+0)
BCH 454 BCH 466	Toxicology & Carcinogens ***OR*** Molecular Biology of Cancer	BCH 440 BCH 361 BCH 452	-	2 (2+0+0)
BCH 477	Immunology	BCH 471	-	2 (2+0+0)
BCH 497	Research and Seminar	BCH 485 Finishing 115 credit hours	-	3 (1+0+2)
Total of Credit Hours				**17**

(Lect. – Exer. – Pract.) = (Lecture – Exercise – Practical)

List of the Elective Courses of the University Requirements
(Student elects 8 credit hours)

Course Code	Course Title	Pre-requisite	Credits (Lect. – Exer. - Pract.)
IC 100	Studies in the Biography of the Prophet	-	2 (2+0+0)
IC 101	Introduction of Islamic Culture	-	2 (2+0+0)
IC 102	Islam and Building up the Society	-	2 (2+0+0)
IC 103	Economic System in Islam	-	2 (2+0+0)
IC 104	Political system in Islam	-	3 (2+0+1)
IC 105	Human Rights	-	3 (2+0+1)
IC 106	Islamic Jurisprudence	-	2 (2+0+0)
IC 107	Ethics of Occupation	-	2 (2+0+0)
IC 108	Contemporary Issues	-	2 (2+0+0)
IC 109	Woman and Her Developmental Role	-	2 (2+0+0)

List of the Elective Courses *from INSIDE OR OUTSIDE the Department*
(The student elects 14 credit hours)

Course Code	Course Title	Pre-requisite	Credits (Lect - Exer- Pract)
BCH 102	Cellular Biochemistry	BCH 201	2 (1+0+1)
BCH 434	Biophysics	BCH 340	2 (2+0+0)
BCH 436	Nanotechnology	BCH 440	2 (2+0+0)
BCH 441	Bioenergetics	BCH 320	2 (2+0+0)
BCH 450	Biochemistry of Specialized Tissues	BCH 340	2 (2+0+0)
BCH 454	Toxicology and Carcinogens	BCH 440	2 (2+0+0)
BCH 464	Gene Expression	BCH 361	2 (2+0+0)
BCH 465	Biochemical Genetics	BCH 461	2 (2+0+0)
BCH 466	Molecular Biology of Cancer	BCH 462	2 (2+0+0)
BCH 472	Biochem. of Biological Fluids	BCH 320	3 (2+0+1)
BCH 473	Biomarkers in Health & Diseases	BCH 320	3 (2+0+1)
ZOOL 352	Principles of Genetics	-	2 (1+0+1)
MBIO 450	Medical Virology	-	3 (2+0+1)
MBIO f460	Medical Bacteriology	-	3 (2+0+1)

List of service courses to Another Departments and Colleges.

Course Code	Course Title	Pre-requisite	Credits (Lect - Exer- Pract)
BCH 101	General Biochemistry	4 (3+0+1)	Science - Agriculture
BCH 102	Cellular Biochemistry	2 (1+0+1)	Science
BCH 201	General Biochemistry (1)	3 (3+0+0)	
BCH 376	Analysis of Biological Fluids	3 (2+0+1)	Agriculture

Short Courses Description

I- Compulsory courses *from* the Specialization [credit hours (Lect. – Exer. – Pract).]

BCH 201: General Biochemistry-1 (E)	3(3+0+0)
This is the first part of a general introductory biochemistry course. This part covers relevant chemical concepts (chemical bonds, functional groups, equilibrium, and energy), building blocks of cellular components, structure and properties of water, buffers, structure and properties of amino acids, peptide bond, protein structure, structural & functional classification of proteins, and introduction to enzymes and metabolism.	

BCH 302: General Biochemistry-2 (E)	4(3+0+1)
This is the second part of a general introductory biochemistry course. This part covers carbohydrates, lipids, nucleic acids, and relevant chemical moieties (hormones, vitamins, etc.), with special emphasis on macromolecules structures and functions.	

BCH 312: Biochemical Calculations (E)	3(2+0+1)
An introductory course that deals with the most common calculation problems in biochemistry including calculation of concentration, pH value, ionization of weak acids, buffer composition, and reaction constants as well as the subjects of spectrophotometric measurements and statistical analysis of data. The course also offers tutorials on the same subjects supported by hands-on experiments whenever possible.	

BCH 320: Enzymes	3(3+0+0)
General aspects: nature of enzymes, localization, units of enzyme activity, specificity and specific Nonenzyme catalysts: ribuzymes and abzymes. Enzymes kinetics. Michaelis-Menten equation. Enzyme inhibition. Irreversible inhibition and suicide inhibition. Bisubstrate reaction. Cooperativity and allosteric enzyme. The transition state theory and its analogs. Types of enzymatic catalysis. Definition, classification of coenzymes. Multimolecular form of enzymes. Isolation, purification, characterization of enzymes and criteria of purity of enzymes. Applications of free and immobilized enzymes in the food, and pharmaceutical industries. Enzyme applications in cheese manufacture. Utilization of enzymes baking. Analytical and therapeutic applications of enzymes.	

BCH 322: Experiments in Enzymology	2(0+0+2)
A set of special experiments designed to study parameters of enzyme activity, activation & inhibition, and isolation & characterization of enzymes.	

BCH 332: Biophysical Biochemistry (E)	3(3+0+0)
A course designed to study the methods for purification and characterization of biomolecules. The topics of this course include biochemical applications of Spectroscopy (absorption, fluorescence, and Mass spectroscopy), basic & common methods (tissue homogenization, dialysis, filtration, and salting out), Hydrodynamic methods (various forms and applications of centrifugation), Electrophoresis (paper, PAGE, and agarose), various forms and applications of Chromatography (gel filtration, ion-exchange, adsorption, affinity, and HLPC), and Radioisotope applications in Biochemistry.	

BCH 333: Experiments in Biophysics Biochemistry (E)	2(0+0+2)
A set of experiments to introduce the students to the most common methods and equipments used in biochemistry.	

BCH 340 : Metabolism-1 (E)	3(3+0+0)
Introduction to metabolism and bioenergetics. Saccharides metabolism. Glycogen metabolism. Glycolysis and its regulation. Citric acid cycle, glyoxylate cycle. Oxidative phosphorylation. Gluconeogenesis. Diabetes. Pentos phosphate shunt. Photosynthesis. Defects in carbohydrate metabolism. Classification of lipid, lipolysis, lipogenesis. Biosynthesis of fatty acids. Oxidation of fatty acids. Ketogenesis. Defect in lipid metabolism.	

BCH 361: Molecular Biology	4(3+0+1)
This course covers fundamental aspects of molecular biology with emphasis on human genome: composition, chemical and physical properties, genes, and gene products. The course covers most DNA-associated processes such as replication, transcription, translation, as well as DNA transposition, recombination and rearrangements, gene expression, and recent advances in molecular biology. The course aims at providing basic knowledge necessary to understand the importance of the central dogma in molecular biology and the more advanced concepts such as genetic engineering or recombinant DNA technology.	

BCH 440: Metabolism-2	3(3+0+0)
Lipoproteins properties and their metabolism. Metabolism of prostaglandins. Sterol metabolism. Digestion and absorption of amino acids. Catabolism of amino acids. Biosynthesis of amino acids. Conversion of amino acids to specialized products. Biochemistry of prophyrins. Integration of metabolism.	

BCH 445: Biochemistry of Nutrition	3(2+0+1)
This course is designed to study nutrition via biochemical concepts with emphasis on biochemical and physiological fundamentals of nutrition. The course presents an integrated approach to the roles of protein, fat, carbohydrate, energy, minerals and vitamins in metabolism, and their relationships to nutritional concepts	

BCH 447: Practical Metabolism	2(0+0+2)
A selection of metabolic experiments that include carbohydrates, lipids, and proteins	

BCH 452: Biomembranes and Cell Signaling	2(2+0+0)
General structural and functional properties of natural and synthetic membranes. Functions and properties of proteins, lipids and carbohydrates of biomembranes. Solubilization and fractionation of biomembranes. Fluids mosaic model. Types of transport across biomembranes. Calculation of energy change in each case. Composition and function of the different types of cellular membranes: Membranes of erythrocyte, intestinal mucosa, renal tubules, muscle cells, mitochondria, nerve cells, retinal cells and bacterial cells. Types and properties of signals and signal transduction. Biosynthesis and assembly of membranes.	

BCH 453: Hormones	2(2+0+0)
Mechanism of action of hormones. Definition and classification of hormones. Hypothalamus and pituitary hormones. Hormones of adrenal cortex. Hormones of the adrenal medulla. Thyroid gland hormones. Parathyroid hormones. Pancreatic hormones. Gonadal hormones.	

BCH 462: Biotechnology and Genetic engineering	4(2+0+2)
The main objective of this course is to introduce the modern and emerging approaches in Molecular Biotechnology and its applications in Biochemistry. The course is divided into four	

rotations, each with its own theoretical and practical sessions with emphasis on the theoretical basis of each technique, the actual working method, hands-on experience, pitfall and strengths of each technique.

BCH 463: Bioinformatics	**3(1+0+2)**
This is a practical course designed to train students in the use of public data banks & software to retrieve, analyze, and assemble biological data with special emphasis on concepts relating to gene and protein structures.	

BCH 471: Blood biochemistry	**3(2+0+1)**
Physical properties and functions of blood. Cellular and non-cellular components of blood. Structure and function of hemoglobin. Metabolism of erythrocytes and its abnormalities (e.g. jaundice). Types of anemia, biochemical basis of each. Types and functions of leucocytes. Coagulation and its interrelationship to platelets. Blood formation and its disorders. Types of plasma proteins and their variation in different diseases.	

BCH 477: Immunochemistry	**2(2+0+0)**
The fundamental aspect of innate and adaptive immunity. Humoral immunity: antibodies: classes and subclasses, structure and function, biosynthesis, reaction with antigen. Complement system. T-lymphocytes and cell mediate immunity. Human HLA antigens and transplation immunity; immunosuppression; hypersensitivity; autoimmunity; vaccination. Disorders; of the immuno deficiency. Immunochemistry techniques.	

BCH 485: Training Course	**2(0+0+2)**
This course trains students with concepts and mechanisms of scientific research including the various stages of preparation, implementation and observing the ethics of scientific research. The course also trains students with important techniques in Biochemistry.	

BCH 497: Research and Seminar	**3(1+0+2)**
Senior student engages in an independent research project in one of the applied field of biochemistry at the department research laboratories under the supervision of a staff's member. By the end of the semester, he should present a seminar and full report about his project.	

II- Compulsory courses *from outside* the Specialization [credit hours (Lect. – Exer. – Pract.)]

CHEM 101: General Chemistry (E)	**4(3+0+1)**
Stoichiometry: SI units, chemical formulas, the mole, methods of expressing concentration, calculations based on chemical equations. **Gases:** Laws, kinetic theory, deviation and van der Waals equation. **Thermo chemistry**: Types of enthalpy changes, Hess Law and its applications,, first law of thermodynamics. **Solutions:** Type of solutions and laws related, colligative properties. **Chemical Kinetics:** Law of reaction rate, reaction order, factors affecting the reaction. Chemical **Equilibrium:** Reaction between Kc & Kp, Le Chatelier's principle and factor affecting equilibrium. **Ionic equilibrium:** Acid and base concepts, pH calculations of acid, base and buffer solutions. **Eleven experiments including:** Physical properties of mater, Hess's law, chemical kinetics, volumetric analysis.	

PHYS 102: General Physics (E)	4(3+0+1)
Vectors, Motion in straight line, Newton's Laws of motion, work, energy and momentum, simple harmonic motion, elasticity, mechanics of non-viscous fluids, flow of viscous fluids, surface tension, temperature, quantity of heat, work and heat	

ZOOL 103: Principles of general Zoology (E)	3(2+0+1)
Study of structure of animal cell. Tissues, General characters of animal Kingdom. Classification of animal Kingdom. Study of Protozoa with selected examples. General characters and classification of different phyla of animal Kingdom with selected examples. Introduction of physiology: Nutrition, digestion and metabolism, blood (structure and function).	

STAT 106: Biostatistics	2(1+0+0)
Introduction to Bio-Statistics, types of data and graphical representation. Descriptive statistics: Measures of Central tendency- Mean, median, mode, Measures of dispersion- Range, Standard deviation, coefficient of variation. Calculating Measures from an Ungrouped Frequency Table Approximating Measures from Grouped Data. Basic probability, conditional probability, concept of independence, Sensitivity, Specificity etc, and Bayes Theorem for predictive probabilities. Some discrete probability distributions: cumulative probability distribution, Binomial, and Poisson –their mean and variance. Continuous probability distributions: Normal distribution, Standard normal and t distributions. Statistical inference: Point and interval estimation, Type of errors, Concept of P-value, testing hypothesis about one and two samples means and proportions including paired data – different cases under normality.	

CHEM 108: Introduction to Organic Chemistry (E)	4(3+0+1)
- Atomic structure and chemical bonding. - Classification, nomenclature, physical properties, synthesis and reactions of the following organic classes: aliphatic and aromatic hydrocarbons, alcohols, ethers, phenols, aldehydes, keones, carboxylic acid and derivatives, and Amines. - Structures and properties of carbohydrates, fats and oils. **Practical:** Experimental include: MP determination, recrystallization, simple distillation, extraction, synthesis of alkenes and unsaturation test, alkyl halide nuclear substitution, reactions of alcohols, phenols, aldehydes, ketones, amines, carboxylic acids (and derivatives) and diazonium compounds, saponification, reactions of carbohydrates.	

MBIO 140: Microbiology (E)	3(2+0+1)
Introduction –Principals of Microbiology-–Historical Review of the pioneer Microbiologist – Development of Microbiology – Methods of Studying Microorganisms – Classification of Microorganisms – Chemistry of Microbial Cell - Structure of Microbial Cell – Microbial Genetic – Nutrition and Microbial Metabolism –Survey Of microorganisms and their habitats – Growth and Reproduction – Relationships with other Organisms – Antimicrobial Agents-Immunity – Biotechnology - Microorganisms in medicine – Microorganisms in Industries- Microorganisms and Pollution	

CHEM 231 : Chemical Thermodynamic	2(2+0+0)

Importance and terminologies, Work and Heat, Zeroth law, First law, Thermochemistry, The second and Third law, Free energy, partial molar quantities. Chemical potential. Mixing ideal and true solutions Chemical and physical equilibrium, Statistical thermodynamic.

Practical:

Heat capacities, thermodynamic of electrochemical reactions Enthalpies measurements, calculating the equilibrium constants for some reactions, distribution coefficients measurements, estimating the strength of hydrogen bonds.

CHEM 251: Analytical Chemistry	3(2+0+1)

Theoretical Part: Introduction to quantitative analysis, concentration units, chemical equilibria and its application on acid base reaction, precipitation, compexation and redox reactions. Solubility, factors affecting solubility, solubility products. Chemical Volumetric calculation on all reactions, acid-base titration precipitation titration, complex titration and redox titration.

Practical Part: Qualitative and quantitative analysis, including identification of anions and cations. Volumetric analysis, e.g. Acid-base, precipitation, complexation and redox titration.

CHEM 341 : Heterocyclic Organic Chemistry	2(2+0+0)

Heterocycles, Nomenclature, Aromaticity, Five-membered heterocycles: Pyrroles, Indoles, Diazoles, Synthesis, Reactions, Cycloaddition Reactions, Six-membered heterocycles, Pyridine, quinoline, Basicity, Synthesis, Reactions. Heterocyclic compounds versus microbes, Antibiotics, antitumors and as Dyes. Biologically important Heterocycles, Uracils and Purins, Carbohydrates, Definition, Nomenclature, Classification, Monosaccarides: absolute configuration, cyclic structures, oxidation, reduction, osazones, ascorbic acid, amino sugars. Oligosaccarides and Polysaccarides, Cellulose technology, Amino acids, Proteins, Natural amino acids: Properties, Synthesis and Reactions, Synthesis of Peptides, Protein classification, Lipids, Classification, Waxes, Oils and Fats (Glycerides), Synthesis and Properties of Glycerides, Glycolipids.

III- Elective courses *from* the Specialization [credit hours (Lect. – Exer. – Pract.)]

BCH 102 : Cellular Biochemistry (E)	2(1+0+1)

Introduction to the nature of living cells - Virus structure and life cycle - Biomolecules and macromolecules - Cell fractionation and separation of cellular organelles - Cell membrane structure and function - Structure and function of the sub-cellular organelles – Cytoskeleton - Cellular compartmentation - Specialization of eukaryotic cells - Cell renewal - Cell growth and cell division - Cell culture.

BCH 434: Biophysics (E)	2(2+0+0)

Biomechanics; fluid properties; flow of fluids; flow of heat in biological systems and its medical applications. Channel and black membranes. Hearing and applications of sound in medicine; function of DNA and proteins; radiation oncology (treatment of cancer by ionizing radiations). X-ray diffraction and diagnostic radiology (diagnostic imaging with X-rays, ultrasound and nuclear magnetic resonance: NMR); nuclear medicine (diagnosis using radioisotopes); health physics (radiation hazards and radiation protection); physiological biophysics.

BCH 436: Nanotechnology	2(2+0+0)
Definition of nanobiochemistry. Preparation, classification and properties of nanostructures. Characterization of nanosystems. Self-assembling nanostructured molecular biochemical materials and devices. Biochemical activities of nanoparticles. Nanoparticles effects on immune system. Biochemical toxicity of nanoparticles. Environmental implications of nanomaterials. Biochemical applications of nanotechnology, nanomedicine, drug delivery, diagnostics, nanobiosensors.	

BCH 441: Bioenergetics	2(2+0+0)
Introduction and definitions. Flow of energy and matter through the biosphere. Principle of bioenergetics. Free energy and equilibrium constants. High-energy compounds: structures and properties. Role of ATP. Coupled reactions. Energetic of carbohydrates and lipid metabolism. Redox reactions and potentials. Mitochondrial electron transport and mechanism of oxidative phosphorylation. Energetic of photosynthesis and transport across biomembranes.	

BCH 450 : Biochemistry of Specialized Tissues	2(2+0+0)
Composition, properties, biosynthesis of the following tissues: Connective tissues, Bone, Cartilage, Teeth, epithelial tissue, Muscle tissue and their contraction, Nerve tissue , Brain, Kidney and Liver.	

BCH 454 : Toxicology and Carcinogens	2(2+0+0)
The aim of this course is to understand the mmechanism of genotoxic carcinogens and epigenetic carcinogens. How the environmental occurrence, and the environmental fate cause human exposure to carcinogens. This course also will focus in toxicity of molecular Oxygen, oxidation reduction biochemistry, xenobiotic induced methemoglobinemia and biotransformation of carcinogens. The course will look at carcinogenic mutagenesis and the covalent binding of xenobiotics to nucleic acids and protein molecules. The molecular principles of specific Toxicants will cover in this course such as alkylating agents, aromatic amines and polycyclic aromatic Hydrocarbon. The course will give attention to cover the physical gents in carcinogenesis, mycotoxins, food additives and carcinogens and recent topics in carcinogens.	

BCH 464: Gene Expression	2(2+0+0)
This course covers fundamental aspects of eukaryotic gene regulation, including: organization of genes, gene expression (constitutive vs. inducible), genetic and epigenetic regulation, DNA and RNA binding proteins, posttranscriptional regulation, combinatorial networks of gene regulation, and genetic and biochemical methods for studying gene regulation.	

BCH 465 : Molecular Genetics	2(2+0+0)
The main objective of this course is to provide knowledge about the fundamental aspects of genetic diseases, their classification, modes of inheritance, population genetics and genetic polymorphism, treatment, control and prevention, genetic counseling and bioethics.	

BCH 466 : Molecular basis of cancer	2(2+0+0)
This course will focus in the molecular basis of cancer by understanding the nature of the cancer cell and its development and the tumor mechanism in different tissues. This course will also cover the oncogenes, the proto-oncogenes and the tumor suppressor genes and the gene mutations causes' cancer. This course will cover the apoptosis mechanism, cell signaling in cancer cells and how hormones, diet and viruses relate to cancer causes. Specific topics in cancer like genomic instability, chromosomal instability in human cancer and how environmental, hereditary factors co-operate in cancer and cancer epigenetics. Finally, this course will emphasize selected types of	

cancer in which a molecular basis elucidated and recent experimental strategies that reveal basic mechanism underlying the cancer.

BCH 472 : Biochemistry of Biological Fluids	**3(2+0+1)**
Types and distribution of body fluids. Samples collection and management. Urine: Formation; normal and abnormal constituents and their role in diagnosis of renal, hepatic and blood diseases. Digestive tract secretions: saliva, bile, pancreatic juice; faeces and their relevance to laboratory diagnosis of some hepatic, pancreatic and intestinal diseases. Sweat analysis and its relevance to cystic fibrosis. Amniotic fluid and its relevance to some genetic diseases. Composition, function and physical properties of semen; milk; lymph; CSF; synovial fluid; tears, aqueous humour and mucous. Biochemical diagnostic tests related to these fluids.	

BCH 473: Biochemistry of Biological Fluid Biomarkers in health and diseases	**3(2+0+1)**
Definition of biomarkers and their general use a measure of tissue function. Significance and measurement of biomarkers associated with liver, kidney, & heart functions. Common biomarkers associated with gastrointestinal, cardiovascular, and neurological diseases and dysfunctions, as well as other clinically useful biomarkers.	

IV- Elective courses *from OUTSIDE* the Specialization [credit hours (Lect. – Exer. – Pract.)]

ZOOL 352 : Principles of Genetics	**3(2+0+1)**
Introduction to genetics. The relationship between genes and traits. Genetics is an experimental science. The chromosomal basis of inheritance (Chromosomes, cell cycle, mitosis, meiosis and chromosome theory). Mendelian inheritance and its extensions. Non-mendelian inheritance. Mutations, mechanisms of DNA repair and sex-determination in eukaryotes. Introduction to genetic engineering and its applications	

MBIO 450 : Medical Virology	**3(2+0+1)**
Human and animal viruses- Lab diagnosis and new techniques – Infection methods – General properties of viruses - Overview of steps in viral pathogenesis – Entry and replication – Spread and cell tropism – Cell injury and clinical illness – Host immune response – Recovery from infection-vaccines – Antiviral agents – Viral diseases	

MBIO 460 : Medical Bacteriology	**3(2+0+1)**
Introduction to Pathogenic Bacteria – Bacterial Toxins – External and internal Barriers – Phagocytic Cells – Bacteria Causing Disease to Human or to both Human and Animals – Mechanisms of pathogenesis – Virulence Factors and their role in disease – Identification Methods – Prevention and treatment .	

V- Service Courses to Other Specializations and Colleges [credit hours (Lect. – Exer. – Pract.)]

BCH 101 : General Biochemistry (E)	**4(3+0+1)**
Cell structure and organelle function. Biological buffers. Amino acids. Peptides. Proteins. Enzymes. Carbohydrates. Lipids. Metabolism of carbohydrates. Metabolism of lipids. Metabolism of proteins. Nucleic acid. Hormones. Vitamins. Biochemistry of blood.	

BCH 102 : Cellular Biochemistry (E)	2(1+0+1)
Introduction to the nature of living cells - Virus structure and life cycle - Biomolecules and macromolecules - Cell fractionation and separation of cellular organelles - Cell membrane structure and function - Structure and function of the sub-cellular organelles – Cytoskeleton - Cellular compartmentation - Specialization of eukaryotic cells - Cell renewal - Cell growth and cell division - Cell culture.	

BCH 201 : General Biochemistry (1)(E)	3(3+0+0)
This is the first part of a general introductory biochemistry course. This part covers relevant chemical concepts (chemical bonds, functional groups, equilibrium, and energy), building blocks of cellular components, structure and properties of water, buffers, structure and properties of amino acids, peptide bond, protein structure, structural & functional classification of proteins, and introduction to enzymes and metabolism.	

Important Note: The student must review the department concerned for decisions that taught outside the college (Compulsory and Elective courses).