# Syllabus of Biochemistry under CBCS system w.e.f. 2015-2016

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<tr>
<th>Paper</th>
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<td><strong>B.Sc. 1\textsuperscript{st} year (Semester-I)</strong></td>
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### B.Sc. 3rd year (Semester-V)

#### Core Course

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#### Elective discipline centric **
(Any two of the following)

1. Human Physiology
2. Biosafety and Bioethics
3. Molecular Basis of Non-Infectious Human Diseases
(4 credits each)

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#### Write up Viva

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### B.Sc. 3rd year (Semester-VI)

#### Core Course

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#### Discipline centric elective**
(Any two of the following)

4. Nutritional Biochemistry
5. Recombinant DNA Technology
6. Molecular Basis of Infectious Diseases
(4 credits each)

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#### Comprehensive Viva-Voce

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BIOCHEMISTRY
B.Sc. (Hons) I Year
Semester I
Core Course

BIOMOLECULES

Credit: 4
Total Lectures: 48

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: WATER AND PROTEINS
(12 Lectures)

Water: Physical properties and hydrogen bonding of water; structure of liquid water and its solvent properties; hydrophobic interactions; ionization of H$_2$O and ion product of water; the pH scale; relationship between pH and pKa (Henderson-Hasselbalch equation); buffers

Proteins: Definition, biological functions of proteins; structure of twenty alpha-amino acids commonly found in proteins; abbreviations and classification of 20 amino acids; zwitterion nature of amino acid in aqueous solutions; essential amino acids; peptide bond formation; backbone structure of proteins/polypeptides; N-terminal and C-terminal amino acids; properties of amino acids/proteins arising from their dipolar nature; basic understanding of primary, secondary, tertiary, quaternary and domain structure of proteins/peptides; fibrous and globular proteins; elementary ideas on protein denaturation and renaturation.

UNIT II: CARBOHYDRATES
(12 Lectures)

Definition, biological functions; classification into monosaccharides (aldoses and ketoses), oligosaccharides and polysaccharides; optical isomerism, open chain and ring structures of carbohydrates; mutarotation; structure of biologically important carbohydrates (D-glucose, D-galactose, D-mannose, D-fructose, D-ribose, D-2-deoxyribose, D-maltose, D-lactose, D-sucrose); polysaccharides- starch, cellulose, glycogen and mucopolysaccharides; suitability of polysaccharides as storage material.
UNIT III: LIPIDS

Definition; biological functions; general formulae, nomenclature and properties of fatty acids; essential and non-essential fatty acids; classification of lipids; general structure and function of major lipid subclasses: acylglycerols, phosphoglycerides, sphingolipids, waxes, terpenes, steroids and prostaglandins; saponifiable and non-saponifiable lipids; suitability of triglycerides as storage lipids; saponification number and iodine number; biomembranes

UNIT IV: NUCLEIC ACIDS

Nucleosides and nucleotides; generalized structural plan of nucleic acids; Watson-Crick model of DNA; size of DNA in prokaryotic and eukaryotic cells; central dogma of molecular biology; gene, genome and chromosome; basic ideas of DNA replication, transcription and protein biosynthesis; genetic code and codons; mutations- definition and types.

RECOMMENDED BOOKS

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: CRITERIA FOR CLASSIFICATION, MORPHOLOGY, NUTRITION & PHYSIOLOGY OF BACTERIA (12 Lectures)

Brief introduction to microorganisms, criteria used in the classification of bacteria - morphology, cytology, genetics, host specialization, serology, physiology etc. General organization of bacterial cells - gram positive and gram negative organisms; structure and function of peptidoglycan in gram positive and gram negative organisms; function of polymeric components in outer membrane and acidic polymers in gram negative organisms. Bacterial growth; phases of growth, physical factors affecting bacterial growth (pH, temperature and oxygen requirements).

UNIT II: BACTERIAL GENETICS (12 Lectures)

Adaptation and mutation: types of mutations and their effects; Significance of Gene transfer in bacteria; Methods of Lateral gene transfer: transformation, transduction and conjugation; their discovery and mechanism, Generalised and specialised transduction; Temperate and virulent phages, lysogenic and lytic cycles, Characteristics of plasmids, Transposable elements: Insertion sequence and transposons.

UNIT III: MORPHOLOGY & REPLICATION OF VIRUSES (12 Lectures)

Definitions of virus, viroids, virusoids and prion; General properties of viruses; Virus structure; variations in size and shape/symmetry, Cultivation and detection of viruses; Plaque formation and Haemagglutination inhibition test, Replication of bacteriophages, animal viruses and retroviruses.
UNIT IV: VIRAL INFECTIONS (12 Lectures)

Acute viral infections - Influenza, dengue and yellow fever viruses, persistent viral infections- Herpes/Hepatitis and AIDS; transformation and Cancer ; Role of vaccines in prevention of viral infections, types of Polio vaccines.

RECOMMENDED BOOKS

4. Tortora, Funke and Case Microbiology and Introduction by Pearson Education, Inc.
NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: INTRODUCTION (12 Lectures)

Definition, historical perspective, IUB enzyme classification (rationale, overview and specific examples), Nature of non-enzymatic and enzymatic catalysis. Measurement and expression of enzyme activity, enzyme assays. Definition of IU, enzyme turnover number and specific activity. Role of non-protein organic molecules and inorganic ions co-factors, coenzymes, prosthetic groups. Role of vitamins as coenzyme precursors (general treatment), details of coenzyme function of NAD and pyridoxal phosphate.

UNIT II: MECHANISM OF ENZYME ACTION (14 Lectures)

Concept of enzyme-substrate complex, evidences for the formation of enzyme-substrate complex. Nature of substrate binding sites, active sites of enzymes. Collision and transition state theory. Michaelis-Menten equation, determination and significance of Vmax and Km. Lock and key and induced fit model of enzyme-substrate interactions. Stereo specificity of the enzyme for substrates. Enzyme catalytic efficiency, proximity, orientation, distortion or strain, acid-base and nucleophilic catalysis.

UNIT III: ENZYME KINETICS (14 Lectures)

Kinetics of zero and first order reactions, effect of enzyme concentration, substrate concentration temperature and pH on enzyme activity; enzyme inhibition (reversible and irreversible inhibition). Evaluation of Km, Ki and Vmax in the presence of inhibitors. Significance and evaluation of energy of activation and free energy.
UNIT IV: BI-SUBSTRATE KINETICS, ALLOSTERIC AND ISOENZYMES
(08 Lectures)


RECOMMENDED BOOKS

BIOCHEMISTRY
B.Sc. (Hons) 2nd Year
Semester III
Ability Enhancement Discipline Centric Course

TOOLS AND TECHNIQUES IN BIOCHEMISTRY

Credits: 2
Total Lectures: 24

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I BIOCHEMICAL REAGENTS AND SOLUTIONS (06 Lectures)

UNIT II CONCEPT OF A BUFFER (06 Lectures)
Concept of a buffer, Henderson-Hasselbach equation, working of a pH meter. Quantitative transfer of liquids.

UNIT III SPECTROPHOTOMETRIC TECHNIQUES (06 Lectures)

UNIT IV CHROMATOGRAPHY TECHNIQUES (06 Lectures)
Chromatography: general principles, types and techniques; partition, size exclusion, ion exchange, and affinity chromatography.

RECOMMENDED BOOKS

BIOCHEMISTRY
B.Sc. (Hons) 2nd Year
Semester III
Ability Enhancement Discipline Centric Course
BIOSTATISTICS AND DATA ANALYSIS

Credits: 2
Total Lectures: 24

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: DATA IN BIOLOGY (04 lectures)

Data in Biology: Development in biostatistics, samples and populations, techniques of sampling (random and stratified), sampling and non-sampling errors, variables in biology, accuracy, precision, univariate and bivariate frequency distributions and their graphical representations.

UNIT II: MEASURES OF CENTRAL TENDENCY AND DISPERSION (08 lectures)


UNIT III: PROBABILITY (06 lectures)

Probability: Basic concepts, addition and multiplication rules of probability, conditional probability, Bayes’ theorem and its applications in biostatistics. Random variables: discrete and continuous.

UNIT III: CORRELATION AND LINEAR REGRESSION (06 lectures)

Correlation Analysis: Scatter diagrams, Pearson’s and Spearman’s coefficients of correlation. Regression Analysis: Method of least squares, equations of lines of regression and their applications in biostatistics.
RECOMMENDED BOOKS


BIOCHEMISTRY
B.Sc. (Hons) 2nd Year
Semester IV
Core Course IV

METABOLISM

Credits: 4
Total Lectures: 48

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: ANAEROBIC CARBOHYDRATE METABOLISM (12 Lectures)
Definition, reactions of glycolysis, entry of galactose, fructose and mannose in glycolysis, utilization of sucrose and lactose, production of ATP and its utilization during muscle contraction; oxygen debt; alcoholic fermentation; gluconeogenesis, glycogenesis; hexose monophosphate shunt pathway and its significance; regulation of glycolysis; what happen in diabetes? galactosemia, glucose intolerance.

UNIT II: AEROBIC CARBOHYDRATE METABOLISM (12 Lectures)
History and background of the tricarboxylic acid (TCA) cycle; oxidation of pyruvate to acetyl CoA; individual reactions of the TCA cycle; energetic of the cycle, anabolic nature of TCA cycle; regulation of TCA cycle, electron transport oxidative phosphorylation; Energy coupling hypothesis.

UNIT III: LIPID METABOLISM (12 Lectures)
Historical development and individual reactions of beta oxidation pathway; oxidation of unsaturated fatty acids and odd chain fatty acids; metabolism of triacylglycerols; formation and break down of ketone bodies; biosynthesis of fatty acid and cholesterol; role of serum lipoproteins (LDL, HDL) in the development of coronary heart disease (CHD).

UNIT IV: NITROGEN METABOLISM (12 Lectures)
Nitrogen balance studies in man (normal, negative and positive nitrogen balance); Urea cycle (preliminary account), transamination and deamination reactions,
comparative biochemistry of nitrogen excretion; metabolism of purines and pyrimidines including regulation (preliminary account); Synthesis of biologically active amines (e.g. epinephrine, non-epinephrine, dopamine, serotonin, α-amino-butyric acid & histamine), glutathione as cofactor.

RECOMMENDED BOOKS


BIOCHEMISTRY
B.Sc. (Hons) 2nd Year
Semester IV
Ability Enhancement Discipline Centric Course
CLINICAL BIOCHEMISTRY

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT 1: INTRODUCTION (6 Lectures)
Organization of clinical laboratory, Introduction to instrumentation and automation in clinical biochemistry laboratories safety regulations and first aid. General comments on specimen collection, types of specimen for biochemical analysis. Precision, accuracy, quality control, precautions and limitations.

UNIT 2: EVALUATION OF BIOCHEMICAL CHANGES IN DISEASES (6 Lectures)

UNIT 3: ASSESSMENT OF GLUCOSE METABOLISM IN BLOOD (6 Lectures)

UNIT 4: LIPID PROFILE LIVER FUNCTION TESTS AND RENAL FUNCTION TESTS (6 Lectures)
Composition and functions of lipoproteins. Clinical significance of elevated lipoprotein. Estimation of triglycerides. Liver and renal function tests

RECOMMENDED BOOKS


BIOCHEMISTRY
B.Sc. (Hons) 2nd Year
Semester IV
Ability Enhancement Discipline Centric Course
PROTEIN PURIFICATION AND CHARACTERIZATION TECHNIQUES

Credits: 2
Total Lectures: 24

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: PROTEIN PURIFICATION
(6 Lectures)

Basic concept about purification of proteins, different techniques of protein purification: ion-exchange chromatography, gel filtration chromatography, affinity chromatography.

Unit II: SEQUENCING, FOLDING AND DENATURATION OF PROTEINS
(6 Lectures)

Protein sequencing; sequenators; quaternary structure of proteins; characteristics of molten globule state; in vivo folding; models of protein folding.

UNIT III: PROTEIN GEL ELECTROPHORESIS AND MS
(6 Lectures)

Two-dimensional polyacrylamide gel electrophoresis; mass spectrometry: matrix assisted laser desorption ionization MS.

UNIT IV: PROTEIN FOLDING
(6 Lectures)

Folding and denaturation of proteins. Functional proteomics; applications of proteome analysis.

RECOMMENDED BOOKS

BIOCHEMISTRY
B.Sc. (Hons) 2nd Year
Semester IV
Open Elective Course
OUTLINES OF BIOCHEMISTRY

Credits: 4
Total Lectures: 48

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: INTRODUCTION (12 Lectures)


UNIT II: ENZYMES (12 Lectures)


UNIT III: PROTEIN CHEMISTRY (12 Lectures)

Definition, biological functions of proteins; peptide bond formation; backbone structure of proteins/polypeptides; N-terminal and C-terminal amino acids; properties of amino acids/proteins arising from their dipolar nature; basic understanding of primary, secondary, tertiary, quaternary and domain structure of proteins/peptides; fibrous and globular proteins; elementary ideas on protein denaturation and renaturation. Basic concepts of proteomics.

UNIT III: MOLECULAR BIOLOGY (12 Lectures)

Genome, Organization, Genome Analysis: Chromatin structure, Primary, secondary and three-dimensional structure of DNA. Supercoiling. Types of DNA. Properties of DNA in solution. Denaturation and renaturation of DNA.
RECOMMENDED BOOKS


BIOCHEMISTRY
B.Sc. (Hons) Final year
 Semester V
Core Course V
CONCEPTS OF CELL BIOLOGY

Credits: 4
Total Lectures: 48

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: SUBCELLULAR ORGANELLES (12 Lectures)

(a) Ultrastructure, organization and functions of mitochondria, nucleus, endoplasmic reticulum, golgi apparatus, lysosomes and microbodies, peroxisome. Vacuoles – special functions in plants.


UNIT II: MEMBRANE STRUCTURE AND FUNCTION (12 Lectures)


UNIT III: CYTOSKELETAL PROTEINS (12 Lectures)

Unit IV CELL CYCLE, CELL DEATH AND CELL RENEWAL (12 Lectures)


RECOMMENDED BOOKS

BIOCHEMISTRY
B.Sc. (Hons) Final year
Semester V
Core Course VI
CONCEPTS OF IMMUNOLOGY

Credits: 4
Total Lectures: 48

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: BASIC ASPECTS OF IMMUNITY
(12 Lectures)

(a) Innate and adaptive immunity: Cellular and humoral immunity, clonal selection hypotheses.
(b) Definition of antigen, antibody, hapten, antigenic and haptenic determinant, structure of antibody molecules, classes of antibodies, polyclonal and monoclonal antibodies.
(c) Primary and secondary immune response, idea of vaccination, adjuvant.

UNIT II: HOST PARASITE INTERACTIONS AND HYPERSENSITIVITY
(12 Lectures)

(a) Host-parasite relationship: normal flora, pathogenicity, disease progress, transmission and types of diseases, disease establishment.
(b) Hypersensitivity reactions, Gel and Coombs classification, Type I, II, III IV types of hypersensitivity. Cytokines.

UNIT III: ORGANS AND CELLS OF IMMUNE SYSTEM
(12 Lectures)

General properties of effector cells, B cells T cells (Tc), natural killer cells; NKT cells. Primary and secondary lymphatic organs, spleen, thymus, lymphnodes.

Unit IV: IMMUNODEFICIENCY AND AUTOIMMUNITY
(12 Lectures)

RECOMMENDED BOOKS


NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: BLOOD AND CIRCULATORY SYSTEM (12 Lectures)

Blood components and their functions genesis of erythrocytes and leukocytes, granular and agranular system and inflammation, phagocytosis by neutrophils and macrophages: Functions of T & B lymphocytes: Mechanism of blood clotting by Intrinsic and Extrinsic pathways, structure of heart, the origin and propagation of heart beat, cardiac cycle and electrocardiogram.

UNIT II RENAL PHYSIOLOGY AND RESPIRATORY SYSTEM (12 Lectures)

a. Anatomy of the; nephron and its organization, functions of glomerular membrane, glomerular filtration rate (GRF), structural and functional characteristics of tubules selective reabsorption and secretion by active and passive transports of various substances (sugars, amino acids, urea & creatinine), concentrating phenomenon of urine, role of aldosterone and antidiuretic hormone


UNIT III ENDOCRINE AND DIGESTIVE SYSTEM (12 Lectures)

a. Endocrine System: A brief outline of various endocrine glands, endocrine hormones and their physiological functions, hormone receptors and their activation, general mechanism of extracellular and intracellular hormone action.

b. Digestive System: Structure and functions of different components, digestion and absorption of carbohydrates, lipids and proteins, role of various enzymes and hormones involved in these processes, mechanism of HCl formation in stomach, role of bile salts in lipid digestion and absorption.
UNIT V NERVOUS AND MUSCULO SKELETAL SYSTEM (12 Lectures)

a. Bone structure and formation. Physiology of muscle contraction in striated and non-striated muscle.

RECOMMENDED BOOKS

2. A.C. Guyton, TEXT BOOK OF MEDICAL PHYSIOLOGY 7th edn. (1986), W.B. Saunders Co., USA
5. The department may provide write-up for some units which shall be available in the seminar library for reprography
BIOCHEMISTRY
B.Sc. (Hons) Final year
Semester V
Discipline Centric Elective Course

BIO-SAFETY AND BIOETHICS

Credits: 4
Total Lectures: 48

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: INTRODUCTION (12 Lectures)
Historical background, introduction to biological safety cabinets, primary containment for biohazards, biosafety levels of specific microorganisms, recommended biosafety levels for infectious agents and infected animals.

UNIT II: BIOSAFETY GUIDELINES (12 Lectures)
Definition of genetically modified organisms (GMOs) and living modified organisms (LMOs) by government of India. Roles of institutional biosafety committee, review committee on genetic manipulation (RCGM), genetic engineering approval committee (GEAC) for GMO applications in food and agriculture, environmental release of GMOs. Biosafety assessment of pharmaceutical products such as drugs/vaccines etc.

UNIT III: FOUNDATION OF BIOETHICS (12 Lectures)
Definition, historic evolution, codes and guidelines, universal principles. Key to the environmentally responsible use of biotechnology, ethical implications of biotechnological products and techniques. Social and ethical implications of biological weapons. Ethical use of animals in laboratory.

UNIT IV: CODES, COVENANTS, DECLARATIONS AND GUIDELINES (12 Lectures)
Bioethics in relation to profession, society, and biomedicine. Gradation of moral and ethical norms from simpler to higher levels for initiating right actions. Guidelines and codes having relevance to bioethics.
RECOMMENDED BOOKS


BIOCHEMISTRY
B.Sc. (Hons) Final year
Semester V
Discipline Centric Elective Course

MOLECULAR BASIS OF NON-INFECTIONOUS HUMAN DISEASES

Credits: 4
Total Lectures: 48

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: NUTRITIONAL DISORDERS (12 Lectures)

Overview of major and minor nutrient components in the diet. Balanced diet and the concept of RDA. Nutrient deficiencies; Kwashiorkor and Marasmus, Scurvy, beri beri, pellagra and B12 deficiency, Xerophthalmia and night blindness, vitamin D deficiency, vitamin K deficiency; their symptoms.

UNIT II: METABOLIC AND LIFESTYLE DISORDERS (12 Lectures)

Obesity and eating disorders like anorexia nervosa and bullemia. Diabetes mellitus as metabolic syndrome and the relationship with hypertension, obesity, hypothyroidism and stress. Cardio vascular disorders and atherosclerosis-defining the ailments that fall in this category, understanding the factors that contribute to the syndrome. Irritable bowel syndrome- influence of diet, stress and environment on the condition.

Unit III: MULTIFACTORIAL COMPLEX DISORDERS AND CANCER (12 Lectures)


UNIT IV: MONOGENIC DISEASES AND DISEASES DUE TO MISFOLDED PROTEINS (12 Lectures)

In born errors of metabolism: PKU, Alkaptonuria, Maple syrup urine disease; Receptor and transport defects: Cystic fibrosis, Long QT syndrome, familial
hypercholesterolemia, Achondroplasia. Hemoglobinopathies and clotting disorders. etiology and molecular basis for Alzheimer's, prion diseases, Huntington's chorea, sickle cell anemia, Thalassemia.

RECOMMENDED BOOKS


BIOCHEMISTRY
B.Sc. (Hons) Final year
Semester VI
Core Course VII

MOLECULAR BIOLOGY

Credits: 4
Total Lectures: 48

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: DNA REPLICATION AND TRANSCRIPTION (12 Lectures)

Replication: Possible modes of replication, Meselson Stahl experiment, origin of replication in E. coli, major proteins and enzymes involved in replication process: DNA replication in nutshell, rolling circle model of replication.

Transcription: Mechanism of transcription, DNA dependent RNA polymerase(s), recognition, binding and initiation sites, TATA/Pribnow box, chain termination. Post-transcriptional modifications, inhibitors of transcription.

UNIT II: GENETIC CODE AND TRANSLATION (12 Lectures)

Genetic Code: Basic features of genetic code, biological significance of degeneracy, Wobble hypothesis, gene within genes, overlapping genes, split genes and pseudogenes, universality of genetic code and its exception, single coding system between the nucleic acids and amino acids.

Mechanism of Translation: Ribosome structures, A and P sites, Charged tRNA, f-met tRNA, initiation codon and non-sense codons, Shine-Dalgarno consensus sequence, formation of 70S initiation complex, role of EF-Tu, EF-Ts, EF-G, GTP and release factors, RFI and RF2. Post-translational modifications and inhibitors of protein synthesis.

UNIT III: REGULATION OF GENE EXPRESSION IN PROKARYOTES (12 Lectures)

Principles of gene regulation, negative and positive regulation, concept of operons, regulatory proteins, activators, repressors, DNA binding domains,
regulation of lac operon and trp operon, transcriptional regulation in λ bacteriophage.

UNIT IV: REGULATION OF GENE EXPRESSION IN EUKARYOTES (12 Lectures)
Heterochromatin, euchromatin, chromatin remodeling, regulation of galactose metabolism in yeast, regulation by phosphorylation of nuclear transcription factors, regulatory RNAs, riboswitches, RNA interference.

RECOMMENDED BOOKS

BIOCHEMISTRY
B.Sc. (Hons) Final year
Semester VI
Core Course VIII

CONCEPTS IN GENETICS

Credits: 4
Total Lectures: 48

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: INTRODUCTION TO MODEL ORGANISMS AND MENDELISM (12 Lectures)

UNIT II: EXTENSIONS OF MENDELISM (12 Lectures)

UNIT III: BACTERIAL AND BACTERIOPHAGE GENETICS (14 Lectures)

UNIT IV: DNA REPAIR AND MUTATIONS (10 Lectures)
Types of Mutations, Molecular bases of mutations. DNA repair and mechanisms.
RECOMMENDED BOOKS


Department of Biochemistry  
Faculty of Life Sciences  
AMU, Aligarh

B.Sc. (Hons) Syllabus  
(Effective from 2015-16)  
Passed in BOS held on 26.10.2015

BIOCHEMISTRY  
B.Sc. (Hons) Final year  
Semester VI  
Elective Discipline Centric Course

NUTRITIONAL BIOCHEMISTRY  
Credits: 4  
Total Lectures: 48

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: INTRODUCTION TO NUTRITION AND ENERGY METABOLISM  
(12 Lectures)
Defining nutrition, role of nutrients. Unit of energy, Biological oxidation of foodstuff. Measurement of energy content of food, Physiological energy value of foods, SDA. Measurement of energy expenditure. Direct and indirect calorimetry, factors affecting thermogenesis, energy utilization by cells, energy output – Basal and resting metabolism, physical activity, factors affecting energy input - hunger, appetite, energy balance Energy expenditure in man. Estimating energy requirements, BMR factors Recommended nutrient intakes (RNI) and recommended dietary allowances for different age groups.

UNIT II: DIETARY CARBOHYDRATES  
(12 Lectures)
Review functions of carbohydrates. Digestion, absorption ,utilization and storage, hormonal regulation of blood glucose. Dietary requirements and source of carbohydrates, Dietary fiber, role of fibre in lipid metabolism, colon function, blood glucose level and GI tract functions.

UNIT III: DIETARY LIPID AND PROTEIN  
(12 Lectures)

for different age group. Amino acid pool. NPU, Biological value, Nitrogen balance. PEM and Kwashiorkor.

**UNIT VI: VITAMINS AND MINERALS** (12 Lectures)
Vitamin A, C, E, K, B complex and D Dietary sources, RDA, Adsorption, distribution, metabolism and excretion (ADME), Deficiency. Calcium, phosphorus and iron - distribution in the body digestion, Absorption, Utilization , transport, excretion, balance, deficiency, toxicity, sources, RDA. Calcium: Phosphorus ratio, Role of iron in prevention of anemia. Iodine and iodine cycle. Iodine, Fluoride, Mg, Cu, Zn, Se, Manganese, chromium, molybdenum distribution in the human body, Physiology, function, deficiency, toxicity and sources.

**RECOMMENDED BOOKS**


BIOCHEMISTRY
B.Sc. (Hons) Final year
Semester VI
Elective Discipline Centric Course

RECOMBINANT DNA TECHNOLOGY

Credits: 4
Total Lectures: 48

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: (12 Lectures)
Tools of recombinant DNA technology: Enzymes used in genetic engineering e.g. Restriction endonucleases, SI nucleases, DNA ligases, Alkaline phosphatase, Reverse transcriptase, DNA polymerase, poly nucleotide kinase, terminal transferase. Cloning vectors: General properties of ideal cloning vectors.

UNIT II: (12 Lectures)
Construction of chimeric DNA molecules. Isolation of plasmid DNA, genomic DNA. Sequencing methods; Sanger’s dideoxy chain termination method, Maxam Gilbert chemical degradation method.

UNIT III: (12 Lectures)
Amplification of genomic DNA and cDNA by PCR. Cloning of PCR products. Applications of PCR. Expression vectors, Expression construct. Different types of expression system.

UNIT IV: (12 Lectures)
Transgenic organisms. regulation of GM organisms, Molecular diagnostics; high throughput methods of DNA analysis, DNA microarrays, DNA fingerprinting and its applications, Gene therapy, DNA vaccines.
RECOMMENDED BOOKS

2. Gene Cloning by Primrose
BIOCHEMISTRY
B.Sc. (Hons) Final year
Semester VI
Elective Discipline Centric Course

MOLECULAR BASIS OF INFECTIOUS DISEASES  

NOTE: The course will be evaluated out of 100 marks and will have the following components of evaluation: Sessional for 10 marks, mid-semester examination of one hour duration for 30 marks, end-semester examination of two hours for 60 marks.

UNIT I: CLASSIFICATION OF INFECTIOUS AGENTS  


UNIT II: OVERVIEW OF DISEASES CAUSED BY BACTERIA  

Detailed study of tuberculosis: History, causative agent, molecular basis of host specificity, infection and pathogenicity, diagnostics, therapeutics, inhibitors and vaccines. Drug resistance and implications on public health. Other bacterial diseases including Typhoid, Diphtheria, Pertussis, Tetanus, Typhoid and Pneumonia.

Unit III: OVERVIEW OF DISEASES CAUSED BY VIRUSES  

Detailed study of AIDS, history, causative agent, pathogenesis, Diagnostics, Drugs and inhibitors. Other viral diseases including hepatitis, influenza, rabies, chikungunya and polio.

Unit IV OVERVIEW OF DISEASES CAUSED BY PARASITES AND OTHER ORGANISMS  

Detailed study of malaria, history, causative agents, vectors, life cycle, Host parasite interactions, Diagnostics, drugs and Inhibitors, resistance, vaccine development. Other diseases including leishmaniasis, amoebiasis.
Fungal diseases, general characteristics. Medical importance of major groups, pathogenesis, treatment.

RECOMMENDED BOOKS


3. Sherris Medical Microbiology: An Introduction to Infectious Diseases by Kenneth J. Ryan, C. George Ray, Publisher: McGraw-Hill