

Biochemistry

B.Sc. I Semester I (Paper I): Human physiology.

Credits: - 2

CO1: Students will be able to understand the composition of blood, protein in plasma and their function.

CO2: Students will be able to understand the mechanism of blood coagulation, role of vitamins K in coagulation, anticoagulant.

CO3: Students will be able to understand the digestion and absorption of carbohydrates, fats, proteins.

CO4: Students will be able to understand the brief idea and types of muscle fibers.

CO5: Students will be able to understand the neurobiology.

CO6: Students will be able to understand the oogenesis, spermatogenesis, menstrual cycle.

CO7: Students will be able to understand the organization of endocrine system, classification and chemistry of hormones.

CO8: Students will be able to understand the basic mechanism of action of peptide and steroid hormones.

B.Sc. Semester – I (Paper II): General Microbiology and Virology.

Credits: 2

After completion of this course, the students will be able to –

CO1: Understand about the study of bacterial morphology and study of bacteria.

CO2: Understand the different types of plasmid and structure and formation of endospore.

CO3: Understand principle and technique of simple staining and differential staining.

CO4: Understand the characteristics structure and composition of viruses.

CO5: Understand the details study of lytic and lysogenic cycle.

CO6: Understand the study of growth curve and its various phases and measurement of the growth.

CO7: student will understand the basic nutrition requirement of bacteria and microbial control.

Practical – Semester- I, Credits: 2

After completion of this course the students will be able to –

CO1: Understand the procedure of RBC and WBC count by Haemocytometer.

CO2: student will understand the differential leukocyte count of blood.

CO3: Gain knowledge of various staining technique and bacterial structure.

CO4: student will understand the estimation of glucose Benedict quantitative method

CO5: Use the different isolation technique. They will be able to isolate microbial pure by performing various isolation techniques.

CO7: Understand the motility of bacterial pure culture.

CO8: Understand and test the effect of antibiotics and heavy metal on the growth of bacteria, by doing this students will be able to test the antibiotics sensitivity of microbes that will help in industrial work and research.

B. SC. – I (Semester II): Paper I – Cell Biology and Biomolecules.

After completion of this course the students will be able to –

CO1: understand the different between prokaryotic and Eukaryotic cell .

CO2: understand the stages of mitosis and meiosis.

CO3: understand study about structure and function of nucleus and nucleolus.

CO4: understand structure function of Mitochondria, Ribosomes, ER, Golgi apparatus.

CO5: understand the classification reaction and structure of carbohydrates.

CO6: understand the definition classification of lipids.

B. Sc. –I (Semester II): Paper II– Clinical Biochemistry and Immunology.

Credits :2

After completion of this course students will be able to:

CO1: Understand structure and function of liver and liver diseases and study about the liver function tests and understand the clinical significance of serum in liver diseases. .

CO2: Understand the structure of kidney and study about the role of kidney in maintaining acid-base and electrolyte balance in the body

CO3: understand organization of immune system and classification of immunity and classification of immunoglobulins .

CO4: student will understand idea of hybridoma and monoclonal antibodies

CO5: . student will understand antigen-antibody reaction.

PRACTICAL - SEMESTER II: Credits: 2

After completion of this course students will be able to:

CO1: student will understand the procedure of identification of different stages of mitosis in onion root tip.

CO2: student will understand procedure of quantitative identification of lipids.

CO3: student will understand the colorimetric estimation of cholesterol.

CO4: student will understand the procedure to detect anti HCG antibody test.

CO5: student will understand the determination of blood groups.

CO6: student will understand determination of saponification value of fats.

CO7: student will understand determination of acid value of fats

CO8: student will understand the procedure of urine analysis.

B. Sc. Part II: SEMESTER III, PAPER – I: MACROMOLECULES (USBCT-C05)

Credits:2

After completion of this course students will be able to:

CO1: Understand Classification and structure of standard amino acids, Zwitter ionic structure, Physiochemical properties.

C02: Understand Classification and structure of proteins

C03: Understand the α helix, β pleated sheet structures and Tertiary structure of proteins, concept of domains, denaturation of protein.

C04: understand quaternary structure of proteins: Subunit interaction and structure and biological functions of Collagen.

C05: understand chemical structure and base composition of nucleic acids.

C06: Understand double helical structures of Watson - Crick Model.

C07: understand forces stabilizing nucleic acid structures.

C08: understand the denaturation and renaturation of nucleic acid, Maxam-Gilbert and Sanger's dideoxynucleotide sequencing and structure of m-RNA, r-RNA and t-RNA.

B. Sc. Part II, SEMESTER III, PAPER – II : BIOPHYSICAL AND BIOCHEMICAL TECHNIQUES- I (USBCT-C06), CREDITS: 2

After completion of this course students will be able to:

C01: understand the Concept of buffers and pH

C02: understand the techniques of titration curve of weak acids and amino acids. Also

understand electrometric determination of pH (pH Meter).

C03: understand the concepts of electromagnetic radiation's, Spectrum and absorption of electromagnetic radiations by spectrophotometry.

C04: understand the concept of orbital theory and their involvement in absorption of electromagnetic radiations.

C05: understand the laws of absorption and deviations of Beer's law. understand the instrumentation and applications of UV and Visible spectrophotometry and absorption and emission of flame photometry.

C06: understand the principle of paper chromatography, thin layer chromatography (TLC) and column adsorption chromatography and Gel filtration.

C07: understand the Principle and applications of Ion-Exchange chromatography and Affinity chromatography.

C08: understand the principle and applications of High Pressure Liquid Chromatography and Gas Chromatography.

B.Sc.II, Semester III , (USBCP-03): PRACTICALS

After completion of this course students will be able to:

C01: understand the preparation of standard solutions (% , Molar, Molal and Normal) of acids and alkali, stock and working solutions.

C02: understand the quantitative estimation of amino acids, colorimetric estimation of creatinine.

C03: understand the method of estimation of blood sugar.

C04: understand how to determine the absorption maxima of protein and also understand the separation of amino acids by two-dimensional TLC and descending\ascending paper chromatography.

C05: understand the Sorenson's formal titration method of glycine estimation.

C06: understand the Preparation of standard buffers and determination of a pH of a solution and pKa of weak acid by pH meter..

C07: understand the techniques of determination of isoelectric pH of casein, egg albumin and BSA.

C08: understand the techniques titration of mixture of strong acid and weak acid, titration curves of and determination of pK value.

B. Sc. Part II, SEMESTER IV, PAPER - I :(USBCT-C07): ENZYMOLOGY

CREDITS: 2

After completion of this course students will be able to:

C01: understand the History, Terminology of the Enzyme.

C02: understand the classification, nomenclature and Specificity of enzymes.

C03: understand the various types of enzyme catalysis.

C04: understand the concepts of regulatory enzymes Isoenzymes (LDH), Multienzyme complexes (PDH), Ribozyme etc.

C05: understand the Principles of energy of activation and mechanism of Enzyme action, mechanism of action of Ribonuclease and Lysozyme.

C06: understand the effect of enzyme concentration, temperature on enzyme activity.

C07: understand the role of vitamins as coenzyme precursors.

C08: understand the enzyme kinetics and types of enzyme inhibition and Importance of Kcat/Km and also understand the concept of enzyme assay

C09: and its importance, Enzyme isolation and purification and Enzyme solubilization and Enzyme immobilization technique.

B. Sc. Part II, SEMESTER IV PAPER – II (USBCT-C08): BIOPHYSICAL AND BIOCHEMICAL TECHNIQUES II. CREDITS: 2

After completion of this course students will be able to:

C01: understand the techniques, principle and application of Paper electrophoresis, Gel electrophoresis and migration of ions in electric field and factors affecting electrophoretic mobility.

C02: understand the principle, procedure and applications SDS-PAGE Electrophoresis, Disc-Gel electrophoresis.

C03: understand the principle, procedures and applications of isoelectric focusing.

C04: understand the immunological techniques viz. Immuno-electrophoresis, Radioimmuno assay (RIA) and ELISA.

C05: understand the radioactive and stable isotopes.nMeasurement of radioactivity:- Geiger-Muller counter, Solid and Liquid scintillation counters (Basic principle, instrumentation and technique), Autoradiography.

C06: understand the applications of isotopes in biology and principles of tracer techniques its advantages and limitations.

C07: understand the principles, types of centrifuge and the analytical centrifugation

B. Sc. Part II Semester IV, (USBCP-04): PRACTICALS

After completion of this course students will be able to:

C01: understand the Isolation of casein by isoelectric precipitation method.

C02: understand the Estimation of proteins by Folin-Lowry's method.

C03: understand the Fractionation of proteins and its purity by PAGE electrophoresis. Also understand the SDS-PAGE of BSA.

C04: Understand the Immobilization of enzymes / cells by entrapment in alginate gel.

C05: understand the Isolation of cell organelles by differential centrifugation

C06: understand the Isolation of Urease and demonstration of its activity

C07: understand the Paper electrophoresis and gel electrophoresis of serum proteins

C08: understand the Effect of pH and temperature on activity of enzyme

B. Sc. Part III, SEMESTER V DSE - I (USBCDST-C09): METABOLISM OF CARBOHYDRATES AND LIPIDS. CREDITS: 2

After completion of this course students will be able to:

C01: understand the various pathways such as glycolysis, gluconogenesis, glycogen metabolism and glyoxalate pathway.

C02: understand the citric acid cycle, reaction of citric acid cycle.

C03: understand oxidative and substrate level phosphorylation and electron transfer chain.

C04: Understand the fatty acid metabolism and β -oxidation of saturated, unsaturated fatty acid

C05: Understand the ketone bodies metabolism.

C06: Understand the method of biosynthesis of lipids.

B. Sc. Part III Semester V, (USBCDSP-05): PRACTICALS

CREDITS: 1

C01: understand the estimation of blood glucose by 2, 3 dinitrosalicylic acid methods.

C02: understand the sugar fermentation of micro-organism.

C03: understand the isolation of lecithin, identification by TLC and its estimation.

C04: understand the isolation of cholesterol from egg yolk and its estimation.

C05: understand the determination of glucose by Folin-Wu method.

C06: understand the determination of serum lipase.

C07: understand the estimation of lipase by triterimetric method.

B. Sc. Part III, SEMESTER VI DSE-II (USBCDST-10) MOLECULAR BIOLOGY.
CREDITS: 2

After completion of this course students will be able to:

- CO1: understand the DNA replication in E.coli.-initiation elongation and termination.
- CO2: understand different models of replication.
- CO3: Understand the structure of polymerase I, DNA polymerase II.
- CO4: understand the DNA damage and repair.
- CO5: understand the prokaryotic transcription.
- CO6: understand the genetic code and decoding system.

B. Sc. Part III Semester V, USBCDSP-06: PRACTICALS
CREDITS: 1

After completion of this course students will be able to:

- CO1: understand the extraction of total nucleic acids from plant tissue.
- CO2: Understand the estimation of DNA by diphenylamine reaction.
- CO3: understand the estimation of RNA by orcinol reaction.
- CO4: understand the isolation of m-RNA from yeast by affinity chromatography

B. Sc. Part III, SEMESTER VI DSE-III (USBCDST-11) Nutritional Biochemistry.
CREDITS: 2

After completion of this course students will be able to:

- CO1: understand the nutrition and energy metabolism.
- Co2: understand the dietary requirement and sources of carbohydrates
- CO3: understand the dietary implication of fats and oils.
- CO4: understand the dietary proteins, minerals and health.
- CO5: understand the role of vitamin A, vitamin K, vitamin E, and D

B. Sc. Part III Semester V, (USBCDSP-07): PRACTICALS
CREDITS:1

- CO1: understand the bioassay for vitamin B12/B1.
- CO2: understand the homocystiene estimation.
- CO3: understand the serum/urine MMA estimation.
- CO4: understand the vitamin A/E estimation in serum.

B. Sc. Part III,SEMESTER VI:- DSE-IV (USBCDST-12) PLANT BIOCHEMISTRY.
CREDITS: 2

After completion of this course students will be able to:

- CO1: understand the cyclic and non-cyclic photophosphorylation
- CO2: understand the calvin cycle and regulation.
- CO3: understand the regulation of plant morphogenetic process by light.
- CO4: understand the representatives alkaloid group and their amino acid precursors.
- CO5: understand the classification of trepenoids and representatives.
- CO6: understand the cell and tissue culture techniques.

B. Sc. Part III Semester V, (USBCDSP-08): PRACTICALS

CREDITS:1

After completion of this course students will be able to:

CO1: understand the introduction of hydrolytic enzymes

CO2: understand the extraction of urease from Jack beans.

CO3: understand the separation of photosynthetic pigments by TLC.

CO4: understand the culture of plant plants (explants).

B. Sc. Part III, SEMESTER V:- DSE-IV (USBCSEC-01) SKILL ENHANCEMENT COURSE: TOOLS AND TECHNIQUES IN BIOCHEMISTRY. CREDITS: 2

After completion of this course students will be able to:

CO1: understand safety practices in the laboratory. Preparation and storage of solution

CO2: understand the principle and instrumentation of UV-visible and fluorescence spectroscopy.

PRACTICAL OF SKILL ENHANCEMENT

After completion of this course students will be able to:

CO1: understand the Preparation of a buffer of given pH and molarity.

CO2: understand the Preparation and standard solutions.

CO3: understand the Measurement of PH by PH meter.

CO4: understand the Preparation of Buffer solutions.

CO5: understand the Measurement of fluorescence spectrum.

CO67: understand the Determination of concentration of a protein solution by Lowry/BCA method.

CO8: understand the Determination of the absorption maxima and molar extinction coefficient (of a relevant organic molecule).

SKILL ENHANCEMENT COURSE

SEMESTER-V,SEC-2:(USBCSEC-02): COMPOSTING: GREEN WASTE MANAGEMENT

TOTAL HOURS: 30 CREDITS: 2

After completion of this course students will be able to:

CO1: understand the Definition and scope of green waste management, Introduction of composting process, definition,

Types of composting, Biomass and its resources

CO2: understand the Organic constituents of green waste, Microbial biota present in composting, Chemistry of composting, microbiology of composting.

CO3: understand the Enzyme and substrate degradation during composting, Different phases of composition with their significance on composting.

C04: understand the Aerobic versus anaerobic composting, Thermophilic versus mesophilic composting Analysis of compost parameter (Proximate analysis, ultimate analysis), Compost maturity (Definition, significance, maturity indexes, maturity tests).

PRACTICAL OF SKILL ENHANCEMENT COURSE:

After completion of this course students will be able to:

C01: understand the Bin composting

C02: Windrow composting

C03. Activator added composting

C04. Heap composting and aerobic versus anaerobic composting .

B. Sc. Part III (CBCS), SEMESTER-VI, DSE – I: (USBCDST-13): BIOENERGETICS AND METABOLISM OF AMINO ACIDS AND NUCLEOTIDES, CREDITS: 2

After completion of this course students will be able to:

C01: understand the basic concepts of Bioenergetics.

C02: understand the principle and mechanism of Phosphorylation potential and Free energy of hydrolysis of ATP.

C03: understand the energy generation and energy reduction process through ATP-ADP Cycle. C04: understand in vivo studies of Intermediary metabolism and methods of in vitro studies of removal of organs and perfusion.

C05: understand the concept of Homogenates and purified enzyme systems and isotope tracer studies and use of inhibitors and anti metabolites.

C06: understand the technique of Protein Metabolism through transamination, Urea cycle, and Oxidative and Non-oxidative deamination, transmethylation and decarboxylation process.

C07: understand the synthesis and catabolism of nucleotides through the Nucleic acid metabolism study.

DSE-9: PRACTICAL (USBCDSP-09): BIOENERGETICS AND METABOLISM OF AMINO ACIDS AND NUCLEOTIDES

CREDITS: 1

After completion of this course students will be able to:

C01: understand the technique of assay of serum transaminases by SGOT and SGPT.

C02: understand methods of estimation of serum uric acid, serum creatinine, serum inorganic phosphate and estimation of proteins.

C03: understand method of determination of creatine & creatinine in urine and serum acetylcholine esterase.

C04: understand the technique of Isolation of RNA from yeast.

C05: understand the method and principle of determination of urinary ammonia

B. Sc. Part III (CBCS) SEMESTER: VI, DSE – II: (USBCDST-14): PROTEIN SYNTHESIS AND RECOMBINANT DNA TECHNOLOGY

CREDITS: 2

After completion of this course students will be able to:

CO1: understand the mechanism and procedure of *Translation in protein synthesis and Post translational modification*.

CO2: understand the principle and *regulation of gene expression in prokaryotes*.

CO4: understand the Basic concept of rDNA Technology and role of restriction endonuclease

CO5: understand the techniques of Joining DNA molecules and types of vectors.

CO6; understand the various *tools and applications of rDNA Technology*

CO7: understand Methods of transformation/transfection, Selection and Screening methods

CO8: understand the concepts of Genomic and cDNA libraries.

CO9: understand mechanism, principle and application of Polymerase chain reaction (PCR)

and applications of recombinant DNA technology.

DSE-10: PRACTICAL

USBCDSP-10: PROTEIN SYNTHESIS AND RECOMBINANT DNA TECHNOLOGY

CREDIT: 1

After completion of this course students will be able to:

CO1: understand method of Estimation of serum urea and acid and alkaline phosphatase.

CO2: understand the technique for assay of activity of papain.

CO3: understand the method of isolation of plasmid, genomic DNA and chromosomal.

Students also understand the method of Southern / western blotting and replica plating technique and restriction digestion method.

CO4: understand the technique used to identify Lac⁺ bacteria by blue white screening using IPTG.

B. Sc. Part III (CBCS) SEMESTER VI, DSE – III (USBCDST-15): ADVANCED CELL BIOLOGY

CREDITS: 2

After completion of this course students will be able to:

CO1: understand the properties, method and principle of Plasma Membrane and Nuclear Transport.

CO2: understand the principle of Cell-Cell Interactions and Cell-Matrix Interactions

CO3: understand the Cell Cycle and mechanism of Programmed Cell Death in eukaryotes.

CO4: understand the method of hematopoiesis, embryonic stem cells and therapeutic cloning.

C05: understand the development, causes and genetic basis of Cancer and Tumor viruses.

C06: understand the Advanced Methods in Cell Biology.

DSE-11: PRACTICAL, (USBCDSP-11): ADVANCED CELL BIOLOGY

CREDITS: 1

After completion of this course students will be able to:

C01: understand Isolation of organelles by sub-cellular fractionation.

C02: understand Study of cell viability /death assay by use of trypan blue and MTT assay.

C03: understand Study of apoptosis through analysis of DNA fragmentation patterns in mitochondria.

C04: understand Identification and study of cancerous cells using permanent slides and photomicrographs.

C05: understand Demonstration of Ames test for carcinogenesis

C06: understand Demonstration of scanning electron microscopic study of *E.Coli*

B. Sc. Part III (CBCS) SEMESTER VI : DSE – IV, (USBCDST-16): BIostatISTICS AND RESEARCH METHODOLOGY

CREDITS: 2

After completion of this course students will be able to:

C01: understand Statistical terms- population, sample, Variables, parameter, statistics, observation, Data etc.

C02: understand Mathematical averages (mean, mode, median)

C03: understand Probabilty Correlation Regression.

C04: understand Search problem, study background of problem

C05: understand Preparation of planning to solve problem according to lacuna of previous research

C06: understand Data compilation and validation through various test.

DSE-12: PRACTICAL (USBCDSP-12): BIostatISTICS AND RESEARCH METHODOLOGY

CREDIT: 1

After completion of this course students will be able to:

C01: understand Preparation of histogram frequency Polygram from given case study

C02: understand Preparation of cumulative frequency curve and pie diagram from given case study

C03: understand Calculation of arithmetic mean and geometric mean from given case study

C04 students will understand Calculation of mean and mode from given case study

C05: understand Calculation of standard deviation from given case study.

CO6: understand Calculation of standard error and plotting on a frequency graph from given case study

**B.Sc.III :BIOCHEMISTRY: SKILL ENHANCEMENT COURSE
SEMESTER-V, SEC-3 (USBCSEC-03): CLINICAL BIOCHEMISTRY**

After completion of this course students will be able to:

CO1: understand organization of clinical laboratory, Introduction to instrumentation and automation in clinical biochemistry laboratories safety.

CO2: understand clinical significance of variations in blood glucose. Diabetes mellitus.

CO3: understand Composition and functions of lipoproteins. Clinical significance of elevated lipoprotein.

CO4: understand Liver function test, Renal function tests.

**B.Sc.III :BIOCHEMISTRY PRACTICAL: SKILL ENHANCEMENT COURSE: CLINICAL
BIOCHEMISTRY(USBCSEC-03)**

After completion of this course students will be able to:

CO1: understand estimation of bilirubin (direct and indirect).

CO2: understand quantitative determination of serum creatinine and urea.

CO3. understand estimation of creatine kinase MB.

CO4: understand Collection of blood and storage.

CO5: understand Separation and storage of serum.

CO6: understand Estimation triglycerides.

**B. Sc. Part III Semester VI: SEC-IV, (USBCSEC-04): RESEARCH PROJECT TO
ENHANCED LABORATORY
SKILL AND RESEARCH APTITUDE**

After completion of this course students will be able to:

CO1: understand about dissertation work/ project work and various problem associated with community during their project work

CO2: understand various aspects of dissertation/project writing and data preparation and presentation

**B.Sc.III : BIOCHEMISTRY: PRACTICAL: SKILL ENHANCEMENT COURSE:
LABORTORY SKILL AND RESEARCH APPTITUDE(USBCSEC-04)**

After completion of this course students will be able to:

CO1: understand presentation of dissertation through power point presentation.