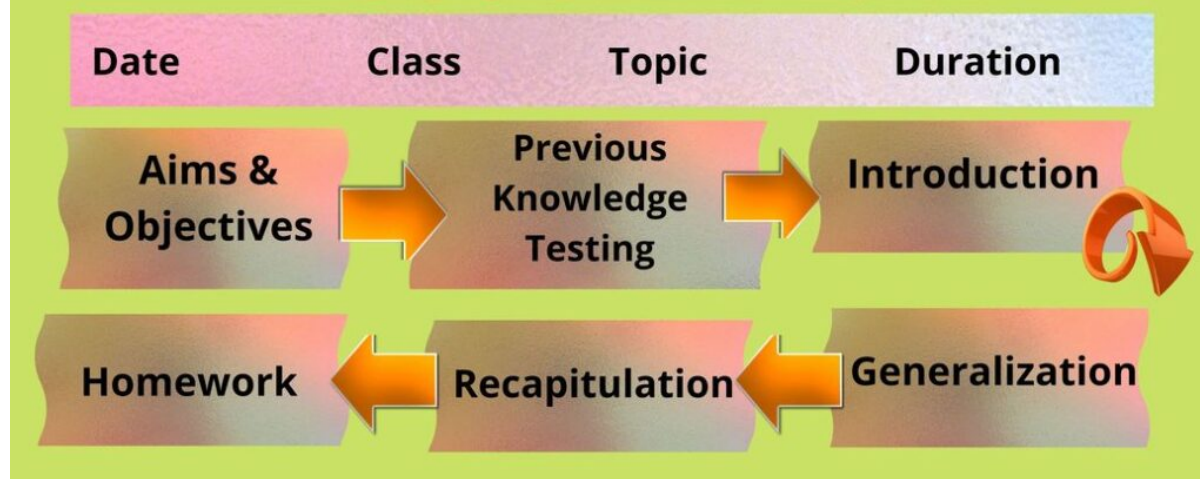


Lesson Plan



Pedagogy	P₁	General Lecture Using Blackboard and Chalk
	P₂	Demonstration
	P₃	Question and Answer
	P₄	Slide Share/PPT
	P₅	Group Discussion
	P₆	ICT (Virtual and online learning)
	P₇	Assignment (Written)
	P₈	Discovery - Story telling
	P₉	Seminar
	P₁₀	Guest Lecture
	P_X	Problem solving
	P_Q	Ouiz
P_T	Written Test	
External & Internal Evaluation	75:25	

course: B.Sc.,MBBC	Year: I		Semester: I		
Subject	Biomolecules – BCH-1				
Units:	1. Biophysical concepts 2. Carbohydrates 3. Lipids 4. Amino acids and protein 5. Nucleic acids and Porphyrines				
Duration:	60hours				
Learning Objectives	<ul style="list-style-type: none"> • How and why water is an universal solvent • Parameters used to detect the quality of water and soil. • Various biomolecules which makeup the living microorganisms. • Structure and biological relevance of the biomolecules. 				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	12	12	12	12	12
Internal Evaluation Total: 25 marks	5	5	5	5	5
Resource Materials	<p><u>Study material (Handouts)</u></p> <ol style="list-style-type: none"> 1. https://www.researchgate.net/publication/296692463_Biochemistry_Chapter_2_Water_the_unique_solvent_for_life 2. https://www.easybiologyclass.com/glycosaminoglycans-structure-examples-and-functions-biochemistry-lecture-notes/ 3. https://www.slideshare.net/mprasadnaidu/gags-32811127 4. https://www.slideshare.net/EmaSushan/cot-curve <p><u>Reference Books</u></p> <ol style="list-style-type: none"> 1. Soil Analysis: An interpretation manual by K. I. Peverill, L. A. Sparrow, D. J. Reuter 2. Biochemistry - Zubay C, Addison – Wesley, 1986. 3. Biochemistry, Lehninger A.H. 4. Principles of Biochemistry White-A, Handler, Pand Smith E.L. Mc Grew Hill 5. Fundamentals of Biochemistry by Donald Voet (1999). 6. Biochemistry by U.Satyanarayana and U. Chakrapani (2017) Elsevier <p><u>Youtube Channels</u></p> <ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=BqQuIBCCUKE 2. https://www.youtube.com/watch?v=cP8iQu57dQo <p><u>Model Paper</u></p> <ol style="list-style-type: none"> 1. https://www.andhrauniversity.edu.in/syllabus/ugmpap/Bio-Chemistry-Biomolecules_M.pdf 2. https://www.andhrauniversity.edu.in/img/syllabus/2022-2023modelpapers/New%20Doc%2001-05-2023%2016.20.pdf 				

Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Biomolecules: Water as biological solvent, Buffers, measurement of pH, electrodes, Biological relevance of pH, pKa value, analysis of drinking water and pond water, Total dissolved salts (TDS), BOD, COD, soil analysis (texture, organic matter, elements), Electrical conductivity.	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	PQ,P6,PT
II	Carbohydrates: Classification, monosaccharides, D and L designation, open chain and cyclic structures, epimers and anomers, mutarotation, reactions of carbohydrates (due to functional groups - hydroxyl, aldehyde and ketone). Amino sugars, Glycosides. Structure and biological importance of disaccharides (sucrose, lactose, maltose, isomaltose, trehalose), trisaccharides (raffinose, melezitose), structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen). Glycosaminoglycans, Bacterial cell wall polysaccharides. Outlines of glycoproteins, glycolipids and blood group substances.	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	PX,P6,PT
III	Lipids: Classification, saturated and unsaturated fatty acids, structure and properties of fats and oils (acid, saponification and iodine values, rancidity). General properties and structures of phospholipids. Prostaglandins- structure, types and biological role. Lipoproteins- types and functions, Biomembranes-formation of micelles, bilayers, vesicles, liposomes. Membrane composition and organization - Fluid mosaic model.	P ₁ , P ₃ , P ₄ , P ₅ , P ₇	PQ,PT
IV	Amino Acids: Classification, structure, stereochemistry, chemical reactions of amino acids due to carbonyl and amino groups. Titration curve of glycine and p _x values. Essential and nonessential amino acids, non-protein amino acids. Peptide bond - nature and conformation. Naturally occurring peptides - glutathione, enkephalin. Proteins: Classification based on solubility, shape and function. Determination of amino acid composition of proteins. General properties of proteins, denaturation and renaturation of proteins. Structural organization of proteins- primary, secondary, tertiary and quaternary structures (Eg. Hemoglobin and Myoglobin).	P ₁ , P ₃ , P ₄ , P ₅ , P ₇	PQ,P6,PT
V	Nucleic acids and Porphyrins: Types of RNA and DNA. Structure of purines and pyrimidines, nucleosides, nucleotides. Stability and formation of phosphodiester linkages. Effect of acids, alkali and nucleases on DNA and RNA. Structure of Nucleic acids- Watson-Crick DNA double helix structure, denaturation and renaturation kinetics of nucleic acids-, T _m -values and their significance, cot curves and their significance. Structure of porphyrins: Identification of Porphyrins, Protoporphyrin, porphobilinogen properties, Structure of metalloporphyrins- Heme, cytochromes and chlorophylls	P ₁ , P ₃ , P ₄ , P ₅ , P ₇	PQ,PT

course: B.Sc.,MBBC	Year: I		Semester: II		
Subject	Analytical Techniques – BCH-2				
Units:	1. Cell homogenization and centrifugation 2. Chromatographic techniques 3. Spectroscopy and tracer techniques 4. Electrophoresis 5. Microbial techniques				
Duration:	60hours				
Learning Objectives	<ul style="list-style-type: none"> Different techniques used to isolate and separate the cellular compartments and biomolecules Basic principles of various biophysical techniques Applications of Biophysical techniques in understanding biological phenomena.				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	12	12	12	12	12
Internal Evaluation Total: 25 marks	5	5	5	5	5
Resource Materials	<p><u>Study material (Handouts)</u></p> <ol style="list-style-type: none"> https://www.biologydiscussion.com/cell/cell-fractionation-extraction-homogenization-and-centrifugation/5848 https://www.slideshare.net/suniu/principles-and-application-of-chromatography https://www.rbvrrwcp.org/wp-content/uploads/2019/04/tracer-techniques.pdf <p><u>Reference Books</u></p> <ul style="list-style-type: none"> Principles and Techniques of practical Biochemistry. Eds. Williams and Wilson. Techniques in Molecular biology Ed. Walker & Gastra, Croom Helm, 1983. Principles of instrumental analysis, 2nd Ed, Holt-Sanders, 1980. An introduction to practical biochemistry David T. Plummer, Tata Mac Grew-Hill <p><u>Youtube Channels</u></p> <ol style="list-style-type: none"> https://www.youtube.com/watch?v=cv7HuZiXf8o https://www.youtube.com/watch?v=hmK7vYr2T54 <p><u>Model Paper</u></p>				

Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Cell homogenization and centrifugation: Methods of tissue homogenization: (Potter-Elvehjem, mechanical blender, sonicator and enzymatic). Centrifugation techniques, principles and applications- differential, density gradient. Ultra-centrifugation- preparative and analytical.	P ₁ , P ₂ , P ₃ , P ₄ , P ₇ , P ₈	PQ,P6,PT
II	Chromatographic techniques: Types of chromatographic techniques, Principle and applications - Paper chromatography- solvents, Rf value, applications; Thin layer chromatography- principle, choice of adsorbent and solvent, Rf value, applications; Gel filtration, Ion- exchange- principle, resins, action of resins, experimental techniques, applications, separation of metal ions; Affinity chromatography.	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	PX,P6,PT,P3
III	Spectroscopy and tracer techniques: Electromagnetic radiation, Beer-Lambert's law. Colorimetry and Spectrophotometry,spectrofluorimetry, flame photometry. Tracer techniques: Radio isotopes, units of radio activity, half life, β and γ - emitters, use of radioactive isotopes in biology, ELISA, RIA.	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	PQ,PT,P9
IV	Electrophoresis: Electrophoresis- principles and applications of paper, polyacrylamide (native and SDS) and agarose gel electrophoresis, isoelectric focusing, immune-electrophoresis- types and applications.	P ₁ , P ₃ , P ₄ , P ₆ , P ₉	PQ,P6,PT
V	Microbial techniques: Microscopy: Basic principles of light microscopy, phase contrast, electron microscope and fluorescent microscope and their applications. Preparation of different growth media, isolation and culturing and preservation of microbes, Gram's staining- Gram positive and Gram negative bacteria, motility and sporulation, Sterilization techniques-Physical methods, chemical methods, radiation methods, ultrasonic and. Antibiotic resistance.	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	PQ,PT,P3,P7

course: B.Sc.,MBBC	Year: II		Semester: III		
Subject	<u>Enzymology, Bioenergetics & Intermediary metabolism – BCH - III</u>				
Units:	<ol style="list-style-type: none"> 1. Enzymology 2. Bioenergetics & Biological oxidation 3. Carbohydrate metabolism 4. Lipid metabolism 5. Metabolism of Amino acids 				
Duration:	60hours				
Learning Objectives	<p>This course offers the knowledge about</p> <ul style="list-style-type: none"> • Discovery of enzymes, its nomenclature, classification , enzyme-substrate models, mechanism of enzyme action and applications of enzymes in different fields • Catabolism and Anabolism of biomolecules and Inborn errors of metabolic disorders <p>Electron transport system and mechanism of synthesis of ATP.</p>				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	12	10	10	14	14
Internal Evaluation Total: 25 marks	5	5	5	5	5
Resource Materials	<p><u>Study material (Handouts)</u></p> <ol style="list-style-type: none"> 1. https://www.slideshare.net/fatimafizan/bioenergetics-and-thermodynamics 2. https://www.slideshare.net/namarta28/cholesterol-synthesis-steps-and-regulation <p><u>Reference Books</u></p> <ol style="list-style-type: none"> 1. Understanding enzymes: Palmer T., Ellis Harwood ltd., 2001. 2. Enzyme structure and mechanism. Alan Fersht, Freeman & Co. 1997 3. Principles of Biochemistry, White. A, Handler, P and Smith. 4. Biochemistry, Lehninger A. L. 5. Biochemistry, LubertStryer. 6. Review of physiological chemistry, Harold A. Harper 7. Biochemistry, 2nd Edition, G. Zubay. <p><u>Youtube links</u></p> <ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=TK7onDEEIYc 2. https://www.youtube.com/watch?v=QXfIU4fqW8 3. https://www.khanacademy.org/science/biology/photosynthesis-in-plants/the-calvin-cycle-reactions/v/photosynthesis-calvin-cycle 				

Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	<p>Enzymology:Introduction to Biocatalysis, differences between chemical and biological catalysis. Nomenclature and classification of enzymes. Definition of holo-enzyme, apo-enzyme, coenzyme, cofactor. Active site, Enzyme specificity. Principles of energy of activation, transition state. Interaction between enzyme and substrate-lock and key, induced fit models. Fundamentals of enzyme assay, enzyme units. Outlines of mechanism of enzyme action, factors affecting enzyme activity. Commercial application of enzymes.</p>	P ₁ , P ₂ , P ₃ , P ₄ , P ₇ , P ₈	PQ,P6,PT
II	<p>Bioenergetics and Biogical oxidation:Thermodynamic principles – Chemical equilibria; free energy, enthalpy (H), entropy (S). Free energy change in biological transformations in living systems; High energy compounds. Energy, change, oxidation-reduction reactions. Organization of electron carriers and enzymes in mitochondria. Classes of electron-transferring enzymes, inhibitors of electron transport. Oxidative phosphorylation. Uncouplers and inhibitors of oxidative phosphorylation. Mechanism of oxidative phosphorylation.</p>	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	PX,P6,PT,P3
III	<p>Carbohydrate Metabolism:Concept of anabolism and catabolism. Glycolytic pathway, energy yield. Fate of pyruvate-formation of lactate and ethanol, Citric acid cycle, regulation, energy yield, amphipathic role. Anaplerotic reactions. Glycogenolysis and glycogenesis. Pentose phosphate pathway. Gluconeogenesis. Photosynthesis- Light and Dark reactions, Calvin cycle, C₄ Pathway. Disorders of carbohydrate metabolism- Diabetes Mellitus.</p>	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	PQ,PT,P9
IV	<p>Lipid Metabolism:Catabolism of fatty acids (β- oxidation) with even and odd number of carbon atoms, Ketogenesis, DE NOVO synthesis of fatty acids, elongation of fatty acids in mitochondria and microsomes, Biosynthesis and degradation of triacylglycerol and lecithin. Biosynthesis of cholesterol. Disorders of lipid metabolism.</p>	P ₁ , P ₃ , P ₄ , P ₆ , P ₉	PQ,P6,PT
V	<p>Metabolism of Amino Acid:General reactions of amino acid metabolism- transamination, decarboxylation and deamination, Urea cycle and regulation, Catabolism of carbon skeleton of amino acids- glycogenic and ketogenic amino acids. Metabolism of glycine, serine, aspartic acid, methionine, phenylalanine and leucine. Biosynthesis of creatine. Inborn errors of aromatic and branched chain amino acid metabolism.</p>	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	PQ,PT,P3,P7

course: B.Sc.,MBBC	Year: II		Semester: IV		
Subject	Physiology, Nutritional and Clinical Biochemistry – BCH - IV				
Units:	<ol style="list-style-type: none"> 1. Digestion and Blood 2. Nervous system and excretory system 3. Endocrinology 4. Nutritional Biochemistry 5. Clinical Biochemistry 				
Duration:	60hours				
Learning Objectives	<p>This course offers the knowledge about</p> <ul style="list-style-type: none"> • Digestion and absorption of carbohydrates, proteins and lipids and its regulation by various hormones • Composition of blood and its function • Structural organisation of nervous system and excretory system and their functions • Endocrine system, various hormones secreted by it, mechanism of action of hormones and its clinical significance • Balanced diet, Malnutrition and deficiency diseases <p>Use of various enzyme markers in the diagnosis of diseases.</p>				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	12	10	10	14	14
Internal Evaluation Total: 25 marks	5	5	5	5	5
Resource Materials	<p><u>Study material (Handouts)</u></p> <ol style="list-style-type: none"> 1. https://www.embibe.com/exams/balanced-diet/ 2. https://training.seer.cancer.gov/anatomy/nervous/ 3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4084612/ <p><u>Reference Books</u></p> <ol style="list-style-type: none"> 1. Essentials of food and Nutrition, Vol. I & II, M.S. Swaminathan. 2. Text Book of Biochemistry with clinical correlations. Thomas M. Devlin (John Wily). 3. Harper’s Review of Biochemistry, Murray et al (Longman). <p><u>Youtube links</u></p> <ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=zVXY7xLwNJQ 4. https://www.youtube.com/watch?v=gEdt7ykNzAw 				

Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	<p><u>Digestion and Blood:</u> Digestion and absorption of carbohydrates, lipids and proteins. Role of enzymes and gastrointestinal hormones in digestion. Composition of blood, Blood groups, coagulation of blood and disorders of blood coagulation (haemophilia). Hemoglobin and transport of gases in blood (oxygen and CO₂). Types of anemias, haemoglobinopathies-sickle cell anemia.</p>	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	P ₃ ,P ₉ ,PT
II	<p><u>Nervous system and excretory system:</u> Introduction to nervous system, general organization of nervous system, Neurons-structure, types, properties and functions; Neurotransmitters, Cerebrospinal fluid-composition and functions, Reflex-types and properties.</p> <p>Introduction to excretory system. Organisation of kidney, Structure and functions of nephron, Urine formation, Role of kidneys in maintaining acid-base and electrolyte balance in the body.</p>	P ₁ , P ₃ , P ₄ , P ₅ , P ₉	P ₁ ,P ₃ ,P ₄ ,P ₉
III	<p><u>Endocrinology:</u>Endocrinology- organization of endocrine system. Classification of hormones. Outlines of chemistry, physiological role and disorders of hormones of thyroid, parathyroid, pituitary and hypothalamus. Introduction of gastrointestinal hormones. Mechanism of hormonal action- signal transduction pathways for glucocorticoids and insulin. Adrenalin, estrogen and progesterone.</p>	P ₁ , P ₃ , P ₄ , P _Q , P ₇	P _Q ,PT,P ₃
IV	<p><u>Nutritional Biochemistry:</u>Balanced diet. Calorific values of foods and their determination by bomb calorimeter. BMR and factors affecting it. Specific dynamic action of foods. Energy requirements and recommended dietary allowance (RDA) for children, adults, pregnant and lactating women. Sources of complete and incomplete proteins. Biological value of proteins. Malnutrition- Kwashiorkar, Marasmus and PEM. Vitamins- sources, structure, biochemical roles, deficiency disorders of water and fat soluble vitamins. Introduction to nutraceutical and functional foods. Bulk and trace elements-Ca, Mg, Fe, I, Cu, Mo, Zn, Se and F.</p>	P ₁ , P ₃ , P ₄ , P ₆ , P _Q	P _Q ,P ₆ ,PT,P ₄ ,P ₆
V	<p><u>Clinical Biochemistry:</u>Plasma proteins in health and disease. Liver diseases-jaundice. Liver function tests- conjugated and total bilirubin in serum, albumin: globulin ratio, Serum enzymes in liver diseases-SGOT, SGPT, GGT,CPK, Acid and alkaline phosphatases. Serum lipids and lipoproteins. Normal and abnormal constituents of urine. Renal function tests-Blood urea, creatinine, GFR, creatinine clearance. GTT and gastric and pancreatic function tests</p>	P ₁ , P ₂ , P ₃ , P ₄ , P ₉	P _Q ,PT,P ₃ ,P ₉

course: B.Sc.,MBBC	Year: II			Semester: IV	
Subject	Microbiology, Immunology and Molecular biology – BCH -V				
Units:	1. Microbiology 2. Nitrogen Fixation 3. Applied Biochemistry 4: Immunology 5. Molecular Biology				
Duration:	60hours				
Learning Objectives	<p>This course offers the knowledge about</p> <ul style="list-style-type: none"> Diversity of microbes, its classification, structures, life style and growth kinetics. Nitrogen cycle, various microorganisms involved in nitrogen fixation. Basics of different fermentation technology including Batch, fed-batch and continuous cultures in the production of various industrially important compounds. Basics of immune system, structures of immunoglobulin and various immunochemical techniques and its applications <p>Types of nucleic acids and their biological function; Introduces various steps involved in cloning technology</p>				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	12	12	12	10	10
Internal Evaluation Total: 25 marks	5	5	5	5	5
Resource Materials	<p><u>Study material (Handouts)</u></p> <ol style="list-style-type: none"> https://www.biologydiscussion.com/plant-physiology-2/nitrogen-cycle/steps-involved-in-nitrogen-cycle-ecology/52988 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6822018/#:~:text=Nucleic%20acids%2C%20deoxyribonucleic%20acid%20(DNA,on%20to%20the%20next%20generation <p><u>Reference Books</u></p> <ol style="list-style-type: none"> Pelczar MJ, Chan ECS and Krieg NR (1993). Microbiology. 5th edition. McGraw Hill Book Company. Willey MJ, Sherwood, LM & Woolverton CJ (2013) Prescott, Harley and Klein's Microbiology by 9th Ed. McGraw Hill. Atlas RM. (1997). Principles of Microbiology. 2nd edition. W.M.T.Brown Publishers Stanbury P.F. (1986) Fermentation Technology (2nd ed.,) Stanbury (Pergmon Press). <p><u>Youtube links</u></p> <ol style="list-style-type: none"> https://web.iitd.ac.in/~vperumal/SBL100-Immunology%20lectures%201-3.pptx https://www.youtube.com/watch?v=MlfDx417SDshttps://www.youtube.com/watch?v=gEdt7yKNzAw 				

Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Microbiology: Introduction to microbiology and microbial diversity. Classification of microorganisms- prokaryotic and eukaryotic microorganisms.Bacterial structure, growth curve and kinetics of growth. Introduction to viruses-plant and animal viruses, structure, life cycle, Food and dairy microbiology.	P ₁ , P ₂ , P ₃ , P ₄ , P ₉	P ₃ ,P ₉ ,PT,P ₆
II	Nitrogen Fixation: Nitrogen cycle, Non-biological and biological nitrogen fixation, photosynthetic and non-photosynthetic systems, Nitrogenase system. Utilization of nitrate ion, Ammonia incorporation into organic compounds. Synthesis of glutamine and regulatory mechanism of glutamine synthase.	P ₁ , P ₃ , P ₄ , P ₇ ,P ₈	P ₁ ,P ₃ ,P ₄ ,P ₉
III	Applied Biochemistry: Fermentation Technology: Batch, continuous culture techniques, principle types of fermentors. Pasteur effect.Industrial production of chemicals- alcohol, acids (citric acid), solvents (acetone), antibiotics (penicillin), Enzyme Technology: Immobilization of enzymes and cells, industrial applications, enzymes in Bioremediation..	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	PQ,PT,P ₃ .P ₄
IV	Immunology: Organs and cells of immune system. Innate and acquired immunity, Cell mediated and humoral immunity (T-cells and B-cells). Classification of immunoglobulins,structure of IgG. Epitopes / antigenic determinants. Concept of haptens. Adjuvants. Monoclonal antibodies.Antigen-antibody reactions- agglutination, immunoprecipitation, immunodiffusion. Blood group antigens. Immunodiagnosics- ELISA. Vaccines and their classification. Traditional vaccines-live and attenuated. Modern vaccines-recombinant and peptide vaccines. Outlines of hypersensitivity reactions.	P ₁ , P ₂ , P ₃ , P ₄ , P ₉	PQ,PT,P ₄ ,P ₆
V	Molecular biology: Types of RNA and DNA, DNA replication-leading and lagging strands, okazaki fragments, inhibitors of DNA replication. Genetic code, Protein synthesis-transcription, translation, inhibitors of protein synthesis. Outlines of cloning technology, vectors, restriction enzymes, PCR,applications of cloning in agriculture, industry and medical fields.	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	PQ,PT,P ₉

course: B.Sc.,MBBC	Year: III		Semester: V		
Subject	Clinical Biochemistry – 6A				
Units:	<ol style="list-style-type: none"> 1. Introduction 2. Basics of Hepatic and Renal Physiology 3. Glucose metabolism 4. Lipid profile 5. Cardiovascular diseases 				
Duration:	60hours				
Learning Objectives	<p>Students will learn the following upon completion of this course</p> <ul style="list-style-type: none"> • Safety regulations to be followed inside lab, types of specimens and how to collect it • Physiology of Kidney, Liver and cardiovascular system and its clinical significance • Details about glucose and lipid metabolism and their regulation by various hormones, abnormal levels of it and its clinical relevance <p>Importance of isoenzymes and their use in the diagnosis of diseases.</p>				
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	12	12	12	10	10
Internal Evaluation Total: 25 marks	5	5	5	5	5
Resource Materials	<p><u>Study material (Handouts)</u></p> <ol style="list-style-type: none"> 1. https://www.slideshare.net/AliRaza305/automation-in-the-clinical-lab 2. https://microbiologynotes.com/elisa-principle-types-and-applications/ 1. https://www.ncbi.nlm.nih.gov/books/NBK507821/ <p><u>Reference Books</u></p> <ol style="list-style-type: none"> 5. Pelczar MJ, Chan ECS and Krieg NR (1993). Microbiology. 5th edition. McGraw Hill Book Company. 6. Willey MJ, Sherwood, LM & Woolverton CJ (2013) Prescott, Harley and Klein's Microbiology by 9th Ed. McGraw Hill. 7. Atlas RM. (1997). Principles of Microbiology. 2nd edition. W.M.T.Brown Publishers 8. Stanbury P.F. (1986) Fermentation Technology (2nd ed.,) Stanbury (Pergmon Press). <p><u>Youtube links</u></p> <ol style="list-style-type: none"> 3. https://web.iitd.ac.in/~vperumal/SBL100-Immunology%20lectures%201-3.pptx 4. https://www.youtube.com/watch?v=MlFDx417SDshttps://www.youtube.com/watch?v=gEdt7ykNzAw 				

Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	Introduction:: Organization of Clinical laboratory. Introduction to instrumentation and automation in Clinical biochemistry laboratories, safety regulations and first aid. General comments on specimen collection, Type of specimen for biochemical analyses. Precision, accuracy, quality control, precautions and limitations.	P ₁ , P ₂ , P ₃ , P ₄ , P ₉	P ₃ ,P ₉ ,PT,P ₆
II	Basics of Hepatic and Renal physiology:: Evaluations of biochemical changes in liver and kidney diseases, Liver function tests (LFTs), Renal function tests (RFTs), GFR. Diagnostic biochemical profile	P ₁ , P ₃ , P ₄ , P ₇ ,P ₈	P ₁ ,P ₃ ,P ₄ ,P ₉
III	Glucose Metabolism: Digestion, absorption and assimilation of carbohydrates. Enzymes and hormones (Insulin, Glucagon) in regulation of blood glucose levels. Clinical significance of variations in blood glucose levels, disorders - Diabetes mellitus, Insulin resistance.	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	PQ,PT,P ₃ .P ₄
IV	Lipid profile: Lipids, fats, Triglycerides, cholesterol, fatty acids, PUFAS. Digestion and absorption of lipids. Composition and functions of lipoproteins. Clinical significance of elevated lipoproteins.	P ₁ , P ₂ , P ₃ , P ₄ , P ₉	PQ,PT,P ₄ ,P ₆
V	Cardiovascular diseases: Basic cardiovascular physiology, biochemical symptoms associated with cardiovascular diseases and their evaluation. Involvement of enzymes in diagnostics of heart diseases including Aspartate transaminase, Isoenzymes of creatine kinase and lactate dehydrogenase and troponin.	P ₁ , P ₂ , P ₃ , P ₄ , P ₇	PQ,PT,P ₉

course: B.Sc.,MBBC		Year: III		Semester: V	
Subject		Haematological and Immunological Techniques – 7A			
Units:		1. Introduction 2. Composition of Blood and Lymph 3. Advanced diagnostic methods 4. Autoimmunity 5. Immunoglobulins			
Duration:		60hours			
Learning Objectives		This course enable the student to have a fundamental knowledge in the following <ul style="list-style-type: none"> • How to organize the clinical and immunological laboratory, What are WHO standards, precision and accuracy etc., • Composition of blood and its biological role • In depth knowledge on the latest molecular biological techniques used in the diagnosis of various microbial infections • Basics of autoimmunity, different types and its mechanism Immunoglobins, their types, structures and functions 			
Units	U1	U2	U3	U4	U5
Hours Split: Total: 60	12	12	12	10	10
Internal Evaluation Total: 25 marks	5	5	5	5	5
Resource Materials		<p><u>Study material (Handouts)</u></p> <ol style="list-style-type: none"> 1. https://www.slideshare.net/8056933252/organization-of-laboratory 2. https://training.seer.cancer.gov/leukemia/anatomy/composition.html 3. https://www.ncbi.nlm.nih.gov/books/NBK555922/#:~:text=Enzyme%2Dlinked%20immunosorbent%20assay%20(ELISA,proteins%2C%20glycoproteins%2C%20and%20hormones. <p><u>References:</u></p> <ol style="list-style-type: none"> 1. Essential Immunology - By I. Roitt, Publ: Blackwell. 2. Abbas AK, Lichtman AH, Pillai S. Cellular and Molecular Immunology. Saunders Publication, Philadelphia. 3. Ronald Hoffman, Edward J. Benz Jr., Leslie E. Silberstein, Helen Heslop, Jeffrey Weitz, John Anastasi - Hematology: Basic Principles and Practice, Elsevier Health Sciences, 2012. <p>1. Betty Ciesla, Hematology in Practice, F.A. Davis, 2011.</p> <p><u>Youtube links</u></p> <ol style="list-style-type: none"> 1. https://kaltura.uconn.edu/media/Introduction+to+Histology+and+Histopathology+-+Part+1/1_w6g8o1g8 2. https://www.youtube.com/watch?v=W5QbNqRBPO0 			

Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	<p><u>Introduction:</u> Organization of Clinical Immunology laboratory. Introduction and maintenance of clinical Immunology laboratory; hazards in clinical laboratory; units; ‘normal range’, reference values. Factors affecting reference values quality control in laboratory – use of external and internal standards; use of WHO standards.</p>	P ₁ , P ₃ , P ₄ , P ₉	P ₃ ,P ₉ ,PT,P ₆
II	<p><u>Composition of blood and Lymph:</u> Plasma and cells-RBC, WBC, platelets, blood clotting, plasma proteins, separation and applications, plasma therapy. Lymph.</p>	P ₁ , P ₃ , P ₇ ,P ₈	P ₁ ,P ₃ ,P ₄ ,P ₉
III	<p><u>Advanced diagnostic methods:</u> Identification of viral, bacterial and other diseases - ELISA, Western blot, RT-PCR-Tissue Histopathology, fixing, staining (H&E) and microtome sections.</p>	P ₂ , P ₃ , P ₄ , P ₇	PQ,PT,P ₃ .P ₄
IV	<p><u>Auto immunity:</u> Introduction, Auto recognition, classes of auto immuno diseases. (Hashimoto disease, thyrotoxicosis, Systemic lupus erythomatosis, Autoimmune haemolytic anaemia, Rheumatoid arthritis).</p>	P ₁ , P ₂ , P ₃ , P ₉	PQ,PT,P ₄ ,P ₆
V	<p><u>Immunoglobulins (Igs):</u> Types of Igs, nature and structure of Igs –Light chain, heavy chain and functions. Adjuvants, Antibody production, enzymatic cleavage of Igs, Haptens.</p>	P ₁ , P ₂ , P ₄ , P ₇	PQ,PT,P ₉

