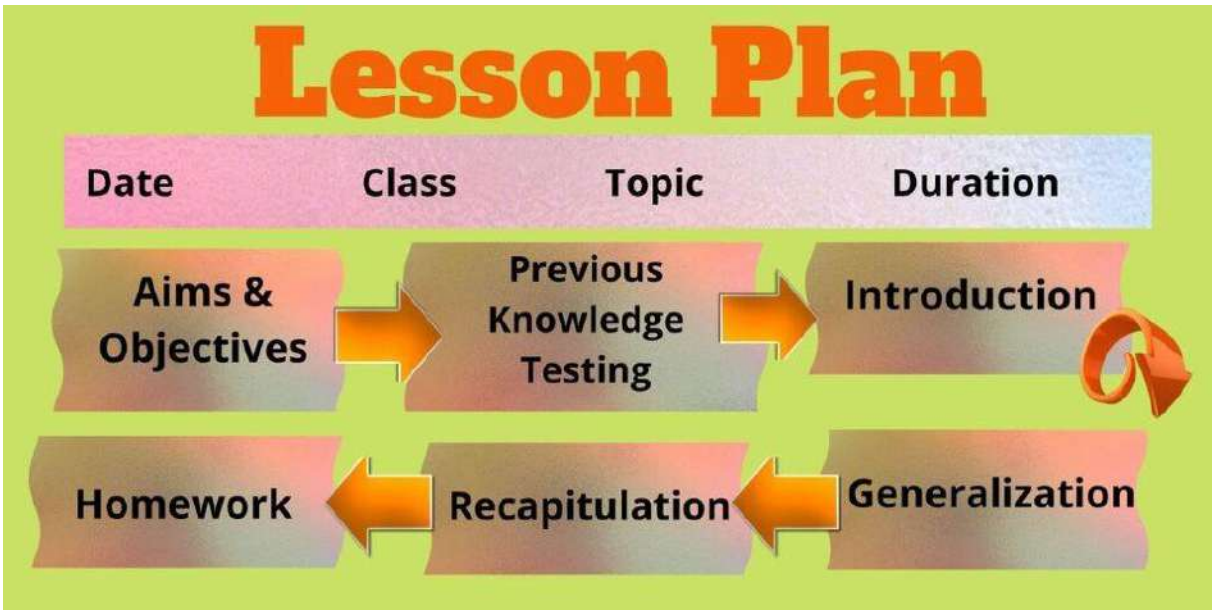
DEPARTMENT OF BIOCHEMISTRY

CURRICULAM PLAN 2023-2026



Pedagogy	**P_1**	General Lecture Using Blackboard and Chalk
	P_2	Demonstration
	P_3	Question and Answer
	P_4	Slide Share/PPT
	P_5	Group Discussion
	P_6	ICT (Virtual and online learning)
	P_7	Assignment (Written)
	P_8	Discovery - Story telling
	P_9	Seminar
	P_{10}	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: II
Subject	**Biomolecules – (Course No-1)**	
Units:	1. Fundamentals of Biochemistry 2. Carbohydrates 3. Lipids 4. Amino acids and protein 5. Nucleic acids and Porphyrins	
Duration:	**60hours**	
Learning Objectives	• How and why water is an universal solvent • History Of Bio-Chemistry • 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

Study material (Handouts)

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
5. https://youtu.be/CHJsaq2lNjU?si=wL9OGD8uHdXmao7B

Reference Books

1. Biochemistry - Zubay C, Addison – Wesley, 1986.
2. Biochemistry, Lehninger A.H.
3. Principles of Biochemistry White-A, Handler, Pand Smith E.L. Mc Grew Hill
4. Fundamentals of Biochemistry by Donald Voet (1999).
5. Biochemistry by U.Satyanarayana and U. Chakrapani (2017) Elsevier

Youtube Channels

1. https://www.youtube.com/watch?v=BqQuIBCcUKE
2. https://www.youtube.com/watch?v=cP8iQu57dQo

Model Paper

1. https://www.andhrauniversity.edu.in/syllabus/ugmpap/Bio-Chemistry-Biomolecules_M.pdf

Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	**Fundamentals of Biochemistry: History, scope and avenues of Biochemistry.:**Water as biological solvent, Buffers, measurement of pH, electrodes, Biological relevance of pH, pKa value Outlines of surface tension, adsorption and osmosis and their biological relevance.	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.	P_1, P_2, P_3, P_4, P_7	PX,P6,PT
III	**Lipids:** 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.	**P_1, P_3, P_4, P_5, P_7**	PQ,PT
IV	**Amino Acids and Proteins:** Classification, structure, stereochemistry, chemical reactions of amino acids due to carbonyl and amino groups. 2. Titration curve of glycine and pK values. Essential and nonessential amino acids, non-protein amino acids. 3. Peptide bond - nature and conformation. Naturally occurring peptides - glutathione, enkephalin. 4. Proteins: Classification based on solubility, shape, and function. Determination of amino acid composition of proteins. 5. General properties of proteins, denaturation, and renaturation of proteins. 6. 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 Porphyrines:** 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-, Tm-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: III
Subject	**Analytical Techniques – (Course No-2)**	
Units:	1. Cell homogenization and Chromatographic techniques 2. Electrophoresis 3. centrifugation 4. Spectroscopy and colorimetry 5. Radio Isotopes	
Duration:	**60hours**	
Learning Objectives	• 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

Study material (Handouts)

1. https://www.biologydiscussion.com/cell/cell-fractionation-extraction-homogenization-and-centrifugation/5848
2. https://www.slideshare.net/suniu/principles-and-application-of-chromatography
3. https://www.rbvrrwcp.org/wp-content/uploads/2019/04/tracer-techniques.pdf

Reference Books

- 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

Youtube Channels

1. https://www.youtube.com/watch?v=cy7HuZiXf8o
2. https://www.youtube.com/watch?v=hmK7yYr2T54

Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	**Cell homogenization and Chromatographic techniques:** Methods of tissue homogenization. Salt and organic solvent extraction and fractionation. Dialysis, Reverse dialysis, ultra filtration, lyophilization. Chromatography: principle, procedure and application of partition chromatography, adsorption chromatography, ion exchange chromatography, gel chromatography, affinity chromatography, GLC and HPLC.	**P_1, P_2, P_3, P_4, P_7, P_8**	PQ,P6,PT
II	**Electrophoresis:** Principle,procedure and application of free flow, zone electrophoresis (Paper electrophoresis, Gel electrophoresis, PAGE, SDS-PAGE and Disc PAGE). Isoelectric focusing, High voltage electrophoresis, Pulse field electrophoresis, Immunoelectrophoretic.	P_1, P_2, P_3, P_4, P_7	PX,P6,PT,P3
III	**Centrifugation:** Principle of sedimentation technique. Different types of centrifuge and rotors. Principle, procedure and application of differential centrifugation, density gradient centrifugation, ultra centrifugation, rate zonal centrifugation, isopycnic centrifugation.	**P_1, P_2, P_3, P_4, P_7**	PQ,PT,P9
IV	**Colorimetry and spectrophotometry:** Laws of light absorption -Beer - Lambert's law. UV and visible absorption spectra, molar extinction coefficient and quantitation. Principle and instrumentation of colorimetry and spectrophotometry. Principle of nephelometry, fluoromentry, Atomic absoption and emission spectrophotometer	P_1, P_3, P_4, P_6, P_9	PQ,P6,PT
V	**Important stable radioisotopes** used in biochemical research. P 32, I 125,I131, Co 60. C 14 etc. Radiation hazards and precautions taken while handling radioisotopes. Principle and application of RIA. Measurement of radioactivity by GM counter and Scintillation counter.	P_1, P_2, P_3, P_4, P_7	PQ,PT,P3,P7

course: B.Sc.,MBBC	Year: II	Semester: IV
Subject	**BIOENERGETICS AND METABOLISM OF CARBOHYDRATES AND LIPIDS-(Course No-3)**	
Units:	1. Principles of thermodynamics 2. Biological oxidation 3. Intermediary metabolism. 4. Lipid metabolism 5. Metabolism of phospholipids	
Duration:	**60hours**	
Learning Objectives	This course offers the knowledge about • Catabolism and Anabolism of biomolecules. • Inborn errors of metabolic disorders. • Electron transport system and mechanism of synthesis of ATP.	

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

Study material (Handouts)

1. https://www.slideshare.net/fatimafizan/bioenergetics-and-thermodynamics
2. https://www.slideshare.net/namarta28/cholesterol-synthesis-steps-and-regulation

Reference Books

1. Principles of Biochemistry, White. A, Handler, P and Smith.
2. Biochemistry, Lehninger A. L.
3. Biochemistry, LubertStryer.
4. Review of physiological chemistry, Harold A. Harper
5. Biochemistry, 2nd Edition, G. Zubay.

Youtube links

1. https://www.youtube.com/watch?v=TK7onDEElYc
2. https://www.youtube.com/watch?v=QXfIlU4fqW8
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	**Principles of thermodynamics**, free energy, enthalpy and entropy, Free energy changes in biological transformations in living systems. Redox potential, phosphate group transfer potential and ATP, High-energy compounds, oxidation and reduction reactions.	**P_1, P_2, P_3, P_4, P_7, P_8**	PQ,P6,PT
II	**Oxidative phosphorylation,** Mitochondria ultrastructure, Energy harnessing cascade from nutrients, Reducing equivalents, Electron transport and its carriers-Complex I, II, III, IV; Mitchell's Hypothesis—experimental verification, Determination of P:O ratio, ATP synthesis by F1-FO ATP synthase, E. Racker's experiment. Relation of proton movement and ATP synthesis. Experimental demonstration of the movement of ATP synthase. Oxidation and reduction enzymes, utilization of oxygen aby oxygenase's, superoxide dismutase and catalase. respiratory control, Mechanism, and theories of oxidative phosphorylation. Respiratory chain inhibitors and unvouplers of oxidative phosphorylation. Microsomal electron transport system. Bioluminescence.	P_1, P_2, P_3, P_4, P_7	PX,P6,PT,P3
III	**Approaches for studying intermediary metabolism.** Glucose as fuel, glucose transporters, Glycolysis, and its regulation. Substrate cycling, TCA cycle – function and regulation, Glyoxylate cycle, Gluconeogenesis, and its regulation, HMP shunt and its significance, Uronic acid pathway, Glycogen metabolism and its regulation with special reference to phosphorylase and glycogen synthase, Metabolism of fructose, galactose and lactose, Biogenesis of amino sugars, peptidoglycans, glycosyl aminoglycans and glycoproteins. In born errors of carbohydrate metabolism.	**P_1, P_2, P_3, P_4, P_7**	PQ,PT,P9
IV	**Lipid metabolism** – Oxidation of fatty acids, Biosynthesis of fatty acids and regulation; Metabolism of arachidonic acid; formation of prostaglandins, thromboxanes, leukotrienes, Biosynthesis of triglycerides	P_1, P_3, P_4, P_6, P_9	PQ,P6,PT
V	**Metabolism of phospholipids**, sphingolipids. Biosynthesis of cholesterol and its regulation, Formation of bile acids. Role of liver and adipose tissue in lipid metabolism. In born errors of lipid metabolism	P_1, P_2, P_3, P_4, P_7	PQ,PT,P3,P7

course: B.Sc.,MBBC	Year: II	Semester: IV
Subject	**Clinical Biochemistry-(Course No-4)**	
Units:	1. Clinical Biochemistry 2. Abnormal Hemoglobin and Inherited Disorders 3. Investigation of Renal and Gastric Functions 4. Liver Function Tests 5. Blood Glucose Regulation and Enzymes of Diagnostic Importance	
Duration:	**60hours**	
Learning Objectives	This course offers the knowledge about • After completing this course, the student will: • Obtain basic knowledge about specimen collections, pathological variations of water, electrolytes • Interpret the results to diagnose the abnormal functions of organs. • Understand the antinutrient factors and its implication on other nutrients in food.Understand the, patterns of inherited disorders and disorders of hemoglobin metabolism • Correlate the tests used for renal and gastric functions and their interpretations • Impart the diagnostic tests for liver function and lipoprotein metabolic disorders • Evaluate the alterations in blood glucose regulation and enzymes of clinical importance	

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

Study material (Handouts)

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4084612/

Reference Books

1. Text Book of Biochemistry with clinical correlations. Thomas M. Devlin (John Wily).
2. Harper's Review of Biochemistry, Murray et al (Longman).
3. Burtis and Ashwood (2007) Tietz Fundamentals of Clinical chemistry, 6th edition, WB Saunders Company, Oxford Science Publications USA.
4. 4. Chatterjee and Shindae(2012). Text book of medical biochemistry, 8th edition.

Youtube links

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	**Clinical Biochemistry:**Laboratory and Investigation of Homeostasis. The use of biochemical tests- Specimen collection and types, Automation and Computerization Water and electrolyte homeostasis - renin angiotensin – aldosterone system Pathological variations of water and electrolytes- diagnosis and Interpretations Self Study: Acid base balance and imbalance - Mechanism of regulations, Anion gap, Acidosis and Alkalosis.	P_1, P_2, P_3, P_4, P_7	P3,P9,PT
II	**Abnormal Hemoglobin** and Inherited Disorders 9hrs Inborn errors of Metabolism: Patterns of inheritance - alkaptonuria, phenyl ketonuria, albinism, glycogen storage diseases and inherited disorders associated with urea cycle. Abnormal hemoglobin and' hemoglobinopathies- Sickle cell anemia and thalassemias, porphyrias and porphyrinurias. Self-study: Plasma proteins in health and diseases	P_1, P_3, P_4, P_5, P_9	P1,P3,P4,P9
III	**Investigation of Renal and Gastric Functions.** Renal functions tests: Preliminary investigations, tests based on GFR, RPF and tubular function. Diseases related to kidney - nephritis, nephrosis, uremia, renal failure, renal calculi, renal hypertension, renal tubular acidosis, diabetes insipidus.. Dialysis - hemodialyis and peritoneal dialysis. Gastric function tests: Examination of resting content, Fractional gastric analysis, stimulation tests, Tubeless gastric analysis. Malabsorption syndrome, acidity, ulcers - gastric, duodenal and peptic, colon cancer, pancreatitis, gastric and pancreatic 'function tests. Self study: Gout, Leschnyhan syndrome and oroticaciduria.	P_1, P_3, P_4, P_Q, P_7	PQ,PT,P3
IV	**Liver Function Tests and Lipid Disorder Liver function tests:** Tests based on abnormalities of bile pigment metabolism, detoxification and excretory functions. Diagnosis of different types of jaundice. Pancreatic function tests. Diseases relating to liver - jaundice, cirrhosis, hepatitis, cholestasis, cholelithiasis, hepatic coma, hepatic carcinoma, inherited diseases of bilirubin metabolism Lipid: Lipoprotinemias and atherosclerosis coronary heart diseases and hypertension. Self study: Biochemical changes in cancer - detection of tumor markers	P_1, P_3, P_4, P_6, P_Q	PQ,P6,PT,P4,P6
V	**Blood Glucose Regulation and Enzymes of Diagnostic Importance:** Carbohydrates: Blood glucose level - regulation and its clinical significance, Diabetes mellitus, Glycosuria and GTT. Enzymes and Isoenzymes of clinical importance - general principles of assay - Clinical significance of enzymes and isoenzymes (LDH, CK, phosphatase, 5' nucleosidase, amylase, lipase, acetyl cholinesterase, transaminase and gamma glutamyl transferase) Self study: meningitis, encephalities, epilepsy, Parkinson's, Alzheimer's, cerebral palsy.	P_1, P_2, P_3, P_4, P_9	PQ,PT,P3,P9

course: B.Sc.,MBBC	Year: II	Semester: V
Subject	**NUTRITIONAL BIOCHEMISTRY-(Course No-5)**	
Units:	1. Animal and vegetative foods 2. Clinical nutrition 3. Biological effects of non-nutrients, Antinutrients 4. Vitamins 5. Obesity	
Duration:	**60hours**	
Learning Objectives	This course offers the knowledge about 1. Analyse the role of various nutrients, their dietary allowances and relate in day-today life. 2. Revise the Knowledge about the water- and fat-soluble vitamins and its significance and its functions 3. Outline the Knowledge about Obesity and obtaining better results.	

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

Study material (Handouts)

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6822018/#:~:text=Nucleic%20acids%2C%20deoxyribonucleic%20acid%20(DNA,on%20to%20the%20next%20generation

Reference Books

1. Smith EL (1983) Principles of biochemistry: mammalian biochemistry: McGrawHill Companies.
2. Chatterjee CC (1951) Human physiology: Medical Allied Agency.
3. Murray R, Granner D, Mayes P, Rodwell V (2003) Harper's illustrated biochemistry (LANGE basic science): McGraw-Hill Medical. 4. Guyton Aurcher C, Hall John E (2006) Text book of Medical Physiology. Elsevier India Pvt. Ltd. New Delhi

, **Youtube links**

1. https://www.youtube.com/watch?v=MIfDx417SDshttps://www.youtube.com/watch?v=gEdt7ykNzAw
2. https://youtu.be/dtCvYfhzPQ0?si=L83Y8SenMGY5vcm-

Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	**Animal and vegetative foods –** chemical composition. Nutrients – Essential Nutrients and their classification. Digestibility, absorption and biochemical functions of macro nutrients, Carbohydrates – dietary requirements. Proteins – Nitrogen balance studies, Determination of Biological values of proteins, Specific Dynamic Action, improvement of protein quality by supplementation and fortification. Lipids – Dietary needs of lipids, essential fatty acids. Calorific values of foods, Basal metabolic rate and its determination, factors influencing BMR.	P_1, P_2, P_3, P_4, P_9	P3,P9,PT,P6
II	**Clinical nutrition –** role of diet and nutrition in prevention of atherosclerosis and obesity, role of leptin in regulation of body mass. Starvation – Protein sparing treatment during fasting, Protein calorie malnutrition – Kwashiorkar and Marasmus, Nutritional requirements for pregnant and lactating women and aged people.	P_1, P_3, P_4, P_7,P_8	P1,P3,P4,P9
III	**Biological effects of non-nutrients, dietary fibre, physiological actions. Antinutrients** – Protease inhibitors, hemagglutinins, hepatotoxin, goitrogens, cyanogenic glucosides, methyl xanthines, oxalates. Toxins from mushrooms. Biological effects of food contaminants – Hexachlorobenzene, arsenic, DDT, cadmium, mercury, lead, aflatoxins, food additives - saccharin and sodium nitrite. Animal foods and seafoods. Food allergy – role of allergens, diagnosis and management of food allergy. Food processing and loss of nutrients during processing and cooking.	P_1, P_2, P_3, P_4, P_7	PQ,PT,P3.P4
IV	**Vitamins** – Fat soluble vitamins (A,D,E,K) and Water soluble vitamins (B complex and C) (Sources, biological functions and RDA), Disorders of vitamins A, D, E, K , Vitamin C and B-complex vitamins : Thiamin, Riboflavin, Niacin, Pantothenic acid, Lipoic acid, Pyridoxine, Biotin, folic acid and vitamin B12.Minerals- iron, calcium, iodine, selenium (Sources, biological functions and RDA). Deficiency disorders of minerals Nutritional requirements in infancy, childhood, pregnancy and lactation and old age..	P_1, P_2, P_3, P_4, P_9	PQ,PT,P4,P6
V	**Obesity** – Causes, Anthropometric measurements and Diet management. Dietary management in – Infection, Fever, Constipation, Diabetes mellitus, Peptic Ulcer, PCOS, Hypertension, Cardiovascular diseases, Pancreatitis, Cirrhosis and Cancer.	P_1, P_2, P_3, P_4, P_7	PQ,PT,P9

course: B.Sc.,MBBC	Year: III	Semester: V
Subject	**ENZYMOLOGY- (Course No-6)**	
Units:	1. Introduction to Enzymes 2. Enzyme kinetics 3. Enzyme Activity 4. Enzyme regulation 5. Immobilization of enzymes	
Duration:	**60hours**	
Learning Objectives	Students will learn the following upon completion of this course 1. Acquire the knowledge of structure and organization of protein 2. Identify the different classes of enzymes, the methods used for purification of enzymes and describe enzyme kinetics for bisubstrate and multisubstrate reactions. 3. Do research in a contemporary action of enzyme and enzyme inhibition. 4. Explain the enzyme regulation and multienzyme complex. 5. Explore the applications of enzymes in clinical and various industrial sectors.	

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

Study material (Handouts)

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/

Reference Books

1. Enzymes: M. Dixon and E. C. Webb. Longman Publication.
2. Enzymology: Nicholas and Price
3. Biochemistry: D.Voet and J. G. Voet, John Wiley & sons Inc. New York ChischesterBrisbane,Toronto, singapore ISBN 0-471-58651-X
4. Biochemistry: L. Stryer. and Hall, J.E., Library of congress cataloguing-in publication Data, Bery, Jeremy mark ISBN -0-7167-4684-0.
5. Enzymes: Trevor Palmer Affiliated East- West Press Pvt. Ltd, New Delhi ISBN 81- 7671-04

, **Youtube links**

1.https://youtu.be/R23ZXqysTZc?si=wy6L5jeFEwTJLHRZ

2https://youtu.be/EKM8oMfg9cQ?si=wRP-LCL8dgOa8Dyk

Academic-Pedagogical-Evaluation:Unit-wise Pedagogy

UNIT	DESCRIPTION	PEDAGOGY	INTERNAL EVALUATION
I	**Introduction to enzymes**: Holoenzyme, apoenzyme, prosthetic group. Interaction between enzyme and substrate- lock and key model, induced fit model., enzyme specificity and types. IUB system of classification and nomenclature of enzymes (Class and subclass with one example) Ribozymes, Abzymes..	P_1, P_2, P_3, P_4, P_9	P3,P9,PT,P6
II	**Enzyme kinetics**: Importance, order of reaction, study of the factors affecting the velocity of enzyme catalyzed reaction- enzyme concentration, temperature, pH, substrate concentration, inhibitors and Derivation of Michaelis - Menten equation and Km value determination and its significance. Definition of Vmax value of enzyme and its significance. Lineweaver- Burk plot (Only for single substrate enzyme catalyzed reaction).	P_1, P_3, P_4, P_7,P_8	P1,P3,P4,P9
III	**Methods of measurements and expression of enzyme activity.** Unit of enzyme activity - definition and importance. Enzyme inhibition: Reversible and irreversible – examples. Reversible- competitive, noncompetitive and uncompetitive inhibition- explanation of double reciprocal plot with examples.	P_1, P_2, P_3, P_4, P_7	PQ,PT,P3.P4
IV	**Enzyme regulation** – covalently modulated enzymes with examples of adenylation and phosphorylation and allosteric regulation- example Aspartate tras carbamoylase. IsoenzymesLactate dehydrogenase and creatine phosphokinase. Zymogens	P_1, P_2, P_3, P_4, P_9	PQ,PT,P4,P6
V	**Immobilization of enzymes,** methods of immobilization. Industrial uses of enzymes: Detergent enzymes, thermo stable alpha amylase, papain, chymotrypsin	P_1, P_2, P_3, P_4, P_7	PQ,PT,P9