SACRED HEART COLLEGE (AUTONOMOUS)

Tirupattur – 635 601, Tamil Nadu, S.India

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Ready for Every Good Work

A Don Bosco Institution of Higher Education, Founded in 1951 * Affiliated to Thiruvalluvar University, Vellore * Autonomous since 1987

Accredited by NAAC (4th Cycle – under RAF) with CGPA of 3.31 / 4 at 'A+' Grade

Sacred Heart College (Autonomous), Tirupattur District

1.2.1 List of New Courses

M.Sc. Biochemistry

Sem	Subject Code	Paper	Title of the Paper	Ins. Hrs/ Week	Cr	Exam Hrs	Max. Marks		
							CA	Sem	Tot
I SEMESTER	BC709	Core Paper I	Cell Dynamics	4	4	3	50	50	100
	BC710	Core Paper II	Biomolecules	4	4	3	50	50	100
	BC711	Core Paper III	Human Physiology and Nutrition	4	4	3	50	50	100
	PBC807	Core Practical I	Lab Course – I: Isolation, Quantitative Analysis and Techniques	5	-	-	-	-	-
	PBC808	Core Practical II	Lab Course – II: Industrial and Clinical Enzymology	5	-	-	-	-	-
	PBC809	Core Practical III	Lab Course – III: Microbial Biochemistry	4	-	-	-	-	-
	BC712A BC712B BC712C	Elective Paper I	(to choose 1 out of 3) 1. Bioinformatics 2. Industrial Microbiology 3. Stem Cell Technology	4	4	3	50	50	100
				30	**16**				**400**
II SEMESTER	BC809	Core Paper IV	Instrumentation Biochemistry	4	4	3	50	50	100
	BC810	Core Paper V	Advanced Enzymology	4	4	3	50	50	100
	BC811	Core Paper VI	Intermediary Metabolism	4	4	3	50	50	100
	PBC807	Core Practical I	Lab Course – I: Isolation, Quantitative Analysis and Techniques	5	4	6	50	50	100
	PBC808	Core Practical II	Lab Course – II: Industrial and Clinical Enzymology	5	4	6	50	50	100
	PBC809	Core Practical III	Lab Course – III: Microbial Biochemistry	4	4	6	50	50	100
	BC812A BC812B BC812C	Elective Paper II	(to choose 1 out of 3) 1. Advanced Endocrinology 2. Pharmaceutical Biochemistry 3. Environmental Toxicology	4	4	3	50	50	100
			Summer Training*	-	**2***	-	-	-	-

			Certificate Course- CMLT*	-	**2***	-	-	-	-
				30	**28+4***				**700**
Sem		**Paper**	**Title of the Paper**	**Ins. Hrs/ Week**	**Cr**	**Exam Hrs**	**Max. Marks**		
							CA	**SEM**	**Tot**
III SEMESTER	BC911	Core Paper VII	Molecular Biology	6	5	3	50	50	100
	BC912	Core Paper VIII	Immunology	5	4	3	50	50	100
	BC913	Core Paper IX	Research Methodology	5	4	3	50	50	100
	PBC1005	Core Practical IV	Lab Course – IV: Biochemical, Immunological and Molecular Biology Techniques	5	-	-	-	-	-
	PBC1006	Core Practical V	Lab Course– V: Haematological Methods	5	-	-	-	-	-
	BC914A BC914B BC914C	Elective Paper III	(to choose 1 out of 3) 1. Ecology, evolution & biodiversity 2.Food Biochemistry 3.Bionanotechnology	4	4	3	50	50	100
		SSP	**Self-Study Paper*** (CSIR/SET – Objective Type Questions) **OR** **Online Course** **[NPTEL/MOOC]**	-	**2***	-	-	-	-
				30	**17+2***				**400**
IV SEMESTER	BC1009	Core Paper X	Advanced Clinical Biochemistry	5	5	3	50	50	100
	BC1010	Core Paper XI	Biotechnology	4	4	3	50	50	100
	BC1012J	Core Paper XII	Project/Dissertation with Viva-Voce	5	5	-	50	50	100
	PBC1005	Core Practical IV	Lab Course – IV: Biochemical, Immunological and Molecular Biology Techniques	5	5	6	50	50	100
	PBC1006	Core Practical V	Lab Course– V: Haematological Methods	5	5	6	50	50	100
	BC1011A BC1011B BC1011C	Elective Paper IV	(to choose 1 out of 3) 1.Plant :Biochemistry and Molecular Biology 2.Herbal Technology 3.Medical Diagnostic Technology	4	4	3	50	50	100
	VE1004		Human Rights	2	1	3	50	50	100
				30	**29**				**700**
			TOTAL	**120**	**90+6***				**2200**

Sacred Heart College (Autonomous), Tirupattur District

1.2.1 List of New Courses

Department: M.Sc.BioChemistry

S.No	Course Code	Course Name
1.	BC709	Cell Dynamics
2.	BC710	Biomolecules
3.	BC711	Human Physiology and Nutrition
4.	BC712 A	Bioinformatics
5.	BC712 B	Industrial Microbiology
6.	BC712 C	Stem Cell Technology
7.	BC809	Instrumentation Biochemistry
8.	BC810	Advanced Enzymology
9.	BC811	Intermediary Metabolism
10	BC812A	Advanced Endocrinology
11	BC812 B	Pharmaceutical Biochemistry
12	BC812 C	Environmental Toxicology
13	PBC807	Lab Course – I: Isolation and Character.studies, Quantitative Anal.Techn
14	PBC808	Lab Course – II: Industrial and Clinical Enzymology
15	PBC809	Lab Course – III: Microbial Biochemistry

SEMESTER I

Cell Dynamics

Semester	Subject Code	Title of the Course	Hours / Week	Credits
I	BC709	Cell Dynamics	4	4

Course Objectives

- To learn the prokaryotic and eukaryotic cellular organization and acquire knowledge on cell cycle and cell division.
- To understand the communication and transport across the cell membrane.
- To know the histopathology techniques and staining methods.
- To understand the membrane proteins and their interactions with other cellular components.
- To explain the molecular basis of apoptosis and necrosis.

Course Outcomes

S.No.	Description	Cognitive Level (K-level)
CO1	Acquire broad knowledge on prokaryotic and eukaryotic cellular organization, cell cycle and cell division.	K3
CO2	Define and provide an understanding of the structure of cell and function of various subcellular organelles.	K1, K2
CO3	Examine the theory and practice of histological techniques and staining of tissues using routine and specialized techniques.	K4
CO4	Learn the basic concepts on the membrane proteins and their interactions with other cellular components.	K1
CO5	Determine the transport mechanisms across biological membranes and learn the concept and mechanism of ATP synthesis.	K1, K3
CO6	Compile the information on cell aging and cell death mechanisms.	K5, K6

UNIT-I

Cell types–Organization of Prokaryotic and Eukaryotic cells, Cell division –Mitosis and Meiosis, Cell cycle–Phases of cell cycle, Cell motility–Molecular motors, Microtubules, Structure and composition, Microtubular associated proteins–Role in intracellular motility.

UNIT-II

Cellular organelles–Nucleus-internal organization, Traffic between the Nucleus the Nucleolus, and Cytoplasm, Endoplasmic reticulum–Protein sorting and transport, Golgi apparatus and Lysosomes, Morphology and Functions of mitochondria, Chloroplasts, Peroxisomes and Glyoxysomes.

UNIT-III

Histopathological Studies–Methods for disrupting tissues and cells, Organ and tissue slice techniques, Cell fixation–fluid fixatives, freezing and section drying, Staining techniques–acid and basic, fluorescent and radioactive dyes, staining of lipids, steroids, nucleic acids, proteins and enzymatic reaction products.

UNIT-IV

Differentiation of Cell membrane–microvilli, tight junctions, epithelia, Bell and sqot desmosomes–Mechanical function, cell-cell interaction, cell adhesion proteins and tight junctions. Overview of membrane protein– Peripheral and Integral, molecular model of cell membrane–Fluid mosaic model and membrane fluidity, Solute transport across membrane–Passive and Active transport by ATP powered pumps.

UNIT-V

Cell Aging and Death–Necrosis and Apoptosis. Cell Signaling–Signaling molecules and their receptors, Functions of cell surface receptors, Pathways of intracellular signal transduction, ras, MAP kinase pathways.

References

1. The Cell-Biochemistry, physiology and morphology by J. Brachet and A.
2. E. Mirsky, Academic Press (1963).
3. Cell and Molecular Biology by concepts and experiments by Gerald Karp (2005) John Wiley sons & Inc.
4. The World of the cell by Becker, Kleinsmith and Harden Academic Internet Publishers; 5th edition (2006).
5. The Cell: A Molecular Approach, Fourth Edition by Geoffrey M. Cooper and Robert E. Hausman (2006).
6. Molecular cell Biology by Harvey Lodish. W. H. Freeman; Sol edition (2007).

SEMESTER I

Biomolecules

Semester	Subject Code	Title of the Course	Hours / Week	Credits
I	**BC710**	**Biomolecules**	**4**	**4**

Course Objectives

- To understand the nature of various biomolecules present in living cells.
- To get exposed to key contributions of scientists such as G.N. Ramachandran and Watson - Crick etc. in order to create scientific interest amongst students in life processes.
- To learn the properties of carbohydrates, proteins, lipids, cholesterol, DNA, RNA, glycoproteins and glycolipids and their importance in biological systems.

- To understand the organic chemical principles in life processes.
- To develop skills to determine amino acid and nucleotide sequences of proteins and DNA respectively.

Course Outcomes

S. No	Description	Cognitive Level (K-level)
CO-1	Describe the role of biomolecules in biosystem	K6
CO-2	Summarize the Carbohydrates–classification, structure and functions	K2
CO-3	Categorize the proteins based on its structure and function	K4
CO-4	Determine the structure and functions of Nucleic acids	K3
CO-5	Perceive Lipids based on its structure and functions	K5
CO-6	Identify the Water soluble and Fat soluble Vitamins	K1

UNIT-I

Polysaccharides–Occurrence, Structure and Functions of homoglycans–Starch, Glycogen, Cellulose, Dextrin, Inulin and Chitins. Occurrence, structure and functions of heteroglycans–bacterial cell wall polysaccharides, glycosaminoglycans, agar, alginic acid, pectins, amino sugars and deoxy sugars, blood group substances and sialic acids. Glycoproteins and Lectins–Structure and functions.

UNIT-II

Classification of Proteins on the basis of solubility and shape, structure and biological functions. Isolation, fractionation and purification of Proteins. Primary structure– determination of amino acid sequences and Ramachandran plot. Secondary structure–weak interactions involved– alpha helix and beta pleated sheets and beta turns. Collagen triple helix, super secondary structures–helix-loop-helix. Tertiary structure–alpha and beta domains. Quaternary structure–Structure of Haemoglobin. Denaturation and renaturation of Proteins.

UNIT-III

Watson -Crick Model of DNA structure. A, B and Z–DNA, Cruciform - structure in DNA, formation and stability, Miscellaneous alternative conformation of DNA-slipped mispaired DNA, parallel stranded, isomorphic DNA, palindrome, isolation and purification of DNA, Molecular hybridization, Cot value curve and hypochromic effect, secondary and tertiary structure of RNA, hnRNA, methods for nucleic acid sequence.

UNIT-IV

Lipids–Classification, saturated and unsaturated fatty acids, phospholipids–classification, structure and functions. Eicosanoids- Structure and functions of prostaglandins, thromboxanes and leukotrienes. Types and functions of plasma lipoproteins. Amphipathic lipids–membranes, micelles, emulsions and liposomes. Steroids–Structure and biological role of cholesterol, bile acids and bile salts.

UNIT-V

Vitamins–Water soluble-Thiamine, Riboflavin, Niacin, Pyridoxine, Biotin, Cyanocobalamin, Folic acid, Ascorbic acid–Sources, structure, biochemical functions, deficiency diseases and daily requirements. Fat soluble–Vitamin A, vitamin D, vitamin E and vitamin K–Sources, structure, biochemical functions, deficiency diseases and daily requirements.

References

1. Biochemistry by Zubey, GL WCB Publishers (1998).
2. Biochemistry by L. Stryer, W.H. Freeman and Co. 5th Edition (2002).
3. Fundamentals of Biochemistry by Voet and Voet, John Wiley and sons NY (2002).
4. Lehninger's Principle of Biochemistry by David L. Nelson and Michael M. Cox. W. H. Freeman; 4th edition (2004)
5. Text Book of Biochemistry with clinical correlation by Thomas .M. Devlin, John Wiley-Liss, Hobokhen NJ publishers (2006).

SEMESTER I

Human Physiology and Nutrition

Semester	Course Code	Title of the Course	Hours /Week	Credits
I	**BC 711**	**Human Physiology and Nutrition**	**4**	**4**

Course Objectives

- To understand the composition and functions of Blood and Plasma.
- To know the process of gaseous exchange in tissues and lungs, respiratory adaption to high altitude.
- To understand the nerve physiology and muscle physiology.
- To gain insight into digestive system and renal physiology.
- To gain awareness on nutritional requirements and energy measurements.

Course Outcomes

S.No.	Description	Cognitive Level (K-level)
CO-1	Describe the structure of major human organs and explain their role in the maintenance of healthy individuals.	**K1**
CO-2	Correlate the process of gaseous exchange in tissues and lungs, respiratory adaption to high altitude.	**K4**
CO-3	Measure the heart function and learn the circulatory system	**K5**
CO-4	Determine the muscular system and excretory system	**K3**
CO-5	Classify the nutritional requirement for different age people, during pregnancy and Lactation	**K2**
CO-6	Compile the energy measurements, BMR, SDA, RNI and RDA	**K6**

UNIT-I

Composition and functions of Blood and Plasma, Blood volume regulation, Blood groups. Blood coagulation mechanism, anticoagulants and its mode of action. Formation and mechanism of Heamoglobin. Cardiophysiology- functional anatomy of heart- genesis and spread of cardiac impulses- cardiac cycle- heart sound- cardiac output- cardiovascular regulatory mechanisms- ECG. Lymph– Composition and function of lymph.

UNIT-II

Respiratory physiology- functional anatomy of air-passages and lung- respiratory muscles- mechanism of respiration- lung volumes and capacities- gas exchange in the lungs- regulation of respiration. Mechanism of transport of blood gases–O_2 and CO_2. Acid-base balance–Role of buffers, erythrocytes, respiratory system and kidneys.

UNIT-III

Nerve physiology-Structure of neuron and synapse- excitability- action potential conduction of never impulse-synaptic transmission- neurotransmitter systems- Types & role of cranial and spinal nerves – Mechanism of reflex action. Muscle physiology- skeletal, cardiac and smooth muscles- electrical properties and ionic properties- types and mechanism of muscle contraction-role of muscle proteins in contraction and relaxation – Neuromuscular transmission.

UNIT-IV

Digestive system – digestive processes at various regions, internal environment and homeostasis- coordinated body functions, mode of absorption of various food, gastric secretions- regulation and motility, intestinal secretion and motility-role of gastrointestinal hormones. Renal physiology- structure of nephron, mechanism of urine formation. Regulation of water and mineral excretion.

UNIT-V

Basal metabolism, Basal Metabolic Rate, factors affecting BMR, determination of BMR–direct and indirect method, respiratory quotient and SDA. Role of fiber in diet, role of essential amino acids–relation with Marasmus, Kwashiorkar disease, role of essential fatty acids, disorders of fatty acid metabolism, Refsum's disease. Trace elements–macro and micro, daily requirements, functions and deficiency manifestations.

References

1. Human physiology by C.C. Chatterjee, 11th Edition (1985)
2. Human Nutrition and Dietetics by Davidson and Passmore. Churchill Livingstone; 8th Edition (1986)
3. Principles of Nutrition and Dietetics by M.S. Swaminathan, Bappco Publishers (1995)
4. Human Physiology and Mechanisms of Disease by Guyton. Saunders Publications; 6th Edition (1996)
5. Review of Medical Physiology by William. F. Ganong, McGraw-Hill Medical; 22nd Edition (2005)
6. Barrett KE, Brooks HL, Boitano S and Barman SM, Ganong's Review of Medical Physiology, 23rd Ed., McGraw-Hill Medical, 2009.
7. Pal, G.K. Textbook of Medical Physiology, Ahuja Publishing House, Delhi, 2007
8. Hall. J.E. Guyton and Hall Textbook of Medical Physiology. 12th ed. Saunders, Elsevier Inc., 2011.

Semester I

Elective – I – Bioinformatics

Semester	Course Code	Title of the course	Hrs	Credits
I	BC712A	Elective – I – Bioinformatics	4	4

Course Objectives

- To give focus on online resources in life sciences and applications of Bioinformatics in scientific research.
- To determine the function of genes and proteins, to establish evolutionary relationships, and to calculate the three-dimensional shape of proteins by using computer programs.
- To learn algorithms and statistics for assessing the relationships among large sets of biological data.
- To know the tools for the analysis and interpretation of the various biological data.
- To understand various databases and learn the useful biological information.

Course Outcomes

S. No	Description	Cognitive Level (K-level)
CO1	Understand the history and basic concepts in bioinformatics.	K2
CO2	Determine the formative databases available for all the biological macromolecules.	K3
CO3	Analyze global and local sequence alignment tools and their importance.	K4
CO4	List the various protein structure prediction methods through computational approaches.	K1
CO5	Integrate the significance of gene prediction methods.	K6
CO6	Evaluate the tools and software in the analysis of nucleic acid and protein.	K5

UNIT-I

Introduction to Computers-Computer Peripherals and Hardware description. Computer system design, Respective Usage I/O and Storage Devices. Internet Service requirements and applications-E-Mail, World Wide Web, URL, HTML and TCP/IP.

UNIT-II

Operating systems. Evolution, types-system and applications of operating systems, layered structure of operating system, CUI and GUI's DOS internet and external commands, anatomy of windows, features and multitasking. Office applications MS-Office, MS-Word, MS-Excel and MS PowerPoint.

UNIT-III

Bioinformatics-definition, application, challenges and opportunities. Internet, Database- types, classification, sequence formats, DBMS, RDBMS and SQL, NucleicAcid Database-NCBI, EMBL, DDBJ and Phylogenetic tree. Protein Sequence Database- BLAST, FASTA, PIR and SWISS-PROT, Structure database-PDB, CDS, ORFand EST motifs.

UNIT-IV

Secondary structure prediction of RNA and protein. RNA Structure Prediction–mFold, Vienna RNA Package and Circles. Protein structure prediction kPROT, Jnet and SSA. Structural classification of proteins (SCOP), Classification of protein (CATH), Structural and functional genomics and proteomics, DNA microarrays Principle, applications and future prospects.

UNIT-V

Molecular Visualization Tools,Rasmol, Chime, Weblab Viewer, Deep View, ISIS Draw, Chemdraw and Molmol and Drug Designing- drug target, computer aided drug design, types and applications. Emulation of common DOS commands using PERL and BIOPERL.

References

1. Bioinformatics Computing by Bergeron, B.P. 1st Edition, Printice Hall (2000).
2. Introduction to Bioinformatics by Lesk, A.M. 1st Edition, Oxford University Press,(2002).
3. Discovering Genomics, Proteomics and Bioinformatics by Campbell and Heyer
4. Cold Spring Harbour Laboratory Press & Benjamin Cummings, (2002).
5. Fundamental concepts of bioinformatics by Dan E. Krane and Michael L. Raymer,Benjamin Cummings, (2003).

Semester I

Industrial Microbiology

Semester	Subject Code	Title of the Course	Hours / Week	Credits
I	**BC 712B**	**Industrial Microbiology**	**4**	**4**

Course Objectives:

- To learn about the basic concepts of industrial microbiology and industrially important microbes.
- To understand the microbial fermentation process, fermenters types and fermentation techniques.
- To gain the knowledge about inoculum development, raw materials used in fermentation process.
- To become familiar with the food preservation techniques and fermented dairy, brewers products.
- To understand the food preservation techniques and uses of microbes in waste management.

Course Outcomes:

S.No.	**Description**	**Cognitive Level (K- level)**
CO-1	Identify the different types of fermenters and explain the various fermentation strategies and the growth of industrial microorganisms.	**K1**
CO-2	Explain the inoculum development methods, various types of raw materials used in fermentation process and scale up process of fermentation	**K2**
CO-3	Manipulate the fermentation media, microbial inoculum and strain for different types of microbial fermentation process.	**K3**
CO-4	Categorize the primary and secondary metabolites production techniques and Describe about industrially important microbes.	**K4**
CO-5	Evaluate the various food preservation methods and identify the fermented dairy, baker's and brewing products.	**K5**
CO-6	Propose a waste management system, design new composting technique and biogas unit.	**K6**

UNIT – I:

General concepts of Industrial Microbiology, Industrially important microorganisms, Primary and Secondary metabolites from microorganisms, Microbial fermentation and its types, Fermentor–Design and types, Factors affecting fermentor design, Sterilization of Fermentor, media and air.

UNIT – II:

Inoculum development for fermentation process, Raw material for media preparation, Strain improvement strategies, Foam formation during fermentation and Antifoam agents, Scale up of fermentation process– Upstream and Downstream process.

UNIT – III:

Microbial products of industrial value–Penicillin, Streptomycin, Ethanol, Amylase, Vitamin – B12, Acetic acid, Citric acid and Glutamic acid. Probiotics-types.

UNIT – IV:

Principles of food preservation; Single cell proteins – *Spirulina*; Lactic acid bacteria and Propionic acid bacteria, Fermented dairy products–Cheese and Yoghurt; Baker's yeast–Bread making, Beer and Wine production. Food Spoilage –Mycotoxins.

UNIT – V:

Wastes - Types of wastes; Solid waste treatment – Saccharification, Gasification and Composting; Liquid waste treatment – Aerobic and Anaerobic methods; Bioremediation and *Biodeterioration* of Industrial wastes. Composting and Vermicomposting of industrial wastes. Biogas Production.

References:

1. A.H. Patel (2007). Industrial Microbiology, Pan MacMillan Publication, UK.
2. R. Ananthanarayan and C.K. Jayaram Paniker (2000). Text book of Microbiology. 6th Edition, Orient Longman Limited, Chennai.
3. R.M. Atlas and R. Bartha (1992). Microbial ecology. Fundamentals and applications. 3rd Edition. Red Wood City. C.A. Benjamin
4. W.C. Frazier and D.C. Westhoff (1988). Food microbiology. 4th Edition. McGraw Hill NY.

M.J. Waites (2007). Industrial Microbiology. Blackwell Publishing Company. UK.

5. U. Satyanarayana (2005). Biotechnology. 1st Edition, Books and Allied (P) Ltd., Kolkata.
6. Martin Adams and Maurice Moss (2008). Food Microbiology, 3rd Edition, RSC Publications, UK.

SEMESTER I

Stem Cell Technology

Semester	Subject Code	Title of the Course	Hours / Week	Credits
I	BC712C	Stem Cell Technology	4	4

Course Objectives

- To learn about the basics of stem cells.
- To understand the embryonic and adult stem cell therapy.
- To examine the increasing potential of stem cell in medicine and understanding of the molecular determinants.
- To develop the ability to understand the role of stem cells in research.
- To learn about Stem cell based therapies in animal models.

Course Outcomes

S.No.	Description	Cognitive Level
CO-1	Enumerate the basics of stem cells and the concepts of embryonic and adult stem cell therapy.	K1
CO-2	Examine the increasing potential of stem cell science to contribute to medicine and understanding of the molecular determinants that define stem cells.	K4
CO-3	Demonstrate *in vitro* manipulation to create distinct cell lineages and understanding of the methodologies used for reverse engineering of mature cells to create induced pluripotent stem cells.	K2
CO-4	Compile the basic research methodologies used in current stem cell research.	K6
CO-5	Determine the ethical issues associated with stem cell research.	K3
CO-6	Defend the stem cell based therapies in animal models.	K5

UNIT- I

Stem cells-Definition, Sources, Classification and Types–Human Embryonic and Adult Stem Cells. Blastocyst Culture–Stages of embryonic development. Properties of Stem cells-Self Renewal, Clonality and Plasticity.Cryopreservation of Stem cells-Conventional, Slow freezing and Vitrification Methods.Pluripotent nature of stem cells-Extrinsic and Intrinsic factors.

UNIT- II

Characteristics of Stem cells and their developmental potentials; Ips- Induced pluripotent stem cells, Blastocyst and inner cell mass, Organogenesis, Mammalian Nuclear Transfer Technology, Stem cell differentiation–*in vitro* and *in vivo*. Applications of Stem cells.

UNIT-III

Therapeutic Cloning Strategies, Derivation and propagation of human embryonic stem cells, Reproductive cloning by Somatic Cell Nuclear Transfer (SCNT) and its uses, Limitations of Cloning, Human stem cell research–Ethical consideration, Stem cell religion consideration. Stem cell based therapies–Preclinical regulatory consideration and Patient advocacy.

UNIT- IV

Overview of Embryonic and Adult stem cells Therapy. Neurodegenerative diseases–Parkinson, Alzheimer, Spinal cord injuries and other brain syndromes.Tissue system failures–Cardiomyopathy, Kidney and Liver failure, Cancer and Hemophilia.

UNIT-V

Skeletol Muscle Stem cells–Development and Functions. Tumor stem cells–Basic differences and similarities of cancer stem cells.Cancer stem cell signaling–NOTCH pathway; Canonical Wntsignaling pathways in hematopoietic stem cells. Stem cell therapies in animal models.

References

1. Stem Cell Biology and Gene Therapy by Peter J. Quesenberry, 1st Edition, Willy-Less Publishers (1998).
2. Human Embryonic Stem Cells: An Introduction to the Science and Therapeutic Potential by Ann A. Kiessling, Jones and Bartett Publishers (2003).
3. Stem Cells by Potten, C.S., Elsevier (2006).
4. Essential of Stem Cell Biology by Robert Lanja, 2nd Edition, Academic Press (2006).
5. Stem cell Transplantation Biology Processes Therapy by Ho, A.D. and Hoffiman, R., Willy-VCH (2006).

SEMESTER II

Instrumentation Biochemistry

Semester	Subject Code	Title of the Course	Hours / Week	Credits
II	**BC 809**	**Instrumentation Biochemistry**	**4**	**4**

Course Objectives:

- To study the principle, procedure and applications of electrophoresis.
- To understand the principle, procedure and applications of microscopes.
- To study the principle, procedure and applications of chromatography.
- To learn the principle, procedure and applications of centrifugation techniques.
- To know the principle, procedure and applications of spectrophotometry.

Course Outcomes:

S.No.	Description	Cognitive Level (K-level)
CO-1	Understand the core concepts of all analytical techniques	**K1, K2**
CO-2	Describe the basic principle, types, procedure and applications of electrophoresis	**K1**
CO-3	Acquire knowledge about advanced microscopy techniques	**K3**
CO-4	Correlate the various types of chromatographic techniques	**K4**
CO-5	Justify the principle, instrumentation and applications of various spectroscopy techniques	**K5**
CO-6	Schematize the Principle and applications of Atomic flame and flameless spectrophotometry	**K6**

UNIT-I

Electrophoresis−General Principles, Factors affecting electrophoretic mobility, Support media. Paper and Gel electrophoresis. SDS-PAGE, 2D PAGE, Native gel Electrophoresis. Detection, estimation and recovery of proteins in gels. Agarose gel, Capillary Electrophoresis and pulsed field gel electrophoresis. Isoelectric focusing, Immunoelectrophoresis and ELISA. Types of Blotting−Southern, Northern, Western, Dot-blot and Slot-blot.

UNIT-II

Microscopy−Bright field, Dark field, Phase contrast, Confocal microscopy and Fluorescence microscope. Visualization of cells and subcellular components by light microscopy, resolving powers of different

microscopes, microscopy of living cells, scanning and transmission microscopes, fixation and staining techniques for EM.

UNIT-III

General principle of Chromatography, Types− Paper, TLC, Ion exchange, Molecular gel exclusion, Affinity, Gas Liquid, HPLC and HPTLC. Basic principle of Centrifugation, Types−Preparative ultracentrifuge, Differential, Density gradient, Rate zonal, isopycnic isodensity and equilibrium isodensity centrifugation. Determination of molecular weight by sedimentation in an ultracentrifuge.

UNIT-IV

UV-Visible spectral analysis of colouring pigments (Beta cyanin, Anthocyanin, Xanthine, Lycopene and Curcumin), Atomic force microscopy, Circular Dichorism spectroscopy, OpticalRotatory Dispersion spectroscopy and X-ray diffraction −Principle, instrumentation and application.

UNIT-V

Principle and applications of Atomic flame and flameless spectrophotometry. Electron spin Resonance, Nuclear Magnetic Resonance, Infrared, Raman spectroscopy and Mass spectroscopy.

References

1. Introduction to Medical Laboratory Techniques by Mukherjee, Volume I, II and III, Oxford University Press (1976).
2. Physical Biochemistry by David Friefielder, W.H. Freeman 2nd Edition (1982).
3. Introductory Practical Biochemistry by K. Shawney and Randhir Singh (2000).
4. Practical Biochemistry by K. Wilson and J. Walker. 5th Edition Cambridge Univ. (2005).
5. Introduction to instrumental analysis by Robert D. Brown, Pharma Book Syndicate (2006).
6. Introduction to Experimental Biophysics (set): Textbook and Lab manual by CRC press. Jay Nadeau (2015).

SEMESTER II

Advanced Enzymology

Semester	Subject Code	Title of the Course	Hours / Week	Credits
II	**BC 810**	**Advanced Enzymology**	**4**	**4**

Course Objectives

- To acquire fundamental knowledge on enzymes and their importance in biological reactions.
- To understand the ability to difference between a chemical catalyst and biocatalyst.
- To know the mechanism of enzyme and its importance in biological reactions.
- To learn the kinetics of enzyme catalyzed reactions and enzyme inhibitory and regulatory process.
- To understand the role of enzymes in clinical diagnosis and industries.

Course Outcomes

S. No	Description	Cognitive Level (K-level)
CO-1	Describe the structure, classification and functions of enzymes	K6
CO-2	Analyze the kinetics of enzyme and chemical catalyzed reactions	K4
CO-3	Assess the mechanism of enzyme action and enzyme inhibitory and regulatory process.	K5
CO-4	Summarize the isolation and purification of enzymes	K2
CO-5	Identify the enzyme immobilization methods and their applications	K1
CO-6	Determine the applications of enzymes and their future potential	K3

UNIT-I

Introduction to Enzymes, Nomenclature and IUBMB classification of enzymes. Enzyme activity, factors contributing to the catalytic efficiency of enzyme. Enzyme Units–Specific activity, Turn over number, Katal and IU. Enzyme Active site–determination of active site amino acids–Chemical probe, Affinity label and Site-directed mutagenesis. Investigation of 3D structure of active site. Coenzymes–Prosthetic group, Classification– Vitamin and non-vitamin Coenzymes and Cofactors.

UNIT-II

Theories of enzyme substrate complex- Lock and key, induced fit theory, Kinetics of Single Substrate-enzyme catalysed reactions–Michaelis-Menten equation, importance of V_{max}, K_m and MM equation. Modification of MM equation–Lineweaver-Burk plot, Eadie-Hofstee plot, Hanes-Woolf plot and Eisenthal and Cornish-Bowden plot. Kinetics of multi substrate-enzyme catalysed reactions: Non Sequential-Ping-pong, bi-bi, Sequential- random order and compulsory order mechanism.

UNIT-III

Mechanism of Enzymic Action–general acid-base catalysis, covalent catalysis, role of metal ion in enzyme catalysis, mechanism of Serine proteases-chymotrypsin and lysozyme. Inhibitors-Definition, Types and kinetics of Reversible inhibition–Competitive, uncompetitive, non-competitive. Irreversible inhibition and Allosteric regulation.

UNIT-IV

Isolation and Purification of enzymes, Preparation of purification chart, Purification techniques, Enzyme Immobilization- methods and their applications, RNA catalysis- Ribozymes, Catalytic antibodies – abzymes and synzymes. Multi enzyme complex- Pyruvate dehydrogenase, Isoenzymes- LDH and CPK.

UNIT-V

Industrial Uses of Enzymes–Sources, thermophilic enzymes, amylases, glucose isomerases, cellulases, lipases, proteases in meat and leather industry, detergents and cheese production. Enzymes as thrombolytic agents, anti-inflammatory agents and digestive aids.

References

1. Enzymes by Dixon and Webb, Academic Press (1964).
2. Enzymes by Boyer. Academic Press, 3rd edition (November 1983).
3. Understanding enzymes by Palmer, Prentice Hall; 4th Edn. (1995).
4. Biochemistry by Metzler, Academic Press (2000).
5. Biochemistry by Stryer. W. H. Freeman; 6th Edition (2006).

Intermediary Metabolism

Semester	Subject Code	Title of the Course	Hours / Week	Credits
II	BC 811	Intermediary Metabolism	4	4

Course Objectives

- ❖ To determine the biochemical reactions, central metabolic pathways and kinetics of energy and homeostasis of metabolism.
- ❖ To learn the importance of lipids as storage molecules and as structural component of biomembranes.
- ❖ To understand the importance of high energy compounds, electron transport chain, and synthesis of ATP under aerobic and anaerobic conditions.
- ❖ To acquire knowledge related to the role of TCA cycle in central carbon metabolism, importance of anaplerotic reactions and redox balance.
- ❖ To gain insights into metabolic engineering for the production of useful biomolecules.

Course Outcomes

S.No	**Description**	**Cognitive Level (K-Level)**
CO-1	Observe the basic concepts of Bioenergetics, mechanisms of oxidative phosphorylation and photophosphorylation	K2
CO-2	Analyze how various biomolecules are metabolized inside the body in order to produce energy for various functions and how various metabolic pathways regulate growth and development of living beings	K4
CO-3	Determine the composition and structure of biomembranes, transport mechanisms across biological membranes and learn the concept and mechanism of ATP synthesis.	K3
CO-4	Justify the role of high energy compounds, how carbohydrates serve as energy source to power various functions, interplay of regulatory networks in the body, hormonal regulation of metabolism, etc.	K5
CO-5	Recognize the role of lipids as storage molecules, role of TCA cycle in central carbon metabolism, importance of anaplerotic reactions, and redox balance occurring in the cells.	K1
CO-6	Integrate how metabolism can be related with issues in lifestyle, health and disease	K6

UNIT-I

Introduction to Metabolism of Cells, Aerobic Glycolysis and Fermentation–Energetics, Citric Acid Cycle – PDH complex, energetics and regulation, Pentose Phosphate Pathway, Gluconeogenesis, Glycogenesis, Glycogenolysis and their regulation. Glyoxylate Pathway and Uronic acid pathway. Metabolism of Fructose and Galactose, Futile cycle.

UNIT-II

Energy Transformation, Free Energy changes and Redox Potential, Biological Oxidation–Enzymes involved in Redox Reactions. Phosphoryl group transfers and ATP. Components of Electron Transport Chain and the sequence of electron transport. Oxidative Phosphorylation–Chemiosmotic Theory. Structure

and Mechanism of ATP synthesis (F_1F_0 complex). Inhibitors of respiratory chain and oxidative phosphorylation - Uncouplers. Regulation of oxidative phosphorylation. Mitochondrial Transport Systems-ATP/ADP exchange, malate aspartate shuttle, glycerol phosphate shuttle and creatine-phosphate shuttle.

UNIT-III

Metabolism of Triglycerides, phospholipids and Sphingolipids. Fatty acid biosynthesis, Fatty acid oxidation (α, β and ω) and lipid peroxidation. Ketone bodies-Formation, utilization, excretion and clinical significance. Cholesterol-Biosynthesis, regulation, transport and excretion. Prostaglandins and thrombaxene metabolism.

UNIT-IV

Biosynthesis of aromatic aminoacids. Catabolism of amino acid nitrogen– Transamination, deamination, ammonia formation and the urea cycle.Disorders of the urea cycle. Catabolism of carbon skeletons of amino acids. Conversion of amino acids to specialized products. Biosynthesis and degradation of Porphyrin and Heme. Metabolism of purines–De novo and salvage pathways for biosynthesis. Purine catabolism. Biosynthesis and Catabolism of pyrimidines.

UNIT-V

Interrelationship of carbohydrates, Proteins and Fat metabolism- Integration of different metabolic pathways and role of acetyl CoA and TCA cycle. Metabolic profile of the principle organs (liver, adipose tissue and brain) and their relationships. Altered metabolism in starvation. Metabolism under different stress conditions.

References

1. Biochemistry by Zubay, G.L, 4th edition, WMC Brown publishers (1988).
2. Principles of Biochemistry by Garrette and Grisham, Saunders College publishing (1994).
3. Biochemistry by Donald Voet, J.G. Voet and John Wiley, (1995).
4. Biochemistry by Kuchel and Ralston, 2nd ed. Schaum's Outlines McGraw Hill (1998).
5. Biochemistry by Davidson and Sittman,. NMS. 4th ed. Lippincott. Willams and Wilkins, (1999).
6. Biochemistry by Campbell and Farrell, 4th ed. Brooks/Cole Pub Co. (2002).
7. Lehninger's Principles of Biochemistry by Nelson Cox, 4th ed. McMillan Worth (2004).
8. Biochemistry by Stryer. W. H. Freeman; 6 editions (2006).

Advanced Endocrinology

Semester	Subject Code	Title of the Course	Hours / Week	Credits
II	BC812A	Elective II - Advanced Endocrinology	4	4

Course Objectives

- ❖ To learn the basic aspects of hormones and endocrine glands.
- ❖ To provide in depth knowledge about chemical structures of hormones.
- ❖ To understand the classification of hormones.
- ❖ To identify about the functions of hormones.
- ❖ To compile information about new diseases associated with hormones.

Course Outcomes

S.No.	Description	Cognitive Level (K-Level)
CO-1	Demonstrate the basic aspects of hormones, glands, chemical classification and functions.	**K2**
CO-2	Exhibit the daily secretion of hormones and abnormal values.	**K1**
CO-3	Acquire knowledge about Reproductive Endocrinology.	**K3**
CO-4	Make inferences of Neuroendocrine integration in homeostasis.	**K4**
CO-5	Make judgments about Pathophysiology of Hormones.	**K5, K6**
CO-6	Compile information about new diseases associated with hormones.	**K6**

UNIT-I

Hormones–Introduction and Chemical nature.Neuroendocrine integration in homeostasis.Classes of chemical messengers.Hormone secretion, Transport and clearance. Feed-back Regulation of hormonal secretion. Mechanism of Group I and Group II hormone action, Receptors and its types, Second messengers. Signal Transduction.

UNIT-II

Endocrine hypothalamus–Structure, hypophysiotropic hormones, regulation of hypothalamic hormone secretion. Pituitary hormones– Anatomy of pituitary gland, hormones of the anterior pituitary– Synthesis, chemistry, physiological roles, mechanism of action, regulation of secretions and pathophysiology.

Neurohypophysis–Synthesis, chemistry, physiological roles, Regulation of secretions and pathophysiology of neurohypophyseal hormone secretion

UNIT-III

Thyroid gland–Synthesis, chemistry, physiological roles, mechanism of action. Regulation of thyroid hormone secretion and Pathophysiology.Parathyroid gland–Synthesis, chemistry, physiological roles, mechanism of action, regulation of parathyroid hormone secretion and pathophysiology.Pineal gland–Melatonin hypothesis, secretion and circulation, proposed role of pineal. Melanotropic hormones–Chemistry, role of MSH, mechanism of action and pathophysiology.

UNIT-IV

Pancreas–Synthesis, chemistry, physiological roles, mechanism of action, regulation of secretion and pathophysiology of Insulin, Glucagon and Somatostatin.Neurohormones–chemistry, physiological roles, mechanism of action, regulation of secretion and pathophysiology of Catecholamines and endorphins.

UNIT-V

Reproductive Endocrinology–Male reproductive system-Synthesis, chemistry, physiological roles, mechanism of action, and pathophysiology of Androgens. Female reproductive system–Synthesis, chemistry, physiological roles, mechanism of action, regulation of secretion and pathophysiology of Ovarian hormones. Endocrinology of pregnancy, parturition and lactation, puberty and hormone regulation.Human infertility–Reasons, therapy and treatment.

References

1. William's Textbook of endocrinology by Wilson, Foster, 8th Edition (2002).
2. Principles of Biochemistry by Smith et al., 7th Edition, McGraw Hill (2003).
3. Harper's Biochemistry by R.K. Murray et al. McGraw-Hill Medical; 27th Edition (2006).
4. Medical Endocrinology by Goodman HM, Basic. Academic Press. 4th Edition (2008).
5. Endocrine and Metabolic Disorders: Clinical Lab Testing Manual by Robert F. Dons., 4th Edition, CRC Press (2009).

Pharmaceutical Biochemistry

Semester	Subject Code	Title of the Course	Hours / Week	Credits

II	**BC812B**	**Elective – II – Pharmaceutical Biochemistry**	**4**	**4**

Course Objectives

- To gain the knowledge on basic concepts of pharmacology to understand the mechanisms of drug action and toxicity.
- To understand the chemistry of drugs with respect to their pharmacological activity.
- To learn the drug metabolic pathways, adverse effect and therapeutic value of drugs.
- To know the mechanism of action of drug therapy.
- To study about the natural drug development.

Course Outcomes

S.No	**Description**	**Cognitive Level (K-Level)**
CO1	Enumerate the relevance, basic concepts of pharmacology, ADME properties and drug metabolism	K1
CO2	Interpret the pharmacological actions of different categories of drugs and factor that modifies the effect of drug and drug potency	K2
CO3	Apply the basic principle of genetic engineering and enzyme technology	K3
CO4	Outline the mechanism of action of drugs used in therapy of Respiratory system.	K4
CO5	Perceive the information of drugs used for cancer, inflammation, respiratory system, GIT, immune system and hormones.	K5
CO6	Formulate natural products for chemotherapy, anti-hypertensive, anti-platelet, anti-inflammatory and anti-cholinergic drugs.	K6

UNIT-I

Drug: Structural feature and pharmacology activity, Prodrug concept. Absorption–first Pass effect. Distribution and Metabolism–Phase I, II reactions, action of cytochrome p450 and elimination of drug. Receptor: localization, types, models and their drug– Receptor interaction, agonist and antagonist.

UNIT-II

Adverse response to drugs, Drug tolerance and intolerance, Idiosyncrasy, drug allergy. Tachyphylaxis, Drug abuse, Vaccination against infection, Factor that modifies the effect of drug. Assay of drug potency-Bioassay and Immunoassay.

UNIT-III

Biotechnology and pharmacy: Genetically engineered protein -Insulin, drug delivery systems, Non-conventional routes of administration. Anti-AIDS drugs, Anti-cancer drugs, Covid-19 drugs and Multi-drug resistance.

UNIT-IV

Mechanism of action of drugs used in therapy of Respiratory system–Cough, Bronchial, Asthma and Pulmonary tuberculosis. GIT–Digestants and Appetite suppressants. Hypo lipidemia agents, Antimicrobial drugs, Aminoglycosides. Insulin and oral diabetic drugs, antifertility and ovulation inducing drugs.

UNIT-V

Role of natural products in drug development, Drug dependence and abuse, Chemotherapy- Immuno suppressive drugs, Anti-hypertensive, Anti-platelet, Anti-inflammatory and Anti-cholinergic drugs.

References

1. Oxford text book of Clinical pharmacology and drug therapy by A. Burger, D. J. Abraham. Burger's medicinal Chemistry & Drug Discovery, (2003).
2. Essentials of Medical Pharmacology by K. D. Tripathi 5th Edition, Jaypee, New Delhi, (2004).
3. Pharmacology (Lippincott Illustrated Reviews Series) by Richard A. Harvey, Pamela C.Champe, Richard Finkel, Luigi Cubeddu, Michelle A.Clarke 4th Edition,Wolterskluwer, (2008).
4. Principles of medicinal chemistry by William, O. and Foge, B.I., Waverks Pvt.Ltd.,New Delhi,(2008).
5. Pharmacology and Pharmacotherapeutics by Bhandarkar, 10th Edition, Elseveir (2010).
6. The pharmacological basis of therapeutics by Laurence Brunton, Bruce A.Chabne and Bjorn Knollman Goodman and Gillman, Vol. I and II,Mc Graw Hill (2011).
7. Pharmacology and Pharmacotherapeutics by Satoskar, 24th Edition, Elseveir (2015).
8. Pharmacology and Pharmacotherapeutics by R.S. Satoskar, S.D.Bhandhakar and S.S. Anilapure, Elsevier (2015).

SEMESTER II

Environmental Toxicology

Semester	Subject Code	Title of the Course	Hours / Week	Credits

II	**BC812C**	**Elective II - Environmental Toxicology**	**4**	**4**

Course Objectives

- To gain knowledge on toxic substances and biochemical basis of toxicity.
- To understand the sources and routes of the various toxic substances in the environment.
- To learn about environmental impacts of pesticides and xenobiotics.
- To study about the toxicity testing and their interpretations.
- To understand the causes of organ toxicity.

Course Outcomes

S.No.	**Description**	**Cognitive Level (K- level)**
CO-1	Demonstrate the degradable and non-degradable toxic substances and action mechanism of toxicity.	K1
CO-2	Define the transport of toxins by air, water and food chain; explain the combined effect of xenobiotics.	K2, K1
CO-3	Determine the environmental impacts of various pesticides and effect of xenobiotics on aquatic organisms.	K3
CO-4	Outline the legal, regulatory and ethical considerations relating to toxicity within the broader societal context.	K4
CO-5	Find the lethal concentration and lethal dose of toxic substances by toxicity testing.	K5
CO-6	Compile the causes of hepatotoxicity, nephrotoxicity, pulmonary toxicity and neurotoxicity.	K6

UNIT-I

Ecotoxicology–Introduction, Principles and Scope. Types of toxic substances-Degradable and Non-degradable. Factors influencing toxicity. Biochemical basis of toxicity–Mechanism of toxicity and Receptor mediated events, Acute and Chronic toxicity.

UNIT-II

Toxic substances in the environment, their sources and entry routes. Transport of toxicants by air and water−Transport through food chain−bioaccumulation and biomagnifications of toxic materials in food chain. Xenobiotics, Combined effect of xenobiotics on physiology and Biochemistry of organisms.

UNIT-III

Toxicology of major pesticides−Environmental impacts of pesticides, biotransformation, biomonitoring, concept of bioindicator groups and examples. Combined effect of xenobiotics on physiology and biochemistry of aquatic organisms.

UNIT-IV

Toxicity testing–Laboratory animals, estimation of LC_{50} and LD_{50}, Interpretation of laboratory data–distinction between adverse and non-adverse effects. Human data–ethical consideration, need for human investigation and clinical toxicology.

Unit-V:

Hepatotoxicity−Common examples of hepatotoxicants, injuries caused to liver, Nephrotoxicity−Common examples of nephrotoxicants, injuries caused to kidney, Pulmonary toxicity−Common examples of pulmonary toxicants, injuries caused to lungs, Neurotoxicity−Common examples of neurotoxicants, injuries caused to nervous tissues.

References

1. Text Book of Preventive and Social Medicine by Park, J.E. and Park, K., Banosidas Bharat Publishers, Jabalpur (1985).
2. Environmental Pollution and Toxicology by Meera Asthana and Astana D.K., Alka Printers, Chandigarh (1990).
3. Environmental Biology and Toxicology by Sharma, P.D, Rastogi and Lamporary, Rajpal and Sons Publishing, New Delhi (1994).
4. Environmental Epidemiology by Anisa Basheer, Rawat Publications, New Delhi (1995).
   Toxicology by Sood, A, Sarup and Sons, New Delhi (1999).

SEMESTER II

Lab Course – I: Isolation and Character.Studies, Quantitative Anal.Techn - PBC807

SEMESTER I & II **5 Hrs/Week (4 Credits)**

CORE PRACTICAL-I

Lab Course–I: Isolation, Quantitative Analysis and Techniques

I. Isolation, Quantitative Analysis

1. Isolation and estimation of Glycogen from Liver.
2. Isolation and estimation of DNA from Liver/Spleen.
3. Isolation and estimation of RNA from Yeast.
4. Isolation of Lecithin from Egg yolk.
5. Estimation of Ascorbic Acid isolated from Lemon.
6. Estimation of Inorganic Phosphorus by Fiske and Subbarow method.
7. Estimation of Pyruvate.
8. Estimation of Tryptophan.
9. Estimation of Protein by Lowry's method.
10. Estimation of Sodium by Flame photometry.
11. Estimation of potassium by Flame photometry

II. Techniques

1. Preparation of buffers and measurement of pH using indicators and pH meter.
2. Separation of Amino acids/Sugar by Thin Layer Chromatography.
3. Separation of Amino acids/sugar by Paper Chromatography
4. Separation of Plant pigments by Column Chromatography.
5. Separation of Serum Proteins by SDS-PAGE.

SEMESTER II

Lab Course – II: Industrial and Clinical Enzymology - PBC808

SEMESTER I & II **5 Hrs/Week (4 Credits)**

Lab Course–II: Industrial and Clinical Enzymology

I. Assay of Industrial enzymes

1. Acid Phosphatase

1. Assay of Acid Phosphatase activity from Potato.
2. Determination of optimum pH on Acid phosphatase activity.
3. Determination of Optimum Temperature on Acid phosphatase activity.
4. Effect of Substrate concentration on Acid phosphatase activity.

2. Alkaline Phosphatase

1. Assay of Alkaline Phosphatase activity from Green gram.
2. Determination of optimum pH on Alkaline phosphatase activity.
3. Determination of Optimum Temperature on Alkaline phosphatase activity.
4. Effect of Substrate concentration on Alkaline phosphatase activity.

3. Urease

1. Assay of Urease activity from horse gram.

2. Determination of optimum pH on Urease activity.

3. Determination of Optimum Temperature on Urease activity.

4. Effect of Substrate concentration on Urease activity and calculate K_m and V_{max} using MM Curve and LB Plot.

4. Salivary Amylase

1. Assay of Salivary amylase activity from Saliva.
2. Determination of optimum pH on Salivary amylase activity.
3. Determination of Optimum Temperature on Salivary amylase activity.
4. Effect of Substrate concentration on salivary amylase activity and calculate K_m and V_{max} using MM Curve and LB Plot.

II. Assay of clinically important enzymes

a. Assay Serum Alanine aminotransferase activity.
b. Assay of serum Aspartate aminotransferase activity.

III.Techniques

1. Immobilization of enzymes by sodium alginate method.
2. Subcellular fractionation of organelles from liver cells and identification by marker enzyme –LDH.
3. Enzymes purification by Ammonium sulphate fractionation.

SEMESTER II

Lab Course – III: Microbial Biochemistry - PBC809

SEMESTER I & II **4 Hrs/Week (4 Credits)**

Lab Course–III: Microbial Biochemistry

1. Cleaning of Glasswares and Sterilization techniques.
2. Preparation of Culture medium used for the cultivation of bacteria and fungi–Broth and Agar.
3. Staining techniques–Simple staining, Gram staining, Capsule staining, Endospore staining and Acid fast staining.
4. Hanging drop method.
5. Antibiotic sensitivity test.
6. Slide culture technique for fungal identification and Lactophenol cotton blue (LPCB) Staining method.
7. Pure culture techniques–Serial dilution (Pour plate and Spread plate) and Streak plate.
8. Growth curve of bacteria.
9. Effect of pH, Temperature and Salinity on the growth of bacteria.
10. Isolation of *Rhizobium* from rhizosphere soil.
11. Isolation of yeast (*Saccharomyces cerevisiae)* from grapes.
12. Isolation and enumeration of microorganisms in milk and water by Standard Plate Count (SPC Method).
13. Analysis of water quality by Most Probable Number (MPN) Technique.