ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

CUDDALORE-1

PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY

UG SYLLABUS

(FROM THEACADEMIC YEAR 2020 ONWARDS)

B.Sc BIOCHEMISTRY

PROGRAMME OUTCOMES (PO)

1. Students find their footing in life through wholesome and integral education.
2. Students are encouraged to climb the academic ladder by pursuing Post Graduate Education in different domain.
3. The students are academically and technically equipped to steer the Nation along the path of progress and peace.
4. The students are trained to be Employable, and entrepreneurial Citizen of the nation.
5. The students are fortified intellectually, ethically, and socially to face the challenges in life.

PROGRAMME SPECIFIC OUTCOMES (PSO)

1. Students are able to gain knowledge and demonstrate their understanding of fundamental principles in Biochemistry such as structure and functions of Biomolecules, metabolism and regulation of biochemical process.
2. Students are trained to gain skill in biochemical techniques and the ablility to evaluate and apply scientifically in both experimentation and in a real life situations.
3. Students are inculcated with moral, ethical, scientific reasoning or issues surrounding biological process or research.
4. Students are groomed to communicate their ideas and thoughts effectively and also apply their critical scientific approach in their knowledge development.
5. Students are encouraged to acquire knowledge and skill throughout the life in order to meet the ever changing scenario in the society.
6. Students are encouraged to articulately interpret and predict various cause and effect relationship inn biological process or investigation or research.
7. Students are entrusted to work independently to enrich their skill and knowledge through various activities like seminar, Assignment, Quiz etc.
8. Students are empowered to gain effective skill for their future growth with existing knowledge to identify their carrier in diverse fields.

B.Sc BIOCHEMISTRY

CURRICULUM DESIGN TEMPLATE FROM THE YEAR 2019

Sem	Subject code	Part	Subject Title	Hrs	Cr	Exam. Hrs
I	LE101T	I	Communicative English- I	4	3	3
	LT101T	II	Language – I	4	3	3
	19BC101	III	Main Paper – I(Biomolecules-1)	4	3	3
	19BC102	III	Main Paper – II(Cell Biology)	3	2	3
	BCP201S	III	Main Practical – I *	3	-	-
	ACH101T	III	Allied 1 (Chemistry)	4	3	3
	ACHP101	III	Allied 1 (Chemistry Practical)	3	2	3
	VE101T	IV	Value education	2	2	3
	20PELS01	IV	Professional English I	3	3	
			Total	**30**	**21**	
II	LE202T	I	Communicative English II	4	3	3
	LT202T	II	Language-II	4	3	3
	19BC203	III	Main Paper – III (Biomolecules-II)	4	3	3
	19BC204	III	Main Paper – IV(Nutritional Biochemistry)	3	2	3
	BCP201S	III	Main Practical – I *	3	4	6
	ACH202T	III	Allied 2 (Analytical Chemistry)	4	3	3
	ACHP202	III	Allied 2 Analytical chemistry Practical	3	2	3
	EPD201T	IV	Personality development	3	2	3
	20PELS02	IV	Professional English II	3	3	
			Total	**30**	**25**	
III	LE303T	I	English III	4	3	3
	LT303T	II	Language III	4	3	3
	19BC305	III	Main Paper – V(Enzymology)	4	3	3
	19BC306	III	Main Paper–VI(Analytical biochemistry-I)	4	3	3
	BCP402S	III	Main Practical – II *	3	-	-
	AMBC302	IV	Allied 3 Principles of Microbiology	5	4	3
	AMBCP301	III	Allied 3 Microbiology Practical	3	2	3
	19AOA301	IV	Skill –Office automation and designing	3	2	3
			Total	**30**	**20**	
IV	LE404T	I	English-IV	4	3	3
	LT404T	II	Language-IV	4	3	3
	19BC407	III	Main Paper –III(Intermediary Metabolism)	4	3	3
	19BC408	III	Main Paper– IV(Analytical Biochemistry-II)	4	3	3
	BCP402S	III	Main Practical – II *	3	4	6
	AZBC401T	III	Allied 4 Advanced Zoology	5	4	3

	AZBP401	III	Allied 4 Advanced Zoology Practical	3	2	3
	EVS401S	IV	EVS	3	2	3
			Total	**30**	**24**	

V	19BC509	III	Main Paper – IX(Molecular Biology)		5	5	3
	19BC510	III	Main Paper – X(Immunology)		5	5	3
	19EBC51A	III	Elective paper-1	Food Technology	5	4	3
	19EBC51B			Environmental Toxicology & Herbal Medicine			
	19EBC52A	III	Elective paper-2	Plant Biochemistry	5	4	3
	19EBC52B			Pharmaceutical Biochemistry and Bioinformatics			
	BCP603S	III	Main Practical – III ***1**		4		-
	BCP604S	III	Main Practical – IV ***1**		4		-
	19SBC51A	IV	Skill paper-I Histopathological Techniques		2	2	3
	19SBC51B		Skill paper-II Fisheries Biology				
	19SSBC52A	IV	SSC- I Life Style Diseases			2#	3
	19SSBC52B		SSC-II Fundamental of Public Health & Epidemiology				
	19SSBC52C		SSC- III Functional foodsonhumanhealth				
				Total	**30**	**20**	
VI	19BC611	III	Main Paper – XII(Medical Biochemistry)		5	5	3
	19BC612	III	MainPaper–XIII(Biotechnology&Genetic Engineering)		5	5	3
	19EBC63A	III	Elective paper-3	Clinical Endocrinology	5	4	3
	19EBC63B			Human Physiology			
	19EBC64A	III	Elective paper-4	Biostatistics & Clinical research	5	4	3
	19EBC64B			Medical Laboratory Technology			
	BCP603S	III	Main Practical – III *1		4	4	6
	BCP604S	III	Main Practical – IV *1		4	4	6
	19SBC61A	IV	Skill Paper I-Horticulture		2	2	3
	19SBC61B		Skill Paper-II Rainwater Harvesting		2	2	3
				Total	**30**	**28**	
	EU601	V	Extension activities			2	
				Total credits		**140**	

*End of the academic year. # extra credits edit

I B.Sc (Biochem)	BIOMOLECULES-I(60 hrs) For the students admitted from the year 2019	19BC101
SEMESTER-I		HRS/WK-4
CORE-1		CREDIT-3

Learning objectives:

- To provide information about biochemically important aspects of the chemistry of carbohydrates and nucleic acids using appropriate examples.
- To understand the structural principles that govern reactivity/physical properties of molecules as opposed to learning structural detail
- To acquire knowledge about the structure and function of heterocyclic compounds.

Course outcomes

CO1-Students are able to understand the nature and types of chemical bonds and types of isomerism.

CO2-Students are able to comprehend the classification of monosaccharides and their properties.

CO3-Students are able to gain knowledge about classification and properties of disaccharides and polysaccharides.

CO4-Students are able to acquire knowledge about the structure and types of DNA and RNA

CO5-Students are able to exhibit the understanding about the structure and functions of heterocyclic compounds

SEMESTER I	SUB CODE: NEW CODE					BIOMOLECULES I								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	4	5	4	3	4	4	4	4	3	4	3	4	4	3.5
CO2	3	4	4	4	4	4	3	4	4	4	3	4	4	3.8
CO3	4	4	3	4	4	3	4	4	4	3	4	3	4	3.7
CO4	4	4	4	3	4	3	3	3	5	5	5	5	3	4.3
CO5	4	4	4	4	3	4	3	3	3	4	3	4	3	3.7
Mean overall score														3.8

This Course is having**HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I CHEMICALBONDING [10 hrs]

Chemical Bonding- nature and types- ionic bond (or) polar bond, covalent (or) non-polar bonds, co-ordinate bond and non-covalent bonds (Hydrogen, hydrophobic, Vander walls interactions). Isomerism - structural isomerism and stereoisomerism.

UNIT II CARBOHYDRATES I [15 hrs]

Carbohydrates: definition, classification – monosaccharides, oligosaccharides and polysaccharides; occurrence, structure and functions of monosaccharides (glucose and fructose).General properties with reference to glucose, anomers, epimers, enantiomers and mutarotation.Ring and straight chain structure of glucose (Haworth projection formula).

UNIT III CARBOHYADRATES II [10 hrs]

Structure, occurrence, properties and biological importance of disaccharides (sucrose, lactose, maltose). Inversion of sucrose.Structure, occurrence, properties and biological importance of polysaccharides: Storage polysaccharides (starch, glycogen, inulin), Structural polysaccharides (cellulose, chitin, pectin), Heteropolyasaccharides (hyaluronic acid, heparin)..

UNIT IV NUCLEIC ACIDS [10 hrs]

Nucleic acids – Bases ,Nucleosides and Nucleotides, Phosphodiester linkage, DNA and RNA, Structure –double helical structure of DNA, Properties of DNA – Denaturation, Renaturation, Tm and Hyperchromicity, Effect of acid & alkali on DNA.Types of DNA, Structure of RNA and its major types - tRNA, mRNA and rRNA.

UNIT V HETEROCYLIC COMPOUNDS [15 hrs]

Porphyrin nucleus and its classification. Biological importance of Heterocylic compounds- Thiazole, Indole, Pyridine, Pteridine, Pyrrole and Imidazole.

TEXTBOOKS:

1. RenukaHarikrishnan ,1995, " Biomolecules and Enzymes" (second edition), Madurai, IndrajaPathipagam
2. J.L.Jain, Sanjay Jain and Nitin Jain, 1997, "Fundamentals of Biochemistry"(6th Edition) , New Delhi, S.Chand& Company Ltd

REFERENCES:

1. Power & Chatwal "Biochemistry", 4thedition , Himalaya Publishing House
2. Cambell&Farrell, 2007, "Biochemistry" 5th edition, Delhi, Baba Borkhanath printers
3. T.N.Pattabiraman, 1993"Principles of Biochemistry" 5th edition, Bangalore,

Gajanana Book Publishers and Distributors

4.Dr.A.C.Deb, 1983,"Fundamentals of Biochemistry" (8^{th} edition), Kolkata, New Central Book Agency

5. Lehninger, Nelson And Cox ,1982, " Principles of Biochemistry", (4th ed)UK, Macmillan Worth Publishers.

6. Chemistry of chemical bonding, Jyothi Roshan Kumar.2008

I B.Sc (Biochem)	CELL BIOLOGY (60 hrs) For the students admitted from the year 2019	19BC102
SEMESTER-I		HRS/WK-4
CORE-2		CREDIT-3

Learning objectives:

- To understand the structure and purpose of the basic components of the Cell and its organelles
- To understand the phases of cell cycle and cell division.
- To acquire knowledge about microfilaments and microtubules.

Course Outcomes:

CO1: To understand the structure and basic components of prokaryotic and eukaryotic cells and also gain insights about various types of membrane transport.
CO2: Students gain knowledge and understanding about the morphology, types and functions of cell organelles such as lysosomes, ribosomes and chloroplast.
CO3: Students acquire knowledge about the morphology and functions of cell organelles like Mitochondria, Golgi complex and micro bodies.
CO4: Tounderstand the structure and functions of chromosomes and learn the phases of cell cycle and cell division.
CO5: Students are able to understand the components and functions of cytoskeleton and their distribution.

SEMESTER I	SUB CODE: NEW CODE					CELL BIOLOGY								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	5	2	2	2	5	2	5	3	2	5	5	4	3.6
CO2	5	5	2	2	2	5	2	2	2	2	2	5	3	3.0
CO3	5	5	2	2	2	5	2	2	2	2	2	5	3	3.0
CO4	5	5	2	2	5	5	3	5	5	5	5	5	2	3.9
CO5	5	5	2	2	2	5	2	3	2	2	5	5	3	3.0
Mean overall score														3.3

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I CELL AND TRANSPORT [15 hrs]

Prokaryotic and eukaryotic cell. Cell membrane: chemical composition of Fluid Mosaic Model. Carbohydrate, lipids, proteins and their function in FMM. Membrane transport – Types of transport, passive- (diffusion,facilitateddiffusion,osmosis) and active transport-Na+-K+, ATPase,sodium potassium pump, $Ca^{2+}$and ATP_{ase} pumps, endocytosis and exocytosis.Symport and antiport.

UNIT II CELL ORGANELLE –I [10 hrs]

Endoplasmic reticulum: occurrence, morphology, types and function. Enzymes of the ER membrane. Lysosomes: structure,types and chemical composition and enzymes of lysosomes. Ribosomes: structure,types and functions.Chloroplast – structure and function.

UNIT III CELL ORGANELLE -II [10 hrs]

Mitochondria: morphology and function. Golgi complex : structure & function. Microbodies: structure, morphology and function, peroxisomes and glyoxysomes

UNIT IV CELL DIVISION AND CELL CYCLE [15 hrs]

Nucleus – structure, composition and biochemical function, chromosome structure -polytene and lambrush chromosome with example. Cell cycles – Phases of cell cycle, mitotic and meiotic cell cycle, apoptosis and necrosis.

UNIT-V MICROTUBULES AND MICROFILAMENTS [10 hrs]

Cytoskeleton - components and biological functions. Microtubules, Microfilaments and IF proteins: Distribution, chemical composition and function.

TEXTBOOKS:

1. Verma. P.S and Agarwal .P.K,1999, “Cell biology, Genetics, Molecular biology, Evolution and Ecology”,(24th edition) New Delhi, S.Chand& Company Ltd
2. De Robertis EDP and De Robertis EMF, 1987, “Cell and Molecular Biology”, (8^{th}edition),New Delhi, B.I.WaverlyPvt Ltd

REFERENCES:

1. Sheela A. Stanly ,2008,“Cell biology for biotechnologist”, (I Edition), Narosa Publishing House Pvt-Ltd
2. Prakash S.Lohar, 2007, “Cell and Molecular biology” (I edition),Chennai, MJP publishers
3. Darnell J, Lodish H, Baltimore D,1986, “Molecular cell biology”, England, WH Freeman.
4. Cell biology –Gerald karp (7^{th} edition) –International student version, wiley publications

I B.Sc (Biochem)	BIOMOLECULES-II(60 hrs) For the students admitted from the year 2019	19BC203
SEMESTER-II		HRS/WK-4
CORE-3		CREDIT-3

Learning objectives:

- To provide information about biochemically important aspects of the chemistry of lipids and proteins using appropriate examples.
- To understand the structural principles that govern reactivity/physical properties of molecules as opposed to learning structural detail
- To acquire knowledge about the structure and function of biologically important peptides/proteins.

Course Outcomes:

CO1: Students are able to understand the classification, structure and functions of lipids and their properties.

CO2: Students are able to gain knowledge about the classification of amino acids and their properties.

CO3: Students are able to learn and understand the different classification of proteins, properties, and their separation methods.

CO4: Students are able to acquire knowledge about the different levels of protein structure apart from the determination of amino acid sequences and chemical synthesis of proteins.

CO5: To acquire knowledge about the structure and function of biologically important peptides.

SEMESTER II	SUB CODE: NEW CODE					BIOMOLECULES-II								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	3	5	2	2	2	4	4	4	3	2	4	4	4	3.3
CO2	5	4	2	3	2	5	5	5	5	3	3	4	3	3.8
CO3	4	5	3	2	3	4	4	4	4	3	4	3	4	3.6
CO4	5	4	2	2	2	3	5	5	3	2	3	4	4	3.4
CO5	4	5	2	3	3	5	5	5	5	2	4	4	4	3.4
Mean overall score														3.5

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I LIPIDS [15 hrs]

Lipids - definition and classification of lipids, Physical properties,classification of fatty acids – saturated, unsaturated and essential fatty acids, properties of fatty acids (Iodine number, Acid number, RM number, Saponification number and Rancidity). Structure and function of commonly occurring phospholipids (esp.Lecithin, cephalin, phosphatidyl inositol and phosphotidylserine)Sphingomyelin, plasmalogen, sterols(cholesterol), Glycolipids- cerebrosides and gangliosides.

UNIT II AMINO ACIDS [10 hrs]

Classification of Amino acids based on structure, metabolism &Polarity.Essential&Non essential amino acids, Non protein amino acids. General properties of amino acids.Titration curve of amino acids.

UNIT III PROTEIN [10 hrs]

Classification of proteins based on size and shape, solubility, composition & functions. Peptide bond. General reactions of proteins (Reactions of both NH_2 group & COOH group). Separation technique of protein-Ammonium salt fractionation,solvent fractionation, dialysis and lyophilisation.

UNIT IV PROTEIN STRUCTURE [15 hrs]

Structure of proteins- primary, secondary, tertiary & quaternary. Ramachandran plot and forces stabilizing the structure of proteins, Determination of amino acid sequence, N -terminal determination- Edman's and Dansylchloride method. C- terminaldetermination-enzymatic method, solid phase polypeptide synthesis.

UNITV BIOLOGICAL IMPORTANT PROTEINS [10 hrs]

Structure and functions of biologically important peptides- Glutathione,vasopressin&oxytocin. Biologically important proteins- structure and functions of Globular proteins (Haemoglobin, Myoglobin),Fibrous protein (Keratins, collagen).

TEXTBOOKS:

1. RenukaHarikrishnan ,1995, " Biomolecules and Enzymes" (second edition), Madurai, IndrajaPathipagam
2. J.L.Jain, Sanjay Jain and Nitin Jain,1997, "Fundamentals of Biochemistry"(6^{th} Edition) ,New Delhi, S.Chand& Company Ltd

REFERENCES:

1. Power & Chatwal “Biochemistry” 4th edition , Himalaya Publishing House
2. Cambell&Farrell, 2007, “Biochemistry” 5th edition, Delhi ,BabaBorkhanath printers
3. Dr.A.C.Deb ,1983,“Fundamentals of Biochemistry” (8th edition), Kolkata,New Central Book Agency
4. Lehninger,Nelson And Cox ,1982, “ Principles Of Biochemistry”, (4TH Ed)UK, Macmillan Worth Publishers.
5. Donald Voet and Judith Voet,”Biochemistry”,2nd edition,John Wiley &Sons,Inc,NY

I B.Sc (Biochem)	NUTRITIONAL BIOCHEMISTRY	19BC204
SEMESTER-II	(60 hrs)	HRS/WK-4
CORE-4	For the students admitted from the year 2019	CREDIT-3

LEARNING OBJECTIVES:

- To study the nutritional aspects of various foodstuffs and its measurement.
- To study the functional aspects of vitamins and minerals
- To enable them to gain knowledge in the nutritional management of different age groups

COURSE OUTCOMES:

CO1:To understand and demonstrate their nutritional measurement of different food stuffs.

CO2:Able to gain knowledge about the biological value of proteins by different methods

CO3: To gain insights depth about the deficiency and functional aspects of different types of vitamins

CO4:To acquire knowledge about the physiological functions and deficiency of minerals

CO5:Able to demonstrate different dietary plan for different age groups

SEMESTER II	SUB CODE: NEW CODE					NUTRITIONAL BIOCHEMISTRY								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	5	4	3	4	4	3	4	3	5	4	3	4	4	3.8
CO2	4	3	3	5	5	3	3	4	5	4	5	4	4	4.0
CO3	3	5	3	3	3	4	5	3	3	5	4	3	5	3.8
CO4	3	4	4	5	5	3	2	4	5	4	5	3	4	3.7
CO5	5	3	3	3	3	2	3	3	5	3	3	2	3	3.2
Mean overall score														3.7

This Course is having**HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I FOOD NUTRITION [15 hrs]

Basic food groups – Energy yielding, body building and protective foods. Basic concepts of energy expenditure, Unit of energy, measurement of foodstuffs by bomb calorimeter, Calorific value of proteins, carbohydrates and lipids, RQ of foods, Basic metabolic rate (BMR), its measurements and influencing factors, SDA of foods. Role of fibre and dietary lipids (Omega 3 and 6 fatty acids) in health.

UNIT II BIOLOGICAL VALUE OF PROTEIN [10 hrs]

Biological value of proteins , evaluation of proteins by nitrogen balance method – DC, BV, NPU and NAP, sparing action of carbohydrates, single cell proteins (SCPs) (e.g.,spirulina only). PCM: Kwashiorkor and Marasmus- preventive and curative measures.

UNITIII VITAMINS [10 hrs]

Vitamins –classification- sources, RDA, deficiency and functions of fat soluble vitamins (A,D,E,K) and water soluble vitamins (B – complex – B_1, B_2, B_5, B_6, B_9, B_{12} and vitamin – C). Role of Vitamin as antioxidant and co-factor.

UNIT IV MINERALS [10 hrs]

Minerals – physiological role and nutritional significance of principal and essential trace elements (sodium, potassium, calcium. Magnesium, phosphorous, copper, zinc, iron, iodine, fluorine, selenium, Molybdenum).Mineraltoxicitywith reference to copper & iron.

UNIT V NUTRITIONAL REQUIREMENTS [15 hrs]

Composition of balanced diet. RDA. Nutritional requirements for infants, children, adolescents, adult (male and female), pregnant and lactating women and old age.Nutritional requirements in disease condition – hypertension and diabetes.

TEXTBOOKS:

1. Dr. M. Swaminathan,1987, “Food and Nutrition Vol I&II ”, Second edition, Bangalore, Bappco Publishers.
2. M.N Chatterjea and Rana Shinde,” Text book of Medical Biochemistry”,4th edition, Jaypee Publishers, New Delhi

REFERENCES:

1. Patricia Trueman, 2007, “Nutritional Biochemistry” (I edition), Chennai, MJ publishers
2. Darnell J, Lodish H, Baltimore D, 1986, “Molecular Cell Biology”, England, WH Freeman publishers.
3. William’s Basic Nutrition and Diet Therapy Williams (14th edition), Staci Nix.
4. U. SathyanarayanaandU.Chakrapani ,”Biochemistry”, Books And Allied Publishers.
5. Dr.A.C.Deb ,1983,“Fundamentals of Biochemistry” (8th edition), Kolkata,New Central Book Agency

II B.Sc (Biochem)	ENZYMOLOGY	19BC305
SEMESTER-III	(60hrs)	HRS/WK-4
CORE-3	For the students admitted from the year 2019	CREDIT-4

OBJECTIVES:

To understand the structure and classification of enzyme and its mechanism of action.

COURSE OUTCOMES:

CO1: To gain knowledge about the classification, mechanism and chemical nature of enzymes.

CO2: To aquire knowledge about the mechanism of enzyme action using different kinetic equations and also get indepth insights about various enzyme inhibition.

CO3: To understand and able to interpret the inhibiton and regulation of Allosteric enzymes

CO4: To gain knowledge about the different types of enzyme catalysis and coenzymes.

CO5: To gain skill and knowledge about the purification andcommercial applications of enzymes.

SEMESTER III	COURSE CODE: 19BC305					ENZYMOLOGY								HOURS:4 CREDITS:4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PS05	PSO6	PSO7	PSO8	
CO1	5	4	3	5	4	4	4	3	4	4	5	4	5	4.15
CO2	4	5	3	4	5	4	4	3	4	4	4	5	3	3.92
CO3	4	4	5	4	5	5	4	4	4	4	3	3	4	4.07
CO4	3	4	4	5	4	5	3	3	3	5	5	3	3	3.84
CO5	4	3	3	4	4	5	5	4	5	4	4	5	4	4.15
	Mean Overall Score													4

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome.

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I CLASSIFICATION &&CHARACTERIZATION OF ENZYMES [15 hrs]

Introduction of Enzymes-Classification-nomenclature-properties and specificity, factors affecting enzyme activity , Active site determination - trapping ES complex, use of substrate analogue. Coenzymes and Cofactor, units of enzyme activity, Monomeric and oligomeric enzymes. Isoenzymes.

UNIT II ENZYME INHIBITION [10 hrs]

Mechanism of enzyme action – Lock and key, induced fit theory. Michaelis-Menten equation - determination of Km and Vmax and its significance. Line weaver Burk plot & Eadie-Hofstee plot. Enzyme inhibition – Competitive, Non-competitive and Uncompetitive inhibition (no derivation), reversible & irreversible inhibition, mixed - partial inhibition (definition) – suicidal inhibition.

UNIT III CHEMICAL NATURE OF ENZYMES [10 hrs]

Chemical nature of enzyme catalysis: Acid base catalysis, covalent catalysis, metal ion catalysis, proximity, orientation effects. catalysis reaction, Co-enzymes – NAD^+, $NADP^+$, FMN & FAD, COA, TPP.

UNIT IV ALLOSTERIC INHIBITION [10hrs]

Allosteric enzymes, sigmoidal curve, mode of action (sequential & symmetry model), Allosteric inhibition and its regulation Eg. Aspartate transcarbomylase and PFK.

UNIT V ISOLATION & APPLICATIONS OF ENZYMES[15hrs]

Basic steps involved in isolation and purification of enzymes, immobilization of enzymes-methods: adsorption, entrapping, ionic bonding, cross -linking and encapsulation. Applications of enzymes - Therapeutic, analytical and industry.

TEXT BOOKS:

1. Trevor Palmer, Enzymes, 5th edition, 2004, Affiliated East –West press (P) Ltd. New Delhi.
2. Renuka Harikrishnan, “Biomolecules and Enzymes” 2nd edition, 1995, IndrajaPathipagamMadurai.
3. Dixon, Malcolm; Webb, Edwin Clifford, Enzymes, 3rd Edition, 1979, Publishedby Longman, USA,.

REFERENCES:

1. BeryJ.M., Tymoezko J.L. and Stryer L, Biochemistry,5thEdition, 2008, W.H. Freeman and Company, New York,.
2. David L. Nelson, LehningerPrinciples of Biochemistry, 6th Edition, 2012,W.H. Freeman and Company, New York,.
3. Victor W. Rodwell, Harpers Illustrated Biochemistry 30th Edition, 2015, Lange publishers.
4. Jain,J.L& Jain, Fundamentals of Biochemistry. 6th Edition, 2005,S.Chand & Company, New Delhi.

II B.Sc (Biochem)	ANALYTICAL BIOCHEMISTRY- I	19BC306
SEMESTER-III	(60 hrs)	HRS/WK-4
CORE-4	For the students admitted from the year 2019	CREDIT-4

OBJECTIVES

To understand the principle and applications of various biochemical techniques

COURSE OUTCOMES

CO1: To gain knowledge about the properties of colloidal particles and understand the viscosity, surface tension and osmosis concept.

CO2: To acquire knowledge about the principles of pH and its measurement using electrodes and understand the buffers and its role in biological system.

CO3: To get in-depth understanding about the principles of spectroscopy and gain thorough knowledge about UV-Visible spectroscopy.

CO4: Able to gain knowledge and understanding about the working principles, instrumentation and applications of spectroscopic techniques such as spectrofluorimetry, flame photometry and atomic absorbtion spectroscopy.

CO5: To gain knowledge about the principles and applications of centrifugation and its types.

SEMESTER III	COURSE CODE: 19BC306					ANALYTICAL BIOCHEMISTRY- I								HOURS:4 CREDITS:4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PS05	PSO6	PSO7	PSO8	
CO1	5	5	5	5	5	5	5	3	5	4	5	5	5	4.38
CO2	5	5	5	5	4	5	5	3	5	5	5	5	5	4.76
CO3	5	5	5	5	4	5	5	4	5	4	4	4	5	4.61
CO4	5	5	5	5	4	5	5	3	5	5	5	5	5	4.76
CO5	5	5	5	5	4	5	5	4	5	5	4	5	5	4.76
	Mean Overall Score													4.654

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNIT I PHYSICAL PROPERTIES OF BIOMOLECULES [10 hrs]

Units of measurements (Normality, Molarity, Molality & % solution). Colloids - properties of colloids, osmosis and viscosity and its significance in biology, surface tension, factors affecting surface tension.

UNIT-II ELECTRO CHEMICAL TECHNIQUES [10 hrs]

Electro chemical techniques : Principles of electro chemical techniques pH, pOH, buffer, buffer capacity, Henderson-Hasselbalch equation, buffers in body fluids,Composition of buffer. Measurement of pH using indicator, Glass electrode, Oxygen electrode – Principle and application of Clark electrode.

UNIT-III ELECTROMAGENTIC RADIATION AND SPECTROSCOPY [15 hrs]

Basic Principles of electromagnetic radiation. Energy, wavelength, wave number and frequency, spectrum,absorption and emission spectra,band and line spectra, Beer-Lambert Law, light absorption and its transmittance. UV and Visible Spectrophotometry – Principles, instrumentation and applications with examples, Infrared – principle and application of spectrophotometry.

UNIT IV SPECTROSCOPY [15 hrs]

Fluorescence and Phosphorescence. Spectrofluorimetry-Principle, instrumentation and applications in Vitamin assays (Riboflavin and Thiamine),Principle and instrumentation of Atomic absorption spectrophotometer with one example(Absorption & Emission). FTIR, Luminometry- principle and instrumentation of Bioluminescence and Chemiluminescence.

UNIT V CENTRIFUGATION [10 hrs]

Centrifugation technique: Basic principles - types of centrifugation, rotors, Sedimentation rate, Svedberg unit. Preparative centrifugation: Differential, Density gradient. Analytical ultracentrifugation- Determination of molecular weight of proteins.

TEXTBOOKS:

1. Keith Wilson, and John Walker, Principles and Techniques of Practical Biochemistry. 7th edition; (2010). Cambridge University Press. UK.
2. AvinashUpadhyaye, and Nirmalendhe Nath, Biophysical Chemistry Principles and Techniques. 3rd edition; (2002). Himalaya Publishers, New Delhi.
3. P.Ashokan, Analytical Biochemistry, 3rd edition; 2006,Chinna Publication.

REFERENCES:

1. S.K. Shawney, Randhir Singh, N, Introduction to Practical Biochemistry, 3rd edition, 2002, Narasa Publication, Delhi.
2. Subramanian, M.A. Biophysics: Principles and Techniques, 4th edition, 2016,MJP Publishers, Chennai.
3. Pingoud, A., Urbanke, Claus, Hoggett, Jim, Jeltsch, Albert. Biochemical methods, (2002), Wiley.
4. Rodney F. Boyer. Biochemistry Laboratory: Modern Theory and Techniques, 2nd Edition, 2011, Pearson Education.

II B.Sc (Biochem)	INTERMEDIARY METABOLISM	19BC407
SEMESTER-IV	(60 hrs)	HRS/WK-4
CORE-5	For the students admitted from the year 2019	CREDIT-4

Objectives

To understand the pathways of various biomolecules and their energetic.

COURSE OUTCOMES:

CO1: To gain knowledge about the major pathways of carbohydrates such as Glycolysis, TCA cycle, Glycogen metabolism and pentose phosphate pathway

CO2: To acquire knowledge about the various pathways of lipids: how it generates energy and performs cellular work.

CO3: To understand the different catabolic pathway of amino acid metabolism along with urea cycle.

CO4: Able to understand the different biosynthetic and biodegrade pathway of nucleotide metabolism and its coenzymes.

CO5: To gain insights about the various components and metabolic steps involved in ETC.

SEMESTER III	COURSE CODE:19BC407					INTERMEDIARY METABOLISM								HOURS:4 CREDITS:3
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	
CO1	4	5	4	3	4	4	4	4	3	4	3	4	4	3.5
CO2	3	4	4	4	4	4	3	4	4	4	3	4	4	3.8
CO3	4	4	3	4	4	3	4	4	4	3	4	3	4	3.7
CO4	4	4	4	3	4	3	3	3	5	5	5	5	3	4.3
CO5	4	4	4	4	3	4	3	3	3	4	3	4	3	3.7
Mean overall score														3.8

This Course is having **HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNITI: CARBOHYDRATE METABOLISM [12hrs]

Glycolysis – aerobic and anaerobic, energetics, Pyruvate dehydrogenase complex, oxidation of pyruvate, citric acid cycle Glycogenesis and glycogenolysis. Pentose phosphate pathway and Gluconeogenesis.

UNITII: BIOSYNTHESIS OF FATTY ACIDS [12hrs]

Biosynthesis of fatty acids -saturated and unsaturated, Fatty acid synthase complex, Biosynthesis of cholesterol, Biosynthesis of triglycerides and phospholipids (lecithin and cephalin only). Degradation of fatty acids, oxidation of fatty acids – alpha, beta, and omega oxidation.

UNITIII: FATE OF DIETARY PROTEINS [12hrs]

Introduction – fate of dietary proteins – Glucogenic and Ketogenic amino acids, catabolism of amino acids – Transamination , oxidative and non-oxidative deamination, Decarboxylation – urea cycle .

UNITIV: BIOSYNTHESIS OF NUCLEOTIDES [12hrs]

Biosynthesis of purine and pyrimidine – de novo and salvage pathway. Degradation of purine and pyrimidine nucleotides. Regulation of purine & pyrimidine nucleotides. Biosynthesis of nucleotide coenzymes – NAD and FAD. Conversion of ribonucleotides to deoxyribonucleotides.

UNIT V: ELECTRON TRANSPORT CHAIN [12hrs]

The Electron transport chain - components and reactions of ETC. Oxidative phosphorylation – chemiosmotic theory, P/O ratio, uncouplers of oxidative phosphorylation.

TEXT BOOKS:

1. M.N Chatterjea and Rana Shinde," Text book of Medical biochemistry",8th edition,2012, Jaypee Publishers, New Delhi
2. Jain, J.L & Jain, (2005) Fundamentals of Biochemistry. Sixth Edition,S.Chand& Company, New Delhi.
3. U.Sathayanarayana, (2006). Biochemistry. 3rd Edition by Books and Allied (P) Ltd., India.

REFERENCES:

1. Lehninger, 2012. Principles of Biochemistry 6th Edition by David L. Nelson
2. Victor W. Rodwell, 2015.Harpers Illustrated Biochemistry, 30th Edition.
3. Voet, D. &Voet, J. G. 2010. Biochemistry. 4th edition
4. Victor W. Rodwell, 2015.Harpers Illustrated Biochemistry 30th Edition.

YEAR-II	ANALYTICAL BIOCHEMISTRY-II (60 hrs)	19BC408
SEMESTER-IV		
Major VI	For the students admitted from the year 2019	CREDIT-3

OBJECTIVES

To understand the principle and applications of various biochemical techniques

COURSE OUTCOMES

CO1: To gain knowledge about the operating principles & applications ofchromatography .**CO2:** To gain knowledge about the working principle, instrumentation, & applications of various types of detectors used in chromatography.

CO3: To understand and acquire knowledge about the working principle, instrumentation & applications different kinds of electrophoretic techniques.

CO4: Able to demonstrate their skills in basic concepts in types of radiation, detection and its measurement using radioisotope techniques.

CO5: To gain knowledge about the operating principles & applications of microscope and Blotting techniques.

SEMESTER IV	COURSE CODE: 19BC408					TITLE OF THE PAPER: ANALYTICAL BIOCHEMISTRY- II								HOURS:4 CREDITS:4
COURSE OUTCOMES	PROGRAMME OUTCOMES(PO)					PROGRAMME SPECIFIC OUTCOMES(PSO)								MEAN SCORE OF CO'S
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PS05	PSO6	PSO7	PSO8	
CO1	5	5	5	5	5	5	5	3	5	4	4	5	4	4.61
CO2	5	5	5	5	5	5	5	3	4	5	5	5	5	4.76
CO3	5	5	5	5	5	5	5	4	4	4	4	5	5	4.69
CO4	5	5	5	5	5	5	5	3	4	5	5	5	4	4.69
CO5	5	5	5	5	5	5	5	3	3	5	4	5	5	4.61
Mean Overall Score														4.672

This Course is having **VERY HIGH** association with Programme Outcome and Programme Specific Outcome

Association	1%-20%	21%-40%	41%-60%	61%-80%	81%-100%
Scale	1	2	3	4	5
Interval	0<=rating<=1	1.1<=rating<=2	2.1<=rating<=3	3.1<=rating<=4	4.1<=rating<=5
Rating	Very Poor	Poor	Moderate	High	Very High

UNITI: CHROMATOGRAPHY [12hrs]

Principle, procedure and types of Paper chromatography, Thin layer chromatography, Gas liquid chromatography, Molecular sieve chromatography, High performance liquid chromatography, Affinity chromatography and ion exchange chromatography.

UNITII: COLUMN, DETECTORS [12hrs]

Column types.-Phase, reverse phase, ion exchange and size exclusion types and its applications. Detectors in chromatography – UV, PDA, electron capture, Thermal conductivity and Flourescence detector.

UNITIII: ELECTROPHORESIS [12hrs]

Electrophoresis-Factors affecting electrophoretic mobility, Principle, procedure and applications of Paper,Cellulose acetate, Gel electrophoresis:Agarose, Polyacrylamide, SDS-PAGE. Isoelectro focusing.

UNITIV:RADIOISOTOPE TECHNIQUES [12hrs]

Radio isotope Techniques: Atomic structure, isotopes, type of radioactive decay, half-life, and units of radioactivity. Detection and measurement of radioactivity – Methods based upon ionization -GM counter and Scintillation counter. Autoradiography, applications of radioisotopes in biology.

UNIT V: MICROSCOPY & BLOTTING TECHNIQUES [12hrs]

Basic principle and components of Light microscopy, Phase field inverted microscopy, fluorescence microscopy. Blotting techniques-Southern, Northern, Western and Eastern.

TEXTBOOKS:

1. Keith Wilson, John Walker, Principles and Techniques of Practical Biochemistry. 7th Edition, 2010, Cambridge University Press, UK.
2. AvinashUpadhyaye, NirmalendheNath, Biophysical Chemistry Principles and Techniques. 3rd Edition, 2002, Himalaya Publishers, New Delhi.
3. P.Ashokan, Analytical Biochemistry, 3rdEdition, 2006, Chinna Publication.

REFERENCES:

1. S.K. Shawney, Randhir Singh, N, Introduction to Practical Biochemistry, 3rdEdition, 2002, Narasa Publication, Delhi.
2. Subramanian, M.A. Biophysics: Principles and Techniques, 4thEdition, 2016,MJP Publishers, Chennai.
3. Rodney F. Boyer. Biochemistry Laboratory: Modern Theory and Techniques, 2nd Edition, 2011, Pearson Education.

YEAR-III	MOLECULAR BIOLOGY	BC507S
SEMESTER-V	(90 hrs)	HRS/WK-6
CORE-VII	For the students admitted from the year 2015	CREDIT-5

OBJECTIVE

To understand the biological activity of macromolecules at the molecular level.

UNIT I CHROMOSOMES [15 hrs]

DNA is the genetic material-Griffith, Avery *et al* and Hershey and Chase experiment, C value paradox, Cot value, organization of chromosomes and nucleosomes, Euchromatin, heterochromatin, centromeres and telomeres, central dogma of molecular biology.

UNIT II REPLICATION [20 hrs]

Replication-conservative and semi conservative methods, experimental proof for semi-conservative replication-factors involved in prokaryotic and eukaryotic replication, DNA polymerases in prokaryotes and eukaryotes, inhibitors of replication, repetitive DNA-Highly repetitive, moderately repetitive and unique DNA sequences. Satellite DNA, Transposons.

UNIT III TRANSCRIPTION [20 hrs]

Transcription-promoters, RNA polymerase in prokaryotes and eukaryotes, initiation, elongation and termination of transcription process in prokaryotes, inhibitors of transcription, post transcriptional modification of mRNA, tRNA and rRNA.

UNIT IV GENETIC CODE &TRANSLATION [20 hrs]

Genetic code-features and deciphering of genetic code, wobble hypothesis, Translation- activation of amino acids, initiation, elongation and termination process in prokaryotes, Inhibitors of protein synthesis, post translational modification. Operon concept- Lac and trp operon.

UNIT V DNA REPAIR [15 hrs]

DNA repair-photo reactivation, Excision repair, recombination, SOS and Mismatch repair, SNPs.

TEXTBOOKS:

1. Nelson, D. L. & Cox, M. M. 2008, Lehninger Principles of Biochemistry. Freeman, 5th edn,
2. David Freifelder, 2008. Molecular Biology. (Ed: 2). Narosa Publications, New Delhi.
3. Watson J.D., 2006. Molecular Biology of the gene (Ed. 5) Pearson Education, UK

REFERENCES:

1. EDP de Robertis and E M F de Robertis, (2001). Cell and Molecular Biology. 8th Edition, Lippincott W&W.
2. Lodish, H., Berk, A., Zipursky, S. L., Matsudaira, P., Baltimore, D. and James Darnell, J. 2012, Molecular Cell Biology , Freeman, 7th edn
3. Karp, G. 2010, Cell and Molecular Biology: Concepts and Experiments. Wiley, 6th edn
4. Primrose (2001) - Principles of gene manipulation. 6th Edition Blackwell Scientific Publishers. UK
5. Krebs,J.E. 2011. Lewin's Genes IX.(Ed: 9).Jones and Barlett Publishers, US.
6. Twyman. 2003. Advanced Molecular Biology, 3RD edition Bios Scientific Publishers LTD. Oxford, UK.

YEAR-III	IMMUNOLOGY (90 hrs) For the students admitted from the year 2015	BC508S
SEMESTER-V		HRS/WK-6
CORE-VIII		CREDIT-5

OBJECTIVE:

To understand and study the various components of immune system and their functions.

UNIT I IMMUNE SYSTEM [20 hrs]

Immune system: Introduction and characteristics, classification of immunity-innate and acquired immunity structure and functions of Primary and secondary lymphoid organs. Structure and functions of immune cells [macrophage, T cell, B cell, NKC, KC, dendritic cell and APC]. Immune response - T and B cell mediated immune response, B & T lymphocytes cooperation. Phagocytosis and pinocytosis.

UNIT II ANTIGEN&ANTIBODY [20 hrs]

Antigen-properties, epitope, paratope, specificity, cross space reactivity, antigenicity and immunogenicity, haptens, adjuvants and multivalent binding sites. Antibody -structure, specificity and distribution of antibodies. Different classes and subclasses of immunoglobulins. Clonal selection theory and Antibody diversity.

UNIT III COMPLEMENT & TRANSPLANTATION [20 hrs]

Complement components- complement cascade-classical, alternate and lectin pathway, complement deficiencies. Major Histocompatibility Complex (MHC) - Structure and function of MHC-I, II & III molecules. Role of MHC antigen in immune response. Transplantation – Graft and its types, mechanism of graft

rejection in skin, graft versus host reaction and Immunosuppressive drugs.

UNIT IV HYPERSENSITIVITY [15hrs]

Allergy and hypersensitivity- type I, II, III and IV and their clinical manifestations, Autoimmune diseases-myasthenia gravis, rheumatoid arthritis, thyrotoxicosis and SLE. Immuno tolerance.

UNIT V ANTIGEN & ANTIBODY REACTIONS [15 hrs]

Antigen-antibody interaction : precipitation reaction, precipitation reaction in gel (double and radial immuno diffusion).Agglutination reaction - Widal, VDRL and pregnancy test. Principle and applications of immuno electrophoresis, RIA & ELISA.

TEXTBOOKS:

1. Abbas,Lightman and Pober.W.B.Sounders, 1994. Cellular and Molecular Immunology",2nd edition,
2. Ananthanarayanan.K and Jayaraman Paniker, 1996. "Textbook of Microbiology",
3. Judith A. Owen , Jenni Punt, Sharon A. Kuby , 2013.Immunology, W H Freeman & Co (Sd); 7th edition

REFERENCES:

1. David Male, Jonathan Brostoff, David Roth Ivan Roitt. 2005. Essential Immunology. 10th edition. Blackwell Science,
2. Tizard.R, "Immunology-An introduction", 1995 Saunders College Publishing 2nd Revised edition)
3. Weir,D.N.(1997):Immunology(8th edition)(Churchil Livingstone).
4. Ivan M. Roitt, D.Male, 1995. Immunology, Mosby Publishers; 4th Revised edition

YEAR-III	FOOD TECHNOLOGY	EBC509A
SEMESTER-V	(75 hrs)	HRS/WK-5
Elective - I	For the students admitted from the year 2015	CREDIT-5

OBJECTIVE:

To study the nature of food, spoilage, preservation and its applications.

UNIT–I FOOD CONSTITUENTS AND ADULTERATION [20 hrs]

Constituents of food: Introduction, water, carbohydrate, fat, oil, vitamins and minerals. Pulses, grams, vegetables and fruits-varieties, composition, nutritive value and cooking.Milk- kinds of milk, composition, nutritive value, pasteurization and homogenization. Food Adulteration: types of adulterants, common adulterants in foods, toxicants in foods, impact of food adulteration in humans.

UNIT –II FOOD SPOILAGE [15 hrs]

Food spoilage: Characteristic features, dynamics and significance of spoilage of different groups of foods - Cereal and cereal products, vegetables and fruits, meat poultry and sea foods, milk and milk products, packed and canned foods. Factors affecting growth & survival of microorganism in food, physical & chemical methods to control microorganism.

UNIT –III FOOD PROCESSING AND PRESERVATION [20 hrs]

Food processing: Principle and methods of food processing and preservation-freezing, heating, dehydration, canning, additives, fermentation, irradiation and osmotic pressure. Application of enzymes and microorganisms in food processing and preservation. Food Additives - Definition, types and functions, permissible limits and safety aspects.

UNIT –IV INDUSTRIAL PRODUCTIONS OF FOODS [10 hrs]

Yogurt preparation, Cheese varieties and its classification, cheese making, fermented vegetables, production of oil from soya beans. Fruit and vegetable juices, jams, production of beer, wine and vinegar.

UNIT -V LEGAL ISSUES AND GOVERNMENT NORMS [10hrs]

Food regulations – History of Indian Food Regulations: BIS, ISI, FPO, PFA and FDA. Food Safety and Standards Act 2006. Food laws and quality control – HACCP, Codex alimentarius, PFA, FPO, MFPO, BIS, AGMARK and FSSAI. Legal aspects related to storage and disposal.

TEXT BOOKS:

1. Gabriel Virella (1997), Microbiology and infectious disease, 3rd Ed, Ingraham international, New Delhi.
2. John L Ingraham and Catherine A.Ingraham. Microbiology an introduction, 2rd Ed, Cengage learning, New Delhi
3. Sivasankar,B.(2005),Food processing and preservation,3rd Ed, Prentice Hall India (P) Ltd.
4. VijayaKhader (2009), Text book of food science and technology,5thEd, Indian council of Agricultural research.
5. Avantina Sharma, Text book of food science and technology, 3rd Ed, CBS Publishers.

REFERENCES:

1. Belitz, H.D. Grosch W et al., (2005). Food Chemistry. 4th edition, Springer Verlag.
2. Adams, M.R. and M.G. Moss (2009): Food Microbiology, 1st edition, New AgeInternational (P) Ltd.
3. Fellows, P.J. (2005). Food processing technology: Principle and Practice. 2nd Ed. CRC Publishers.
4. BibekRay, Fundamental food microbiology, 3rd edition, PRC Press, Washington D.C.
5. James, M.J. (2000) Modern Food Microbiology, 2nd Edition. CBS Publisher.

YEAR-III	ENVIRONMENTAL TOXICOLOGY AND HERBAL MEDICINE	EBC509B
SEMESTER-V		HRS/WK-5
Elective – I	(75 hrs) For the students admitted from the year 2015	CREDIT-5

OBJECTIVES:

- To study various harmful chemical agents in environment and its impacts.
- To study the basics of medicinal and therapeutic use of plants.

UNIT-I TOXICOLOGY [20hrs]

Toxic substances: Types-degradable & non-degradable.Factors influencing toxicity.Drugtoxicity.Mechanism of toxicity. Receptor mediated events. Acute and chronic toxicity.

UNIT-II TOXIC SUBSTANCES IN ENVIRONMENT [15hrs] Toxic substances in environment- sources and routes, Transport of toxicants through food chain-bioaccumulation and bio-magnification. Toxicology of major pesticides, Biotransformation, bio-monitoring, bio-indicator and its examples. Environmental impact of pesticides.

UNIT-III BIOASSAY [20 hrs]

Bioassay- Types, characteristics and importance. Microbial bioassay for toxicity testing. LC50, LD50. Hepatotoxicity- examples of hepatotoxicants and its impacts on liver. Nephrotoxicity - examples of nephrotoxicants and its impacts on kidney. Neurotoxicity - examples of neurotoxicants and its impacts on brain.

UNIT-IV INTRODUCTION TO HERBAL SCIENCE [10 hrs] Herbs, characterization of herbs based on plant properties, usage and active constituents. Preparation of herbal medicine. Herbs for common ailments. Dosage and formulation.

UNIT-V HERBAL MEDICINE [10 hrs]

Drugs for urinogenital disorders – roots of *Withaniasomnifera* – Memory stimulants – *Centella asiatica* – Drugs for dissolving kidney stones – *Musa paradisica* (pseudostem) – Anti-inflammatory drugs – *Curcuma longa*, Cardiospermum – Anticancer drugs – *Catharanthus roseus* and A*zardica indica*. Dengue fever – Papaya leaves.

TEXT BOOKS:

1. David Hoffmann., 2003.Medical Herbalism: The Science Principles and Practices of Herbal Medicine, 1ST edition, Healing Arts Press publishers.
2. Agnes Arbe, 1987.Herbals: Their Origin and Evolution, Cambridge University Press; 3 edition,
3. Kumar, N.C. 1993.An Introduction to Medical botany and Pharmacognosy. Emkay Publications, New Delhi.
4. P. D. Sharma,2014. Environmental Biology and Toxicology, Rastogi Publications.

REFERENCES:

1. Gupta, P.K. and Salunka, D.K. 1985. Modern toxicology. Vol I and II. Metropolitan, New Delhi.
2. Ming-Ho Yu, HumioTsunoda, Masashi Tsunoda, 2011.Environmental Toxicology: Biological and Health Effects of Pollutants, CRC Press; 3 edition

YEAR-III	PLANT BIOCHEMISTRY	EBC510A
SEMESTER-V	(75hrs)	HRS/WK-5
ELECTIVE -II	For the students admitted from the year 2015	CREDIT-5

OBJECTIVE:

To study the basic science, explaining the molecular functions of plant.

UNIT I PLANT CELL & ABSORPTION [20 hrs]

Discovery and definition of plant cell, cell wall, plasmodesmata, meristematic cells and secretary systems. Mechanism of absorption- Ion exchange, passive absorption & Active absorption.The carrier concept and Donnan membrane equilibrium.

UNIT II PLANT HORMONES [10 hrs]

Structure, biosynthesis, mode of action and physiological effects of auxins, gibberellins, cytokinins and IAA.Biochemistry of seed dormancy, seed germination, fruit ripening and senescence.

UNIT III PLANT PIGMENTS & PHOTOSYNTHESIS [20 hrs]

Structure & synthesis of chlorophyll, phycobilins and carotenoids. Photosynthesis: photosystem I & II, Light absorption, Hill reaction, Red drop & Emerson's enhancement effect. Cyclic and non-cyclic photophosphorylation, Calvin cycle, C3, C4 & CAM. Photosynthesis-factors and regulation.

UNIT IV SECONDARY METABOLITES &STRESS METABOLISM [15hrs]

Secondary metabolites in plants – classification & function of alkaloids, terpenoids, tannins, lignin and pectin. Stress metabolism in

plants - Environmental stresses, salinity, water stress, heat, chilling and their impact on plant growth, criteria of stress tolerance**.**

UNIT V NITROGEN FIXING ORGANISMS [10 hrs]

Nitrogen fixing organisms: Structure and mechanism of action of nitrogenase: *Rhizobium* symbiosis. Leghaemoglobin, strategies for protection of nitrogenase against the inhibitory effect of oxygen, nif genes of K*lebsiella pnemoniae* and their regulation.Nitrate reductase.

TEXT BOOKS:

1. Jain.V.K., 2005.'Fundamentals of Plant Physiology', Revised 1st edition,S.Chand& Company Ltd
2. Pandey.S.N.,andSinha.B.K. 1999. Plant Physiology,Vikas Publishing House.

3. Verma, S.K. 2005, Text Book of Plant Physiology,7th Revised edition, Emkay Publications 2001, S. Chand & Co Ltd., New Delhi.

REFERENCES:

1. Solisbury and Ross,Plant Physiology,3rd edition,CBS Publishers and Distributors.
2. Hans-Walter Held, Plant Biochemistry, 3rd edition,Elsevier India Pvt.Ltd.
3. Bonner and Varner, Plant Biochemistry, 3rd edition,Academic Press.
4. Heldt, HW. (2005), Plant Biochemistry. 3rd edition, Elseveir Academic Press Publication, USA.

YEAR-III	PHARMACEUTICAL BIOCHEMISTRY AND BIOINFORMATICS (75hrs) For the students admitted from the year 2015	EBC510B
SEMESTER-V		HRS/WK-5
ELECTIVE-II		CREDIT-5

OBJECTIVES:

- To gain essential knowledge about drugs and their metabolism.
- To understand the biological database and their alignment.

UNIT I DRUGS [15 hrs]

Definition, source and Nature of common drugs - Antimalarial drugs – Chloroquine, quinine, Hydroxychloroquine, Amodiquine. Antifungal drugs - Chlorophenesin, Griesofulvin and Candicidin. Antiviral agents- Idoxuridine, Acyclovir, Methisazone, Amantadine hydrochloride (structure not required).

UNIT II PHARMACOKINETICS [20 hrs]

Factors affecting metabolism, site of metabolism, routes of elimination (kidney, biliary excretion) Phase-I: oxidation, microsomal oxidation, microsomal reduction, non-microsomal metabolism, hydrolysis, Phase-II: Conjugation-glucuronide conjugation, acylation, methylation, mercapturic acid formation and sulphate conjugation.

UNIT III ANTIOXIDANT DEFENSE [10hrs]

Antioxidant defense system-oxygen dependent and independent (NOS) antioxidant defense enzymes SOD, Catalase, Glutathione peroxidase, Glutathione reductase and lipid peroxidation.

UNIT IV BIOINFORMATICS [15 hrs]

Bioinformatics-definition, application, challenges and opportunities. Internet, www. Database-types, classification, sequence formats, DBMS, RDBMS, SQL (brief description), Nucleic Acid Database-NCBI, EMBL & DDBJ. Protein Sequence Database-PIR, SWISS-PROT, Structure database-PDB, CDS, ORF, EST motifs, domain and annotation.

UNIT V SEQUENCE ALIGNMENT [15 hrs]

Sequence alignment-algorithm, global and local alignment, sequence alignment methods, pairwise alignment-dot matrix, dynamic programming, FASTA & BLAST. Multiple sequence alignment-HMM &CLUSTAL[brief descrption]. Homology, orthology, paralogs &xenologs. Softwares used for phylogenetic analysis.

TEXTBOOKS:

1. Tripathi KD, 2013.Essentials Of Medical Pharmacology, 7th edition. Jaypee Brothers Medical Publishers
2. Katzung Bertram, 2015. Basic and Clinical Pharmacology 13th ed., McGraw Hill,.
3. S.Ignacimuthu, 2005. Basic Bioinformatics,Narosa publications
4. Arthur M.Lesk. 2002. Introduction to Bioinformatics, Oxford University press.
5. Rastogi,S.C.Mendiratta, N. and Rastogi P ,"Bioinformatics-Methods and applications", Prentice-Hall of IndiaPvt. Ltd, New Delhi.
6. Karen Whalen, 2014. Lippincott Illustrated Reviews: 6th edition. Pharmacology – Publisher: Wolter Kluwer

REFERENCES:

1. David R.Westhead,J.Howard Parish &Richard, 2003. Instant notes on bioinformatics" ,viva book Pvt ltd
2. K.Mani&N.Vijayaraj,2004 "Bioinformatics- a practical approach",Aparnapublications,Coimbatore
3. LubertStyrer,Biochemistry ,4th editon, W.H.Freeman and Company, New York.
4. G.R.Chatwal, Pharmaceutical chemistry, Himalayaa Publishing House.
5. Joseph R.Dipalma,,G.Johndi Gregorio, Basic Pharmacology in Medicine,3th edition.
6. Attwood, T.K. and Parry-Smith, D.J. 1999. Introduction to bioinformatics. Pearson Education Ltd., Delhi, India

YEAR-III	MEDICAL BIOCHEMISTRY (90 hrs) For the students admitted from the year 2015	BC611S
SEMESTER-V		HRS/WK-6
CORE IX		CREDIT-5

OBJECTIVES

To understand biochemical basis of various diseases and disorders

UNIT I COLLECTION & PRESERVATION OF SAMPLES [15 hrs]

Biological samples, Specimen collection, anticoagulant, preservatives for blood and urine, transport of specimens. Normal and abnormal values of different blood parameters.

UNIT II DIABETES MELLITUS [15 hrs]

Diabetes mellitus- definition, WHO criteria, classification of diabetes mellitus-signs, symptoms and complications, GTT, galactosemia, galactosuria and fructosuria.

UNIT III INBORN ERRORS & LIPID TRANSPORT [20 hrs]

Inborn errors of metabolism- phenylketonuria, alkaptonuria, albinism, cystinuria and fanconisyndrome.Exogenous and endogenous transport of lipids- chylomicron transport, VLDL transport-reverse cholesterol transport.Atherosclerosis, fatty liver- risk and anti-risk factors.

UNIT IV LIVER & GASTRIC FUNCTION TEST [20hrs]

Liver function test-Heme catabolism- Jaundice- classification- biochemical findings-liver function test based on bile pigments- Vanden bergh test, Detoxification-Hippuric acid excretion and BSP dye test, metabolism-galactose tolerance test, Prothrombin time, Gastric function test-gastric contents, resting stage gastric analysis-stimulation test (histamine, pentagastrin) - FTM-AZURE-A test. Hypo and hyperacidity.

UNIT V RENAL FUNCTION TEST & DIAGNOSTIC ENZYMES [20 hrs]

Renal function test-renal concentration test-PSP dye test-urea, creatinine and inulin clearance test.Plasma enzymes-functional and non-functional enzymes, isoenzymes, enzyme patterns in acute pancreatitis, liver diseases and myocardial infarction.

TEXTBOOKS:

1. Textbook of Biochemistry for medical students-DM.Vasudevan,5th edition,Jaypee publishers, 2008.
2. Textbook of Medical Biochemistry, Chatterjee, M.N. and RanaShinde, 5th ed. Jaypee Medical Publishers, 2002.
3. Devlin, T.M, Textbook of Biochemistry with Clinical Correlations. John Wiley and sons, INC. New York, 2002.

REFERENCES:

1. Robert K. Murray, Daryl K. Grammer "Harper's Biochemistry",(25th Edition) McGraw Hill, Lange Medical Books.
2. Sathya Narayana U,1999, "Biochemistry", (2nd Edition), Kolkata, Allied Publishers..
3. Mallikarjuna Rao N,2002, " Medical Biochemistry",2nd Edition, New Delhi, New Age International publishers.
4. Bhagavan.N.V(2004),"Medical Biochemistry",(4thed) Noida, Academic press
5. Harrison,T.R.Fauci,Braunwalad,andIsselbaeher,"Principles of Internal Medicine,1998,McGraw Hills.
6. Victor W. Rodwell, 2015.Harpers Illustrated Biochemistry 30th Edition.
7. Luxton R, 2010, Clinical Biochemistry, 2nd edition, VinothVashista Pvt. Ltd., New Delhi.

YEAR-III	BIOTECHNOLOGY AND GENETIC ENGINEERING (90 hrs) For the students admitted from the year 2015	BC612S
SEMESTER-VI		HRS/WK-6
CORE-X		CREDIT-5

OBJECTIVE

To provide an insight into the basic concepts of biotechnology.

UNIT I INTRODUCTION [15 hrs]

Introduction to Biotechnology- scope & its importance. Enzymes involved in rDNA technology. Restriction and modification enzymes, vectors- plasmids, pBR322, Ti plasmid, bacteriophages- lambda, phage M13, cosmids, BAC, YAC, shuttle vectors. Gene transfer methods- Microinjection and Electroporation.

UNIT II ANIMAL CELL CULTURE [20 hrs]

Animal cell culture- requirements, sterilization& applications. Culture media- natural and artificial, properties & use of serum and serum-free media, cell adhesion molecules. Primary cell culture - mechanical disaggregation, enzymatic disaggregation and primary explants technique. Cell lines- finite and continuous.Subculture-mono layer and suspension cultures.

UNIT III VACCINES &TRANSGENESIS [20 hrs]

Production of vaccines in animal cells-traditional and recombinant vaccines -subunit vaccines- Hepatitis B, Vaccinia virus (Vector recombinant vaccine), DNA and RNA vaccines.Transgenic animals - techniques and applications - transgenic mice and sheep.Stem cells- isolation, identification and uses.Transgenic plants and its uses.

UNIT IV PLANT TISSUE CULTURE [20 hrs]

Totipotency, tissue culture-media, composition, nutrients, growth regulators, regeneration of plants- organogenesis and somatic embryogenesis, callus and cell suspension culture, micropropagation, production of haploid plants, protoplast isolation, fusion and regeneration.

UNIT V FERMENTATION [15 hrs]

Fermentation, Fermentor-common features and operation for a conventional bioreactor, classification of fermentation process - type 1, type 2 and type 3. Fermentation process-factors affecting fermentation process, media for fermentation – synthetic and crude media.

TEXTBOOKS:

1. Sathya Narayana U, 1999, "Biotechnology", (2nd Edition), Kolkata,Allied Publishers.
2. P.K.Gupta,"Biotechnology and Genomics", 2004,Rastogi Publications.
3. Dubey.R.C.,A Textbook of Biotechnology,S.Chand& Company Ltds.,

REFERENCES:

1. Bernard, Glick Jack.R,Pasternak.J,Molecular Biotechnology-Principle and Application of Recombinant DNA, 3rd edition,2003,Library of Congress Cataloging in Publication Data.
2. Primrose (2001) - Principles of gene manipulation. 6th Edition Blackwell Scientific Publishers. UK
3. Zubay, 1998, Biochemistry 4th Edition, WMC Brown Publishers, USA.

YEAR-III	CLINICAL ENDOCRINOLOGY	EBC613A
SEMESTER-VI	(75 hrs)	HRS/WK-5
ELECTIVE-III	For the students admitted from the year 2015	CREDIT-5

OBJECTIVE

To provide an insight into the structure and functions of hormones.

UNITI INTRODUCTION TO HORMONES [15 hrs]

Hormones - feedback regulation. Different mechanisms of signal transduction, secondary messengers - cAMP mediation, calcium and DAG mediation, cGMP mediation, ionic conduction.

UNIT II PITUITARY& HYPOTHALAMUS HORMONES [15 hrs]

Structure of pituitary gland**,** Hormones of anterior pituitary-FSH, LH, TSH and its functions.Posterior pituitary - oxytocin and vasopressin with its functions.Hormones of hypothalamus.

UNIT III THYROID ,PARATHYROID& PANCREATIC HORMONES [15hrs]

Thyroid hormones-structure and functions.Hypothyroidism-cretinism, myxedema, simple Goiter, Grave's disease. Parathyroid hormones- regulation of calcium homeostasis by PTH and calcitonin.Hormones of pancreas- insulin & glucagon.

UNIT IV ADRENAL HORMONES [15 hrs]

Hormones of adrenal cortex - cortisol biosynthesis (structure not required) and its functions, Cushing's syndrome, Addison's disease - Aldosterone biosynthesis and its functions – renin - angiotensin mechanism, Conn's syndrome. Medullary hormones -biosynthesis of epinephrine and nor-epinephrine.Dopamine and its metabolic functions, pheochromocytoma.

UNIT V GASTROINTESTINAL HORMONES & SEX HORMONES [15 hrs]

Gastrointestinal hormones- chemical nature, functions of gastrin, enterogastrone, secretin, and cholecystokinin. Sex steroids-male sex hormones - biosynthesis and its metabolic functions.Female sex hormones - biosynthesis and its metabolic functions.

TEXTBOOKS:

1. Chatterjee, M.N. and RanaShinde. Textbook of Medical. Biochemistry, 2002. 5th edition. Jaypee Medical Publishers.
2. DM.Vasudevan. Textbook of Biochemistry for medical students. 5th edition, Jaypee Publishers, 2008.

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1. U.Sathayanarayana, (2006). Biochemistry. 3rd Edition by Books and Allied (P) Ltd., India.
2. Mallikarjuna Rao N,2002, " Medical Biochemistry",2nd edition, New Delhi,New Age International Publishers.
3. Devlin, T.M. (2002) Textbook of Biochemistry with Clinical Correlations. John Wiley and sons, INC. New York.
4. Ramakrishnan S, Prasanna K.G. and Rajan R,1980, " Textbook of Medical Biochemistry",3rd edition, Chennai, Orient Longman.
5. Bhagavan.N.V (2004),"Medical Biochemistry",4thedition, Noida, Academic Press.

YEAR-III	MEDICAL PHYSIOLOGY (15 hrs) For the students admitted from the year 2015	EBC613B
SEMESTER-VI		HRS/WK-5
ELECTIVE-III		CREDIT-5

OBJECTIVE:

To understand the structure and functions of the organ systems in our body.

UNIT I BLOOD AND CIRCULATORY SYSTEM [15 hrs]

Composition of blood – types of blood cells, morphology and its functions, Blood groups - ABO group and Rh group. Composition of lymph, circulatory system: Heart - basic anatomy, cardiac cycle, cardiac output and pace maker.

UNIT II DIGESTION [15 hrs]

Definition, digestive system - chemical process of digestion. Salivary digestion, gastric digestion - Mechanism of Hcl secretion in stomach, pancreatic digestion, intestinal digestion, Role of bile salt in Digestion, Digestion and absorption of carbohydrates, proteins, and lipids.

UNIT III RESPIRATORY SYSTEM AND EXCRETORY SYSTEM [15 hrs]

Respiration, types of Respiration, Respiratory system of man, Transport of O_2 and CO_2, Role of Hemoglobin in of O_2 and CO_2 transport. Oxygen Dissociation curve, Bohr Effect, Chloride shift. Excretory system of man, structure of nephron, Mechanism of urine formation – Ultra filtration, Reabsorption and Secretion.

UNIT IV NERVOUS SYSTEM [15hrs]

Neuron, types of neuron, conduction of nerve impulse, Synapse - types of synapse, synaptic transmission, Neurotransmitter, Neuromuscular junction, Reflex action.

Human brain - Anatomy of brain - meninges, cerebrum, brain stem, cerebellum and functions.Spinal cord and its function.

UNIT V MUSCLE [15 hrs]

Introduction, types of muscle, Ultra structure of skeletal muscle - light band, dark band, Sarcomere, thick filament-myosin, thin filament - actin, tropomyosin and troponin. Muscle contraction – types

of muscle contraction and theories of muscle contraction, Molecular basis of skeletal muscle contraction.

TEXTBOOKS:

1. KA Goel, KV Sastri, A Text book of Animal Physiology, Rastogi publications, Meerut.
2. Arthur C. Guyton and John E. Hall, 2016.Textbook of Medical Physiology , Harcourt Asia Pvt. Ltd, 10th edition.
3. Sembulingam, Premasembulingam,2012.Essentials of medical Physiology-K 6th edition, Jaypee Brothers Medical Publishers (P) Ltd.,
4. A.K.Jain, 2016.Textbook of Physiology Vol - I & II, 6th edition Avichal Publishing Company.

REFERENCES:

1. BJ Meyer, HsMeij, AC Meyer, Human Physiology, 2nd edition – AITBS Publishers and distributon.
2. Giese, Cell Physiology, 5th edition, W .B Saunders company, Tokyo, Japan.
3. Animal Physiology and biochemistry – RA Agarval, Anil. K. Srivastav, Kaushal Kumar, S .Chand& CO.,
4. Ganong W. E. 2003.Review of Medical Physiology, 21st edition. McGraw Hill.
5. West, E.S. and Todd, W.R., 1985, Textbook of Biochemistry, MacMillan, Germany.
6. Zubay, 1998, Biochemistry 4th edition, WMC Brown Publishers, USA.

YEAR-III	BIOSTATISTICS AND CLINICAL RESEARCH (75 hrs) For the students admitted from the year 2015	EBC614A
SEMESTER-VI		HRS/WK-5
ELECTIVE-IV		CREDIT-5

OBJECTIVES:

- To provide sufficient background to interpret statistical results in research papers.
- To ensure the students with requisite knowledge to pursue a career in the clinical research industry.

UNIT I DATA COLLECTION AND PRESENTATION [15hrs]

Introduction: Collection of data, primary data, secondary data, methods of data collection. Processing of data- classification and tabulation of statistical data, Frequency Distribution: Simple and Cumulative, Diagrammatic presentation of data - Histogram, Bar chart, Frequency polygon and Pie chart, graphical presentation of data- line graph.

UNIT II MEASURES OF CENTRAL TENDENCY [15 hrs]

Measurement of Central Value: Mean, Median, Mode, Geometric Mean (G.M) and Harmonic Mean (H.M), Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standard deviation.

UNIT III STATISTICAL ANALYSIS [15hrs]

Test for correlation and regression coefficients, Chi-square test for goodness of an independence of attributes. F-test for equality of variances, ANOVA – one way classification.

UNIT IV CLINICAL RESEARCH [15hrs]

Introduction to clinical research, origin and history of clinical research, Biochemical investigations in clinical research, difference between clinical research and clinical practice, types of clinical research, phases of clinical research, career in clinical research.

UNIT V DRUG DEVELOPMENT [15 hrs]

Drug discovery and development process, Preclinical testing, Clinical trials, ethical issues, new drug application and approval. Pharmacokinetics, Pharmacodynamics and Pharmacogenomics.

TEXT BOOKS

1. Green. R. H. 1979. 'Sampling Design and Statistical Methods for Environmental Biologists' .John Wiley & Sons.

2. Gupta.S.C& Kapoor. 1978.V.K. "Fundamental of Applied Statistics" (2nd ed), MJP Publishers.

3. Satoskar RS, bhandarkar SD, AinapureSS,E.Padmini, 2003.Biochemical calculations and Biostatistics. Books and Allied (P) Ltd.Pharmacology&Pharmacotherapeutics. 18th ed. Mumbai: popular prakashan: 376.

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1. Thomas Glover, Kevin Mitchell.2001.' Introduction to Biostatistics', 1st ed. McGraw Hill Science

2. Dr N .Gurumani,2015. "An Introduction to Biostatistics",MJP Publishers

3. Wilson & Walker, 2000. Principles and Techniques in Practical Biochemistry' 5th ed.. Cambridge Univ. Press.

4. Clinical Research Practice and prospects-T.K.Pal,Sangita Agarwal,1st edition.

5. Essential of Medical Pharmacology, Sixth edition-KD.Thripathi MD, Jaypee brothers medical publishers (P) Ltd. St Louis (USA)

YEAR-III	MEDICAL LABORATORY TECHNOLOGY	EBC614B
SEMESTER-VI	(75 hrs)	HRS/WK-5
ELECTIVE IV	For the students admitted from the year 2015	CREDIT-5

OBJECTIVE

To provide an insight into the basic techniques in medical diagnostics.

UNIT I INTRODUCTION TO LABORATORY EQUIPMENTS[15 hrs]

Introduction to laboratory equipments, Basic laboratory operation and the role of laboratory technician.Types of specimen collection and procedure - blood, urine, sputum, throat swab, stool and CSF.Unit of measurement, reagent preparation and laboratory calculation-metric system. Smear preparation and types, calibration, measurements, quality control & GLP.

UNIT II HEMATOLOGY [15 hrs]

Blood grouping and Rh factor, cross matching, clotting time, bleeding time, hemoglobin estimation, total count-RBC count and WBC count, Differential WBC count, Erythrocyte Sedimentation Rate (ESR), Hematocrit value (Packed Cell Volume). Screening test-HIV (ELISA) HBs Ag, TPHA.

UNIT III CLINICAL PATHOLOGY [15hrs]

Brief outline of histopathology: Tissue cutting, fixation, embedding, tissue slicing by microtome, slide mounting and staining techniques: types – carbohydrates, proteins & lipids.

UNIT IV CLINICAL BIOCHEMISTRY [15 hrs]

Blood glucose, urea, uric acid, triglycerides, SGOT, SGPT, serum alkaline and Acid phosphatase, calcium, phosphorous, total protein, albumin, amylase, lactic dehydrogenase, electrolytes-sodium and potassium role and its significance.

UNIT V MICROBIOLOGY [15 hrs] Culturing of organisms from various specimens, culture media and antibiotic sensitivity test (pus, urine, blood, sputum, throat swab).Gram stain &Ziehl-Neilson staining method (TB, Lepra bacilli).Safety procedure in microbiological techniques.

TEXTBOOKS:

1. Kanai L. Mukherjee,1996. Medical Laboratory Technology Vol. I, II & III Tata McGraw Hill New Delhi.
2. GradWohl, Clinical Laboratory-Methods and Diagnosis, 8th edition, mosby year book publisher, Vol-I.

3. Mukherj,2000. Medical Laboratory Technology,Tata McGraw Hill Education
4. Darshan P. Godkar Praful B. Godkar,2014. Textbook of Medical Laboratory Technology Vol 1 &2, Bhalani Publishing House; 3rd edition

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1. Henry, John Bernard, Todd Sanford and Davidson, 2002. Clinical diagnosis and management by laboratory methods. W.B. Saunders & Co.
2. Fischbach Francis A, 2003. Manual of laboratory and diagnostic tests. Philadelphia,J.B. Lippincott & Co, N.Y.

- Gradwohls, 2000. Clinical laboratory methods and diagnosis Alex.C. Sonnenwirth& Leonard Jarret.M.D.B.I.Publications, New Delhi,
- Sood R, 2005, Medical Laboratory methods and interpretation, Jaypee Brothers Medical Publications, New Delhi.
- ArundhatiKolhatkar,J.Ochei, 2000. Medical Laboratory Science: Theory and Practice, Tata McGraw-Hill Education Pvt. Ltd.