

**ST. JOSEPH'S COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
CUDDALORE-1**



**PG & RESEARCH DEPARTMENT OF BIOCHEMISTRY
PG SYLLABUS 2016-2017**

M.Sc BIOCHEMISTRY

Semester	SUB. CODE	Subject Title	Hrs	Cr	Exam hrs	
FIRST	PBC701S	Main Paper - I(Bio organic chemistry)	5	4	3	
	PBC702S	Main Paper - II(Principles of Cell biology)	5	4	3	
	PBC703S	Main Paper - III(Intermediary Metabolism)	5	4	3	
	EPBC704S	Elective Paper- I	Clinical Nutrition	5	4	3
	EPBC704A		Medical lab Technology			
	PBCP101	Main Practical - I		8	6	6
		Seminar/paper presentation/library		2		
		Total		30	22	
SECOND	PBC805S	Main Paper - IV Molecular biology		5	4	3
	PBC806S	Main Paper - V Enzymes		5	4	3
	PBC807S	Main Paper - VI Analytical Biochemistry		5	4	3
	EPBC808A	Elective Paper-II	Plant biochemistry	5	4	3
	EPBC808S		Advanced Endocrinology			
	PBCP202	Main Practical - II		8	6	6
		Seminar/paper presentation/library		2		
		Total		30	22	
THIRD	PBC909	Main Paper -VII(Clinical Biochemistry)		5	4	3
	PBC910	Main Paper -VIII(Immunology)		5	4	3
	PBC911	Main Paper -IX(Research methodology and Biostatistics)		5	4	3
	EPBC912A	Elective Paper-III	Microbial biochemistry	5	4	3
	EPBC912B		Biotechnology			
	PBCP303	Main Practical - III		8	6	6
	ECHR901S	Human Rights		2	1	3
		Work Done Outside the class-Project			2	

		Design & Proposal			
		Total	30	25	
FOURTH	PBC1013	Main Paper - X (Molecular physiology)	5	4	3
	PBC1014	Main Paper - XI(Bio informatics)	5	4	3
	EPBC1015A	Elective paper - IV	5	4	3
	EPBC1015B				
		Project work	15	11	
		Total	30	25	

*End of the Academic Year

YEAR-I	BIO-ORGANIC CHEMISTRY (75 hrs)	PBC701S
SEMESTER-I		HRS/WK-5
CORE-I		CREDIT-4

OBJECTIVE:

To obtain a keen knowledge on the characterization of biological macromolecules.

UNIT-I CARBOHYDRATES [20 hrs]

Carbohydrates-classification, Polysaccharides – occurrence, structure and biological functions of cellulose, chitin, starch and glycogen. A brief account on fructans, arabinans and galactans., bacterial cell wall polysaccharides and blood group antigens. Glycosaminoglycans – structure and biological role of hyaluronic acid, chondroitinsulfate and heparin. Sialic acid – structure and significance, Proteoglycans- A brief account on glycoproteins and their biological importance.

UNIT-II PROTEINS [15 hrs]

Proteins-classification. Orders of protein structure. Primary structure – determination of amino acid sequence of proteins. The peptide bond – The Ramachandran plot. Secondary structures – α -helix, β -sheet and β -turns. Pauling and Corey model for fibrous proteins. Reverse turns and super secondary structures. Collagen triple helix Tertiary structure . Conformational properties of silk fibroin. Quaternary structure of proteins. The structure of hemoglobin. Models for hemoglobin allostery.

UNIT-III LIPIDS [10 hrs]

Lipids – Introduction, classification,- structure and functions. Fatty acids – saturated, unsaturated and hydroxy fatty acids. Phospholipids and glycolipids – structure and functions. structure and functions of cholesterol. Lipoproteins – classification and composition.

UNIT-IV NUCLEIC ACIDS [15 hrs]

DNA double helical structure – Watson and Crick model. A, B and Z forms of DNA. DNA supercoiling and linking number. Properties of DNA – buoyant density, viscosity, denaturation and renaturation – The cot curve. Major classes of RNA – mRNA, rRNA, tRNA, sn RNA, ,Sno RNA – structure and biological functions.

UNIT-V NUCLEIC ACIDS IN CELLS**[15 hrs]**

Salient features of nucleic acid recognition by proteins. DNA binding motifs in proteins – the basic helix loop helix (bHLH) motif, zinc finger, the leucine zipper and helix-loop helix. RNA binding motifs in proteins. Techniques characterizing nucleic acid-protein complex – gel retardation assay, DNase I footprinting. CHIP.

TEXT BOOKS:

Fundamentals of Biochemistry by J.L.Jain .

REFERENCES:

1. Lehninger Principles of Biochemistry 4th edition Nelson and Cox, Freeman Publishers, 2005
2. Harper's Biochemistry 26th edition. McGraw Hill, 2003
3. Biochemistry 4th edition. Zubay, William C. Brown Publication, 1998
4. Biochemistry. Voet and Voet, John Wiley, 1995
5. Nucleic acid structure and recognition. Neidle, Oxford University Press, 2002
6. Nucleic acids in chemistry and biology. Blackburn and Gait, IRL Press, 1996

YEAR-I	PRINCIPLES OF CELL BIOLOGY(75hrs)	PBC702S
SEMESTER-I		HRS/WK-5
CORE-II		CREDIT-4

OBJECTIVE

To understand the membrane models ,membrane transport, characteristics and the functional organisation of cells.

UNIT I CELL STRUCTURE AND ORGANELLES [15 hrs]

The ultra structure of nucleus, mitochondria, endoplasmic reticulum (rough and smooth), Golgi apparatus, lysosomes ,Ribosomes & peroxisomes and their functions. Membrane bilayer - Models, Membrane lipids - fluidity, Asymmetry phase transition, Liposomes Membrane proteins - Types, Orientation, proteins on RBC membrane, Lectins.

UNIT II CELL DIVISION [10 hrs]

Purification of subcellular organelles, cell divisions-Mitosis and Meiosis, Bright field microscopy, phase contrast microscopy, SEM, TEM,AFM-Principles and applications. Marker enzyme for different organelles.

UNIT III MEMBRANE ASSEMBLY [15 hrs]

Microfilaments - Actin – Structures, Assembly and disassembly. Microtubules – structure and composition. Microtubular associated proteins, MTOCs ,Cilia and Flagella - Structure and functions, Intermediary filaments.

UNIT IV CELL-CELL INTERACTIONS [20 hrs]

Cell-Cell, interaction: - ECM; Collagen, hyaluronan & proteoglycans, laminin, integrins and fibronectins.Cell-Cell adhesion: Specialised junctions -- Desmosomes, Gap junctions, tight junctions Adhesion molecules - Cadherins - Connexins.

UNIT V Cell Cycle and Cancer [15 hrs]

Overview of cell cycle and its control. Checkpoints in cell –cycle regulation. Apoptosis (Programmed cell death) -- Pathways, regulators & effectors in apoptosis. Cancer: Properties of tumor cells & Genetic basis and onset of cancer. Tumor suppressor genes and functions of their products.

TEXTBOOKS:

- 1.Molecular cell biology 5th edition- Lodish, Berk *et al.*, Freeman and Co., 2004
2. Molecular biology of the cell 4th edition – Alberts *et al.*, Garland Publishers, 2002

REFERENCES:

1. Molecular cell biology 5th edition- Lodish, Berk *et al.*, Freeman and Co., 2004
2. Principles of biochemistry, Garrette, Grisham, Saunders College Publishing Co.1994
3. Molecular Cell biology 3rd edition, Lodish *et al.*, Scientific American Books.Freeman and Co.,1995
4. Molecular biology of the cell 4th edition – Alberts *et al.*, Garland Publishers, 2002
5. Harper’s Biochemistry 26th edition – Murray *et al.*, McGraw Hill, 2003
6. Cell and molecular biology- de Robertis .

TEXT BOOKS:

1. Nelson.D.L, Cox. M. M, Lehningers Principle of Biochemistry,4th ed. Freeman, 2004
2. DM Vasudevan, 'Textbook of biochemistry for medical students' 5th ed,Jaypee publications

REFERENCES:

1. Berg.J.M, Tymoczko.J.L, Stryer, L. "Biochemistry". 6th ed. Freeman, 2006.
2. Zubay," Biochemsitry" 4th ed. William C. Brown Publication, 1998
3. Voet and Voet. Biochemistry. 3rd ed. John Wiley, 1995.
- 4.Murray. R.K, Granner.D.K, Mayes. P. A, Rodwell. V. W.Harper s Biochemistry. 27th ed. McGraw Hill, 2006.

YEAR-I	CLINICAL NUTRITION (75 hrs)	EPBC704S
SEMESTER-I		HRS/WK-5
ELECTIVE-I		CREDIT-4

OBJECTIVE:

To study the proximate principles of nutrition and to understand the disorders and therapy associated with it.

UNIT-1 NUTRITIONAL DISORDER [15 hrs]

Introduction: source of energy-carbohydrates, fats and proteins ;Diet-composition ,fibre in diet. Disorders associated with protein metabolism-marasmus and kwashiorkor ,Biological value of proteins, Chemical score.

Fats: souces-essential and non-essential fatty acids-disorders concerned with fatty acid metabolism-Refsum’s disease,atherosclerosis,fatty liver and obesity.

UNIT II BASIC METABOLIC RATE [15 hrs]

Basal metabolic rate-factors affecting BMR-determination of BMR, direct and indirect methods,-benedict’s roth apparatus-respiratory quotient-BOD. SDA, Anthropometry: height, weight, skin fold thickness and arm circumference-their importance in nutrition

UNIT III VITAMINS & TRACE ELEMENTS [15 hrs]

Vitamins-Classification, fat soluble and water soluble vitamins-source, daily requirements, functions and deficiency manifestations. Micro, Macro and trace elements-daily requirements-functions-deficiency manifestations.

UNIT IV NUTRITIONAL MANAGEMENT [15 hrs]

Objectives of diet therapy-regular diet and rationale for modifications in energy and other nutrients ,texture-fluid,soft diets etc.Metabolic and clinical complications, prevention and recent advances in the medical nutritional management on :obesity,cardiovascular diseases,Diabetes mellitus, Renal disorders and neurological disorders (parkinson’s disease, alzheimer’s disease). Nutrition at different stages of life-during infancy, adolescence, pregnancy, lactation and old age.

UNIT V Recent Advances in Clinical Nutrition [15 hrs]

Neutraceuticals-Adverse effects of certain neutraceuticals, dietary supplements & neutraceuticals used in functional medicine. Functional foods-Health benefits of functional foods in Immune function & mental health. Probiotics and prebiotics -

Types & Health benefits. Antioxidants-Role of antioxidants in human health (Vit E, Vit C & Zinc).

TEXTBOOKS:

- 1.Swaminathan,M.S(1985):Principles of Nutrition, J.LPublishers, New Delhi
- 2.Mahan ,L. Kand Escott-Stump ,S (2000):Krause's Food Nutrition and Diet therapy,10th ed, W-13 Saunders Ltd

REFERENCES:

- 1.Mahan ,L. Kand Escott-Stump ,S (2000):Krause's Food Nutrition and Diet therapy,10th ed,W-13 Saunders Ltd
- 2.Shills,ME,Olson,JA,Shike,M and Ross,A.C(1999):Modern Nutrition in Health and Disease,9th ed,A.Vaiiams and willons
3. Williams, SR(1993):Nutrition and Diet Therapy,7th ed, Times Mirror/Mosby College Publishing
4. Davidson and Passmore(2000):Human Nutrition and Dietetics
5. Anthony A.Albanase(1972),Newer Methods of Nutritional Biochemistry, Academic Press
6. Swaminathan, M.S: "Food and nutrition ",vol I & II ,J.LPublishers, New Delhi

YEAR-I	MEDICAL LAB TECHNOLOGY (75hrs)	EPBC704A
SEMESTER-I		HRS/WK-5
ELECTIVE-I		CREDIT-4

OBJECTIVE:

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

UNIT-I LABORATORY CARE AND INSTRUMENTATION [15 hrs]

Instrumentation to laboratory equipments and basic laboratory operation and role of laboratory technician. Types of specimen collection and collection procedure- blood, urine, sputum, throat swab, stool and CSF. Unit of measurement, reagent preparation and laboratory calculation-metric system. Reagent solution, preparation of reagent solution.

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), Hematocrite value (Packed Cell Volume). Screening test-HIV, HBs Ag, TPHA, etc. Anemia-types

UNIT-III CLINICAL PATHOLOGY [15 hrs]

Brief outline of histopathology: Tissue cutting, fixation, embedding, tissue slicing by microtome, slide mounting and staining techniques.

UNIT-IV CLINICAL BIOCHEMISTRY [15 hrs]

Blood glucose, urea, uric acid, triglycerides, SGOT, SGPT, serum alkaline and acidic phosphates, calcium, phosphorous, total protein, albumin, electrolytes-sodium, potassium, amylase, lactic dehydrogenase-Explanation about its role and abnormalities

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 (TB, Lepra bacilli). Safety procedure in microbiological techniques.

TEXTBOOKS :

1. Kanai L. Mukherjee, Medical Laboratory Technology Vol. I. Tata McGraw Hill 1996, New Delhi.
2. Gradwohl, Clinical Laboratory-methods and diagnosis, Vol-I

REFERENCES

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.
3. Gradwohls, 2000. Clinical laboratory methods and diagnosis ed. Alex.C. Sonnenwirth & Leonard Jarret. M.D.B.I. Publications, New Delhi,
4. Sood, R, 2005, Medical Laboratory methods and interpretation, Jaypee brothers medical publications, New Delhi.

YEAR-I	MOLECULAR BIOLOGY (75 hrs)	PBC805S
SEMESTER-II		HRS/WK-5
CORE-IV		CREDIT-4

OBJECTIVE

To understand about the complete blue print of life and its central Dogma

UNIT-I CHROMOSOME [20 hrs]

DNA-genetic material-Griffith, Avery et al and Hershey and Chase experiment value ,C value paradox, Cot value, organization of chromosomes and nucleosomes, Euchromatin, heterochromatin, centromeres and telomeres, central dogma of molecular biology , mitochondria and chloroplast DNA-Gene transfer in microorganisms- conjugation-Hfr transfer, chromosomal transfer and the mediation by F plasmids, transformation-competence, transduction . Repetitive DNA-Highly repetitive moderately repetitive and unique DNA sequences, Satellite DNA, Telomerase.

UNIT -II REPLICATION [15 hrs]

Replication-conservative and semiconservative- experimental proof for semiconservative replication-factors involved in prokaryotic and eukaryotic replication-DNA polymerases in prokaryotes and eukaryotes-inhibitors of replication-replication of circular DNA and linear DNA. Mitochondrial replication.

UNIT-III TRANSCRIPTION AND GENE REGULATION. [10 hrs]

Transcription-promoters, RNA polymerase in prokaryotes and eukaryotes-intiation, elongation and termination of transcription process -inhibitors of transcription-post transcriptional modification of mRNA, tRNA and rRNA, Antisense RNA .Operon concept-lac, arabinose and trp operon.

UNIT-IV GENETIC CODE AND TRANSLATION [15 hrs]

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

UNIT-V DNA REPAIR& TRANSPOSONS [15 hrs]

DNA repair-photoreactivation, Excision repair, Post replication and mismatch repair, base and nucleotide excision recombination and SOS repair. Protein targeting-Heat shock proteins ,glycosylation; SNAPs and SNAREs.,transposons, retroposons .

TEXT BOOKS:

1. Lewin B(2004): Genes VIII, Oxford University Press, New York
2. Watson. J. D, Baker. T. A, Bell. S. P, Gann. A, Levine. M, Lodish. R. Molecular Biology of Gene. 5th The Benjamin /Cummings Pub. Co. Inc, 2003

REFERENCES:

1. Darnell, Lodish and Baltimore. Molecular Cell Biology, Scientific American Publishing Inc, 2000
2. Weaver. R. F. Molecular Biology. 3rd ed. Mc Graw Hill publication, 2005
3. Weaver R.F and Philip.P.W(1989): Genetics, WMC Brwn Publishing, USA
4. Nelson Cox. Lehninger s Principle of Biochemistry. 3rd ed. MacMillian Worth Publ, 2000

YEAR-I	ENZYMES (75 hrs)	PBC806S
SEMESTER-II		HRS/WK-5
CORE-V		CREDIT-4

OBJECTIVE:

To understand the kinetics of enzyme-catalysed reactions and mechanism of enzyme action.

UNIT I ENZYMES (15 HRS)

Introduction, Classification and Nomenclature of enzymes - General characteristics of enzyme activity, Factors affecting enzyme activity. First Law & Second Law of thermodynamics. ΔG , characteristics of free energy, entropy and enthalpy. Law of mass action-Zero and first order reaction.

UNIT II KINETICS OF ENZYME ACTION (15 HRS)

Concept of ES complex, collision, transition state theories and energy of activation, derivation of Michaelis-Menten equation for uni- substrate reactions. Different plots for the determination of K_m , V_{max} and their significance. Turn over number. The rate of expression for Bisubstrate reactions for Ping Pong, random & ordered Bi-Bi mechanisms.

UNIT III MECHANISM OF ENZYME ACTION (15 HRS)

Acid-base catalysis, covalent catalysis, metal ion catalysis, proximity, orientation effect. Active site – definition , common features of active site – Investigation of active site structure – trapping ES complex, Use of substrate analogue. Modification of aminoacid side change by single chemical procedure. Strain & distortion theory. Lock and Chemical modification of active site groups. Site directed mutagenesis of enzymes. Mechanism of action of chymotrypsin and lysozyme.

UNIT IV ENZYME REGULATION (15 HRS)

General mechanisms of enzyme regulation, product inhibition. Reversible and irreversible. Covalent modifications of enzymes. Allosteric enzymes - positive and negative co-operativity with special reference to aspartate transcarbamoylase & Phosphofructokinase.

UNIT V ENZYME INHIBITION (15 HRS)

Irreversible- reversible- competitive- noncompetitive- uncompetitive inhibition- kinetic differentiation and Graphical analysis- Suicide inhibition. Immobilized enzymes-methods of immobilization-applications of immobilized enzymes K_i, IC_{50} .

TEXT BOOKS:

1. T.Palmer. Understanding enzymes. Prentice Hall.
2. Dixon and Webb. Enzymes 3rd ed. Longmans, 1979.

REFERENCES :

1. Zubay, " Principles of Biochemistry", 4th ed. 1998. William C.Brown Publ.
2. Stryer."Biochemistry, "5th ed. Freeman, 2002.
3. Uhlig H. Industrial enzymes and their applications. John Wiley, 1998.
4. Balasubramanian et al. Concepts in Biotechnology Universities Press (India) Ltd., 1998
5. Chapline, Bucke,, "Protein Biotechnology,"1st edition, Cambridge University Press,1990
6. Price, Stevens , "Fundamentals of enzymology" 2nd edition, Oxford University Press, 1999
- 7.Marangoni "Enzyme kinetics. A modern approach", John Wiley,2002

YEAR-I	ANALYTICAL BIOCHEMISTRY (75 hrs)	PBC807S
SEMESTER-II		HRS/WK-5
CORE-VI		CREDIT-4

OBJECTIVE

To understand the theoretical principles, practical skills and techniques required in biochemical analysis

UNIT 1 CHROMATOGRAPHY [15 hrs]

Principle, instrumentation and applications of thin layer and gas chromatography. Column chromatography-packing, loading, elution and detection. Ion-exchange chromatography-preparation of resins, procedure and applications. Molecular exclusion chromatography-principle, gel preparation, operation and applications. Affinity chromatography- principle, materials, procedure and applications. HPLC-principle, materials, instrumentation and applications.

UNIT II ELECTROPHORESIS AND ELECTROCHEMICAL TECHNIQUES [15 hrs]

Electrophoresis: General principles. Support media. Cellulose acetate electrophoresis. Electrophoresis of proteins-native gels, SDS-PAGE, gradient gels, isoelectric focusing, 2-D PAGE. Detection, estimation and recovery of proteins in gels. Electrophoresis of nucleic acids- agarose gel electrophoresis, DNA sequencing gels.

UNIT III CENTRIFUGATION TECHNIQUES [10 hrs]

Centrifugation-principle, types of centrifuges, rotors-types, preparative centrifugation- types, instrumentation and applications Analysis of subcellular fractions - Analytical ultracentrifuge- instrumentation and applications - sedimentation velocity and sedimentation equilibrium.

UNIT IV SPECTROSCOPIC TECHNIQUES [20 hrs]

Laws of absorption and absorption spectrum. Principle, instrumentation and applications of UV-visible spectrophotometry and spectrofluorimetry. Basic principles of turbidimetry and nephelometry. Principle, instrumentation and applications of luminometry. Flame spectroscopy- principle and applications of atomic absorption and flame emission

UNIT V RADIOISOTOPE TECHNIQUES**[15 hrs]**

Units of radioactivity. Detection and measurement of radioactivity– GM counter, solid and liquid scintillation counting, quenching and quench correction, scintillation cocktails and sample preparation. Cerenkov counting. Autoradiography. Applications of radioisotopes in biology. Radiation hazards.

TEXTBOOKS:

Upadhyay, Upadhyay and Nath. Biophysical Chemistry Principles and Techniques. Himalaya Publ. 1997.

REFERENCES:

1. Wilson and Walker. A biologist's guide to principles and techniques of practical biochemistry. 5th ed. Cambridge University Press 2000.
2. Boyer, R. Modern Experimental Biochemistry. 3rd ed. Addison Wesley Longman, 2000.
3. Simpson CFA & Whittacker, M. Electrophoretic techniques.
4. Sambrook. Molecular Cloning. Cold Spring Harbor Laboratory, 2001.
5. Friefelder and Friefelder. Physical Biochemistry – Applications to Biochemistry and Molecular Biology. WH Freeman & Co. 1994.
6. Pavia et al. Introduction to Spectroscopy. 3rd ed. Brooks/Cole Pub Co., 2000.

YEAR-I	ADVANCED ENDOCRINOLOGY (75 hrs)	EPBC808S
SEMESTER-II		HRS/WK-5
ELECTIVE-II		CREDIT-4

OBJECTIVE:

To provide much information about hormones and the mechanism of action of various hormones with its effect on human due to their hypo and hyper secretion.

UNIT I SIGNAL TRANSDUCTION [15 hrs]

Introduction to Endocrinology: anatomical aspects of mammalian endocrine system. Definition of a hormone – classification, circulation in blood and Feed back regulation. Fundamentals concepts and definitions of signals, ligands and receptors, endocrine, paracrine and autocrine signaling. Receptors and signaling pathways – cell surface receptors, ion channels, G-protein coupled receptors, Signaling molecules- cAMP, cGMP, IP₃, Ca²⁺, DAG, and NO , Signal transmission via Ras proteins and MAP kinase pathways. Crosstalk in signaling pathways

UNIT II HYPOTHALAMIC AND PITUITARY HORMONES. [15 hrs]

Hypothalamic releasing factors. Anterior pituitary hormones: biological actions, regulation and disorders of growth hormones, ACTH, gonadotrophins prolactin. and Leptin. Posterior pituitary hormones – vasopressin and Oxytocin- biological actions, regulation and disorders ,MSH

UNIT III THYROID AND PARATHYROID HORMONES [15 hrs]

Thyroid hormones – synthesis, secretion, regulation, transport, metabolic fate and biological actions. Antithyroid agents. Hyper and hypothyroidism. Hormonal regulation of calcium and phosphate metabolism. Secretion and biological actions of PTH, calcitonin and calcitriol. Hypercalcemia and hypocalcemia Rickets and osteomalacia.

UNIT IV ADRENAL HORMONES [15 hrs]

Adrenal cortical hormones. Synthesis, regulation, transport, metabolism and biological effects. Cushing's syndrome, aldosteronism, congenital adrenal hyperplasia, adrenal cortical insufficiency. Adrenal medullary hormones – synthesis, secretion, metabolism, regulation and biological effects of catecholamines. Pheochromocytoma.

UNIT V GONADAL AND PANCREATIC HORMONES [15 hrs]

Gonadal hormones: Biosynthesis, regulation, transport, metabolism and biological actions of androgens. Hypogonadism and gynecomastia. Biosynthesis, regulation, transport, metabolism and biological effects of oestrogen and progesterone. The menstrual cycle. Amenorrhoea.

Pancreatic hormones – cell types of islets of langerhans -synthesis, regulation, biological effects and mechanism of action of glucagon and insulin.

TEXT BOOKS:

1. Harper's Biochemistry – Murray et al. 26th ed. McGraw Hill, 2003.
2. Williams Textbook of Endocrinology – Wilson and Foster 8th ed.

REFERENCES:

1. Mechanisms of hormone action – Autind and Short.
2. Principles of Biochemistry – Mammalian Biochemistry – Smith et al. McGraw Hill 7th ed
3. Nelson.D.L, Cox. M. M. Lehninger s Principle of Biochemistry. 4th ed. Freeman, 2004

YEAR-I	PLANT BIOCHEMISTRY (75 hrs)	EPBC808A
SEMESTER-II		HRS/WK-5
ELECTIVE-II		CREDIT-4

OBJECTIVE

To understand the basics of plant biochemistry.

UNIT-I PLANT CELL & ABSORPTION OF MINERAL SALTS [15 hrs]

Discovery and definition of plant cell . Mechanism of absorption .Ion exchange passive absorption. Active absorption .The carrier concept. Donnan's equilibrium.

UNIT-II NATURAL GROWTH HORMONES IN PLANTS [15 hrs]

Structure, biosynthesis ,mode of action &physiological effects of auxins, giberllins, cytokinins, IAA

UNIT-III PHOTOSYNTHESIS PIGMENTS [15 hrs]

Structure &synthesis of chlorophyll phycobilins,carotenoids. photosynthesis photosystem -I &II.Light absorption,Hill reaction Red drop & Emerson's enhancement effect.Cyclic and non-cyclic photophosphorylation,calvin cycle. Factors and regulation of photosynthesis.CAM Pathway,C3 and C4 plants

UNIT-IV SECONDARY METABOLITES [15 hrs]

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

UNIT-V NITROGEN FIXATION [15 hrs]

Nitrogen fixation-symbiotic&non symbiotic nitrogenase enzyme-nodule development carbon dioxide fixation, glyoxalate cycle.

TEXTBOOKS :

- 1.Jain.V.K.,Fundamentals of Plant Physiology,revised 1st edition 2005,S.Chand and Co.
- 2.Pandey.S.N.,and Sinha.B.K.,Plant Physiology,1999,Vikas Publishing House.

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.

YEAR - I	PRACTICAL - I	PBCP101
SEMESTER - I		HRS / WEEK: 8
PRACTICAL - I		CREDITS: 6

SEMESTER-I

1. Qualitative Analysis of Carbohydrates
2. Qualitative Analysis of Amino acids
3. Estimation of Protein by Lowry's Method
4. Estimation of Ash Content
5. Estimation of Moisture Content
6. Determination of Glycogen in Liver
7. Extraction and Estimation of Total Lipid
8. Estimation of Ascorbic Acid (Vitamin C)
9. Determination of Protein by Bradford Method
10. Estimation of Pyruvate
11. Estimation of Tryptophan
12. Isolation and Estimation of DNA
13. Extraction and Estimation of DNA
14. Extraction and Estimation of RNA
15. Separation of Amino acids by Paper Chromatography
16. Separation of Sugars by Paper Chromatography
17. Separation of Plant Pigment by Column Chromatography

YEAR - I	PRACTICAL - II	PBCP202
SEMESTER - I		HRS / WEEK: 8
PRACTICAL - II		CREDITS: 6

SEMESTER-II

1. Preparation of buffers
2. Titration curve
3. Activity of alkaline phosphatase
4. Effect of ph on the activity of alkaline phosphatase
5. Effect of temperature on the activity of alkaline phosphatase
6. Effect of substrate concentration on the activity of alkaline phosphatase
7. Specific activity of alkaline phosphatase
8. Effect of ph on the activity of salivary amylase
9. Effect of temperature on the activity of salivary amylase
10. Effect of substrate concentration on the activity of salivary amylase
11. Determination of specific activity of salivary amylase
12. Effect of ph on the activity of urease
13. Effect of temperature on the activity of urease
14. Effect of substrate concentration on the activity of urease
15. Determination of specific activity of urease
16. Separation of proteins by sds page method
17. Separation of amino acid by thin layer chromatography

YEAR-II	CLINICAL BIOCHEMISTRY (75 hrs)	PBC909
SEMESTER-III		HRS/WK-5
CORE-VII		CREDIT-4

OBJECTIVE

To gain knowledge about the basis of various diseases and their assay procedure

UNIT- I BLOOD SUGAR HOMEOSTASIS [15 hrs]

Role of tissues and hormones in the maintenance of blood sugar. Diabetes mellitus – classification, stages of diabetes-metabolic abnormalities-acute complications – diabetic ketoacidosis –hyper osmolal non-ketotic coma. Immediate and Long-term complications – diabetic retinopathy, neuropathy and nephropathy, cataract - diagnosis-GTT- role of HbA1C- Hypoglycemia

UNIT-II HEME METABOLISM [15 hrs]

Jaundice- classification-biochemical findings. Liver function test based on bile pigments- plasma proteins- A: G ratio, prothrombin time- detoxification function - hippuric acid excretion , BSP dye test and metabolic functions. Galactose tolerance test- gall stones. Disorders of hemoglobin – thalassemia, sickle cell anemia. Anemias –types of anemia

GASTRIC FUNCTION TESTS: Physical examination of gastric contents-basal and maximal secretion-renal concentration test-Stimulation tests – histamine, alcohol and pentagastrin-Fractional test meal analysis-Azure A test-analysis of gastric contents-disorders of gastric function. Peptic ulcer, gastritis and hypoacidity and hyper acidity.

UNIT- III RENAL FUNCTION TEST [15 hrs]

Renal concentration test-PSP dye test-clearance test-inulin clearance-urea clearance-creatinine clearance - NPN-Biochemical findings in glomerulonephritis, renal failure and nephrotic syndrome. Renal stones –types of renal stones-factors influencing renal calculi formation and treatment

DISORDERS OF LIPID METABOLISM – hypo and hyperlipoproteinaemia. Lipid storage diseases – Gaucher’s, and TaySach’s, Niemann Pick disease. Fatty liver. Atherosclerosis. Risk and anti risk factors

UNIT- IV INBORN ERRORS IN METABOLISM [15 hrs]

Phenylketonuria, alkaptonuria, albinism, tyrosinosis, maple syrup urine disease, Fanconi syndrome-cystinuria-galactosemia

YEAR-II	IMMUNOLOGY (75 hrs)	PBC910
SEMESTER-III		HRS/WK-5
CORE-VIII		CREDIT-4

OBJECTIVE

To understand the molecular and cellular components that comprises the immune system, including their functions and interaction.

UNIT I CELLS AND ORGANS OF IMMUNE SYSTEM [15 hrs]

Types of Immunity-innate, acquired, humoral & cell mediated immunity -lymphocyte development. Antigen processing & presentation by B-cell & T-cell. Cell of the immune system-structure & function of mononuclear phagocytes- phagocytosis process, dendritic cells, granulocytes, kupffers cell, osteoclasts, microglial cell, null cell, mast cell, APC. Organs of the immune system- structure and function of primary & secondary lymphoid organs.-bone marrow, thymus, lymph node, spleen

UNIT II ANTIGEN & IMMUNOGLOBULINS [15 hrs]

Antigen-properties,immunogenicity&antigenicity. factors that influence immunogenicity,adjuvants , epitopes, haptens. Antibodies- Basic structure of immunoglobulins & classes . Antigenic determinants on immunoglobulin-isotype, allotype, idiotype , Immunoglobulin-organization expression& rearrangement of heavy & light chains sequencing. Diversity. clonal selection theory. Monoclonal Antibodies – formation ,selection ,production & clinical uses.

UNIT III IMMUNO TECHNIQUES [15 hrs]

Cytokines - properties, structure & function, Complement components and its path way . Principle & application of precipitation reaction in fluids & gels (radial, double immunoelectrophoresis). Agglutination reaction- hemagglutination ,bacterial,passive & agglutination inhibition reaction. Widal test ,Radio Immuno Assay ELISA, FISH. Immuno fluorescence, Immuno blotting.complement fixation test.

UNIT IV THE IMMUNE SYSTEM IN HEALTH & DISEASE [15 hrs]

MHC-structure &function of MHC-I,II,III in human and mouse, gene organization-HLA Cytotoxicity- immunological memory, immuno tolerance, immuno suppression Transplantation immunology- immunologic basis of graft rejection, hyper acute ,chronic rejection. Clinical transplantation-kidney and skin.

UNIT V HYPERSENSITIVE REACTION & AUTOIMMUNITY [15 hrs]

Type-I-components, mechanism & consequences of type-I, type II-transfusion reaction, and hemolytic disease of the newborn, drug induced hemolytic anemia, Type III, & Type IV. Auto immunity- organ – specific & systemic auto immune diseases, (eg., Grave's disease, Hashimoto's thyroiditis, SLE& rheumatoid arthritis), treatment of autoimmune diseases.

TEXT BOOKS:

- 1) Ian Tizard, "Immunology –An introduction", Saunders College Publishing Harcourt Brace College Publishers, USA
- 2) Abbas, Lightman and Pober."Cellular and Molecular Immunology,"2nd edition, W.B. Saunders ,1994.

REFERENCES:

1. Ivon Roitt "Essential Immunology", 7 th edition ,Blackwell publishers , 2006
2. P.M. Lydyard, A.Whelan &M.W Fnger "Immunology"
3. Kuby Richard A.Goldsby,Thomas J.Kindt, Barbara A.Osborne "Immunology" , 6th edition, Freeman publications
4. Mark Peakman, Diegovergani "Basic & Clinical Immunology"
5. David Male, Brian Champion, Anne Cooke & Michael Owen "Advanced Immunology" 2nd edition

YEAR-II	RESEARCH METHODOLOGY & BIOSTATISTICS (75 hrs)	PBC911
SEMESTER-III		HRS/WK-5
CORE-IX		CREDIT-4

OBJECTIVE

To provide knowledge and skills to understand the role of statistics in research.

To develop skill in scientific writing and recent techniques.

To provide sufficient background to be able to interpret statistical results in research papers

UNIT I DATA COLLECTION AND PRESENTATION [15 hrs]

Introduction: Collection of data, primary data and secondary data-different methods of collecting primary data-classification and tabulation of statistical data-Frequency Distribution: Simple and Cumulative. Displaying data-Histogram, Bar chart, Frequency polygon, Pie chart

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 and their coefficients.

UNIT III STATISTICAL ANALYSIS [15 hrs]

Small sample Tests – Student ‘t’ test for mean, difference of two means, 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 and two way classification.

UNIT IV RESEARCH METHODOLOGY [15 hrs]

Literature collection ,Literature citation, writing review of literature, Report writing: formatting & typing. Technique of interpretation, writing abstract ,summary &conclusion. Scientific writing ,Blotting technique – southern ,western, northern & dot-blot ,RFLP& RAPD -techniques & application.

UNIT V SPECTROSCOPIC TECHNIQUES [15 hrs]

Spectroscopy-- principles, technique & application of NMR, ORD & Circular dichroism. PCR Technique- Basic principle, RT-PCR, Quantitative PCR & In Situ PCR. Diagnostic & laboratory application of PCR,DNA finger printing, . MALDI TOF-principle &application.DNA Sequencing.

TEXT BOOKS:

1. Green. R. H. 'Sampling Design and Statistical Methods for Environmental Biologists' .John Wiley & Sons, 1979.
2. Dr.A.Wilson Aruni,Dr.P.Ramadass "Research and writing: Across the disciplines", MJP Publishers
3. Gupta.S.C & Kapoor. V.K. "Fundamental of Applied Statistics" (2nd ed) ,MJP Publishers, 1978

REFERENCES:

1. Dr.G.Vijayalashmi, Dr.C.Sivapragasam "Research methods: Tips and Techniques",MJP Publishers
2. Matthews,' Sucessful Scientific writing: A step-by step guide for Biomedical Scientists'. 2nd ed. Cambridge University Press, 2001.
3. Thomas Glover, Kevin Mitchell.,' Introduction to Biostatistics', 1st ed. McGraw Hill Science, 2001.
4. Dr N .Gurumani, "An Introduction to Biostatistics",MJP Publishers
5. Dr N .Gurumani, "Thesis writing and paper presentation", MJP Publishers
6. Wilson & Walker,' Principles and Techniques in Practical Biochemistry' 5th ed.. Cambridge Univ. Press, 2000.
7. Pavia et al.' Introduction to Spectroscopy', 3rd ed. Brooks/Cole Pub Co., 2000.
8. Upadhyay, Upadhyay and Nath,' Biophysical Chemistry- Principles and Techniques'
Himalaya Publ. 1997.

YEAR-II	BIOTECHNOLOGY (75 hrs)	EPBC912B
SEMESTER-III		HRS/WK-5
ELECTIVE-V		CREDIT-4

OBJECTIVE :

To understand the basic concepts and applications of biotechnology in diverse fields such as agriculture, medicine and the environment

UNIT I GENE TRANSFER METHODS [15 hrs]

Basic principles, use of restriction enzymes for production of DNA fragments. Cloning vectors—plasmids (pBR 322, pUC 18), phages (λ and M13) and cosmids. YACs, BACs, PACs. Splicing of DNA— cohesive end method, blunt end ligation, linkers and adaptors. Selectable markers and reporter genes used for gene transfer - GUS gene, Lux gene, *npt II* and GFP protein. Co-integrate and binary vectors, Agrobacterium mediated gene transfer- Ti plasmid, the process of T DNA transfer and integration, direct gene transfer methods - particle bombardment, PEG transformation, Electroporation.

UNIT II PLANT BIOTECHNOLOGY [15 hrs]

Introduction to cell and tissue culture-media, composition and preparation. Culture types- callus culture, cell suspension culture, protoplast culture etc., Somatic embryogenesis, organogenesis, embryo culture and embryo rescue. Micropropagation, Protoplast isolation, protoplast culture and fusion, selection of hybrid cells, cybrids, somaclonal variation. Germplasm storage and cryopreservation

UNIT III ANIMAL BIOTECHNOLOGY [15 hrs]

In vitro fertilization and embryo transfer. Vaccines –types, subunit recombinant vaccine – hepatitis B and vector recombinant vaccine – vaccinia Development of transgenic animals– retroviral, microinjection and embryonic stem cell methods. Applications of transgenic animals. Gene therapy–ex vivo and in vivo.

UNIT IV BIOPROCESS TECHNOLOGY [10 hrs]

Bioprocess– Basic principles of microbial growth. Types, design and operation of fermenters. Fermentation culture medium– carbon, nitrogen and vitamin sources. Downstream processing– separation, concentration, purification and modification .Production of vitamin B₁₂ & penicillin.

UNIT V ENVIRONMENTAL BIOTECHNOLOGY

[20 hrs]

Management of industrial waste- aerobic and anaerobic processes. Solid waste management. Composting ,municipal sewage treatment, pollution control. Biogas, Biofertilizer, Bioremediation. Microbial degradation of xenobiotics.

TEXT BOOKS:

1. U.Sathyanarayana, 'Biotechnology', Allied publishers
2. P.K. Gupta, 'Elements of Biotechnology', Rastogi Publication, 1998

REFERENCES:

1. J.E. Smith, 'Biotechnology', Cambridge University Press 1996.
2. Glick and Pasternak, 'Molecular Biotechnology', Panima Publ
3. S. Ignacimuthu, 'Plant Biotechnology', Oxford, IBH.
4. Watson, 'RecombinantDNA Technology', Scientific American Publ.
5. Slater A, NW Scott, MR Fowler, 'Plant Biotechnology', Oxford University Press, 2003

YEAR-II	MICROBIAL BIOCHEMISTRY (75 hrs)	EPBC912A
SEMESTER-III		HRS/WK-5
ELECTIVE-VI		CREDIT-4

OBJECTIVE

To gain knowledge regarding the structure and properties of micro-organisms, including those of clinical, environmental and industrial importance.

UNIT I GROWTH & METABOLISM OF BACTERIA [15 hrs]

Transport of sugars into bacterial cell – the bacterial phosphotransferase system. Growth – balanced and unbalanced; measurement of growth; continuous culture, fed batch culture; growth and environment; growth cycle of bacterial culture; growth of single cells – cell cycle. Energy yielding metabolism – carbohydrates – EMP, HMP, TCA – importance in bacteria. Phosphoketolase pathway, ED pathway, characteristics of electron transport in bacteria

UNIT II FERMENTATION [15 hrs]

Fermentations: alcoholic fermentation, propionic acid, formic acid, butyric acid and lactic acid fermentation, oxidation of aliphatic and aromatic hydrocarbons, metabolism of one carbon and two carbon compounds. Amino acid biosynthesis; biosynthesis of cell wall – peptidoglycan, teichoic acid, lipids; biosynthesis of straight and branched chain fatty acids, unsaturated fatty acids and cyclopropane fatty acids.

UNIT III BIOPROCESS TECHNOLOGY [15 hrs]

Bioprocess technology – screening for industrially important microbes, strain improvement for better yield; types of fermentation processes. Analysis of batch and continuous bioreactions; stability of microbial reactors; Solid substrate fermentation and media formulation. Inocula preparation; Recovery and purification of products; monitoring of downstream processing.

UNIT IV MICROBIAL PRODUCTS [15 hrs]

Microbial products – Production of organic acids – source, recovery and uses of citric acid and lactic acid. Production of antibiotics – source, production, recovery and uses of tetracycline and amoxicillin. Production of bio insecticides from bacteria and fungi; production of bacterial polysaccharides.

UNIT V BIOMASS PRODUCTION

[15 hrs]

Bioreactors for large scale culture of animal cells; transplanting cultures, artificial organ production. Biomass production –introduction, single cell protein production. General metabolism of cultured animal cells. Secondary metabolites like hormones TPA and Factor VIII.

TEXT BOOKS:

1. Alexander *et al.*, 'Microbial biotechnology', W.H. Freeman Publishers, 1995
2. P.K.Gupta, "Elements of biotechnology", Rastogi Publication, 1998

REFERENCES:

1. Madigan *et al.*, 'Biology of microorganisms', Prentice Hall, 2002
2. Mandelstram, 'Biochemistry of bacterial growth', Blackwell Scientific Publishers
3. Stanbury *et al.*, 'Principles of fermentation technology'. 2nd edition Pergamon Publishers, 1995.
4. Ratledge, Kristiansen 'Basic biotechnology', 2nd edition Cambridge University Press, 2001
5. Schuler, Karg, 'Bioprocess engineering – basic concepts', 2nd edition, Prentice Hall, 2001
6. Balasubramanian *et al.*, 'Concepts in biotechnology' University Press, India. Ltd., 2004
7. Freshney, 'Culture of animal cells: a manual of basic techniques', 4th edition Wiley Liss, 2000

YEAR-II	MOLECULAR PHYSIOLOGY (75 hrs)	PBC1013
SEMESTER-IV		HRS/WK-5
CORE-X		CREDIT-4

OBJECTIVE

To gain knowledge about the structure & functions of various organs in the molecular level.

UNIT I DIGESTIVE SYSTEM [15 hrs]

Digestion- Digestive processes at various regions of digestive system, composition, functions and regulation of saliva, gastric, pancreatic, intestinal and bile secretions. Digestion and absorption of carbohydrates, lipids, proteins and nucleic acids.

UNIT II CARDIO PHYSIOLOGY [15 hrs]

Cardiac system – physiologic anatomy of heart- genesis and spread of cardiac impulses-coronary cycle, cardiac cycle, heart sound, cardiac output, cardiovascular regulatory mechanisms, E.C.G-Measurement Of ECG. Composition of blood, blood coagulation – mechanism and regulation.

UNIT III RESPIRATORY PHYSIOLOGY [15 hrs]

Respiratory system – functional anatomy of air, passages and lung respiratory muscles, mechanism of respiration, pulmonary ventilation, alveolar surface tension, lung volumes and capacities. Gas-exchange in the lungs, regulation of respiration. Role of 2,3-diphosphoglycerate, Bohr's effect and chloride shift.

UNIT IV RENAL PHYSIOLOGY [15 hrs]

Renal system- structure of kidney & nephron- glomerular filtration, tubular reabsorption of glucose, water and electrolytes and tubular secretion. Mechanism of formation of urine- homeostatic regulation of water and electrolytes, counter current mechanism. Regulation of acid-base balance.

UNIT MUSCLE & NERVE PHYSIOLOGY [15 hrs]

Muscles - types of muscle -skeletal and smooth muscle- mechanism of muscle contraction-. Nervous system-structure of neuron and synapse-basic functions of synapses & neurotransmitters. Mechanim of transmission of impulse -synaptic transmission, neuromuscular transmission. Central nervous system-Cerebrospinal fluid. Basis of EEG.

TEXT BOOKS:

1. Ganong W. E." Review of Medical Physiology", 21st ed, Mc. GrawHill, 2003.
2. Guyton. A.C, Hall. J.E. "Textbook of Medical Physiology", 11th ed. Saunders Company, 2005

REFERENCES:

1. Meyer, HS Meij, AC Meyer,' Human Physiology', AITBs Publishers and Distributors.
2. GIES, Cell biology 5th edition, W.B Saunders company, Tokyo, Japan.
3. K.A. GOEL, K.V. Sastri, "A Text book of Animal Physiology, Rastogi publications, Meerut.
4. K.Saradha Subramanyam,"A Hand Book of Basic Human physiology", S.Chand & Co.,Ltd.
5. Y.Rajalaskhmi,'Guide to Physiology', S.Chand & Co.,Ltd
6. Smith et al,' Mammalian Biochemistry', 7th edn.,Mc. Graw Hill.

YEAR-II	BIOINFORMATICS (75 hrs)	PBC1014
SEMESTER-IV		HRS/WK-5
CORE-XI		CREDIT-4

OBJECTIVE

To gain knowledge in using software techniques and internet resources to handle and compare sequence and structure information and search databases .

UNIT I INTRODUCTION [15 hrs]

Bioinformatics, Goal, Scope, Applications, Limitations. Database, Types of Databases, Biological Databases, Pitfalls of Biological Databases .Sequence databases – Nucleic acid – GenBank, EMBL, DDBJ. Protein – Swissprot, TrEMBLPIR. Structural – PDB, MMDB. Sequence retrieval – Entrez.

UNIT II SEQUENCE ALIGNMENT [15 hrs]

Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues. Basic concepts of sequence alignment, Needleman & Wuncsh, Smith & Waterman algorithms for pairwise alignments. Basic concept of a scoring matrix, Matrices for nucleic acid and proteins sequences, PAM and BLOSUM series, Sequence alignment –pairwise-local and global - Dot Matrix Method and Dynamic Programming Method. BLAST and FASTA

UNIT III PHYLOGENETICS & MSA [15 hrs]

Multiple sequence alignment (MSA) – Tools for MSA on open source CLUSTALW. Phylogenetics, Parsimony, forms of tree representation ,rooted and unrooted, Boot trapping, phylogenetic programs-PHYLIP

UNIT IV GENE PREDICTION [15 hrs]

DNA micro arrays and uses. Gene prediction in prokaryotes and eukaryotes, SNPs, Methods for gene prediction – GenScan, GRAIL, FGENESH/FGENES, Metabolic pathways-KEGG, Pharmacogenomics (Brief Description)

UNIT V HUMAN GENOME PROJECT [15 hrs]

Introduction and need of Human Genome Project, rough and final draft of the Human Genome Project, Goals of the HGP, uses and applications. Applications of bioinformatics in various fields:Environment, biotechnology, molecular biology, neurobiology, agriculture, drug designing, biomedical genome medicines, medical microbiology.

TEXT BOOK:

Arthur M.Lesk ,'Introduction to Bioinformatics '(2002) , Oxford University press.

REFERENCES:

1. Attwood & Parry-Smith, "Introduction to Bioinformatics", Pearson Education
2. Jean-Michel Claverie, "Bioinformatics-A Beginner's guide", John Wiley & Sons.
3. Philip E. Bourne and Helge Weissing , "Structural Bioinformatics", Wiley
4. 4. Rastogi,S.C. Mendiratta, N. and Rastogi P , "Bioinformatics-Methods and applications", Prentice-Hall of IndiaPvt. Ltd, New Delhi
5. Jin Xiong , "Essential Bioinformatics", Cambridge University Press
6. Mount DW , "Bioinformatics - Sequence and Genome analysis", Cold Spring Harbour Laboratory Press, New York
7. BaxevanisAD & Quellette BFF , "Bioinformatics", John Wiley & Sons Inc.

Web sites

<http://www.ensembl.org>

<http://www.ncbi.nlm.nih.gov/genbank>

<http://www.123genomics.com>

<http://www.expasy.ch>

YEAR-II	PHARMACEUTICAL BIOCHEMISTRY (75 hrs)	EPBC1015A
SEMESTER-IV		HRS/WK-5
ELECTIVE IV		CREDIT-4

OBJECTIVE:

To understand various routes of drugs administration, distribution, metabolism and excretion.

UNIT I INTRODUCTION [15 hrs]

Drug – sources, dosages forms and routes of administration. Drugs – structural features and pharmacological activity, prodrug concept, absorption, factors modifying drug absorption. Distribution, metabolism and excretion of drugs, phase-I, II reaction, action of cytochrome P₄₅₀

UNIT II DRUG –RECEPTOR INTERACTIONS [10 hrs]

Drug receptor- localization, types and sub types, models and theories. G-protein coupled receptor and ion- channel linked receptor, Examples of drug –receptor interactions. Agonist and Antagonist.

UNIT III PHARMACOKINETICS [15 hrs]

Drug tolerance and drug dependence. Principles of basic pharmacokinetics. Adverse response to drugs, drug intolerance, pharmacogenetics, drug allergy, tachyphylaxis, drug abuse, vaccination against infection, factors modifying drug potency: chemical, bio assay and immunoassay.

UNIT IV DRUG THERAPY-I [20 hrs]

Mechanism of action of drugs used in therapy of respiratory system (cough- eg- chlorpheniramine, Diphenhydramine, bronchial-asthma-eg, salbutamol, methyl xanthine, pulmonary tuberculosis), anti-microbial drugs-sulfonamides, trimethoprim, penicillin, aminoglycosides -General principles involved in the chemotherapy of cancer -anti thyroid drugs eg carbimazole, insulin and oral antidiabetic drugs eg-sulphonylureas, biguanides

UNIT V DRUG THERAPY-II [15 hrs]

Anti malarial drugs –mode of action of chloroquine, quinine, anti fungal drugs – mode of action of chlorophenacin, griseofulvin and candidin. Anti viral drugs - mode of action of idoxuridine, acyclovir and amantadine hydrochloride.

TEXT BOOKS:

1. G.R.Chatwal, "Pharmaceutical Chemistry -vol-1",Himalaya Publishing House , New Delhi
2. G.R.Chatwal, "Pharmaceutical Chemistry -vol-2",Himalaya Publishing House , New Delhi
3. Jayasree Ghosh "Text book of Pharmaceutical Chemistry", S.Chand & Company, Ltd., New Delhi

REFERENCES:

1. Joseph R.Palma,John DiGregorio"Basic Pharmacology in Medicine",McGraw Hill Publishing Company,New York
2. 2.Good man, Gilman "The Pharmacology, volume I and II".
3. Katzung ,"Basic and Clinical Pharmacology", 7th edition- ,Prentice hall ,New Delhi.
4. Satoskar et al ,"Pharmacology and Pharmaco therapeutics", Popular Purashar,Mumbai.
5. M.Atherden ,"Text book of Pharmaceutical Chemistry", 8th edition.

YEAR-II	GENETIC ENGINEERING (75 hrs)	EPBC1015B
SEMESTER-IV		HRS/WK-5
ELECTIVE IV		CREDIT-4

OBJECTIVE

To equip the students to learn and apply the recent advances in the various techniques of GE to introduce a new characteristics to introduce a novel trait or enhancing existing ones, or produce a new protein or enzyme.

UNIT I AN INTRODUCTION TO GENETIC ENGINEERING [15 hrs]

Enzymes used in genetic engineering- Restriction endonucleases, DNA polymerases, Reverse transcriptase, Ligases, Polynucleotide kinase, Alkaline phosphatase, Nucleases, Klenow fragment, Terminal deoxynucleotidyl transferase, RNase. Vectors for cloning- Plasmids, Bacteriophage, Filamentous phage vectors, Cosmids, Phagemids, YACs. Ligation of DNA fragments with vectors - Homopolymer tailing, Ligation of cohesive termini, Blunt-end ligation, Linker molecules.

UNIT II GENE TRANSFER METHODS [15 hrs]

Introducing genes into prokaryotes- Natural gene transfer methods- Transformation, transduction, calcium chloride mediated transformation, Transfection with phage vectors. Introducing genes into eukaryotes- Gene transfer by viral transduction, Calcium phosphate mediated transformation; Liposome mediated transformation, Microinjection, Electroporation.

UNIT III CLONING STRATEGIES [15 hrs]

Cloning strategies: Producing genomic libraries in cloning vectors, Genomic libraries in high-capacity vectors, cDNA cloning, Shotgun cloning, Cloning in *E.coli*, Identifying the recombinant DNA and its products- Immunochemical screening, Hybrid arrested translation, Nucleic acid probes.

UNIT IV PROKARYOTIC EXPRESSION SYSTEMS [15 hrs]

Prokaryotic expression systems Gene expression based on bacteriophage T7 RNA polymerase, Eukaryotic expression systems- Fused genes, Unfused genes, Secreted proteins, Gene expression by transcription factors- Nfkb, PPAR, Antisense RNA technology- SiRNA, miRNA.

UNIT V TECHNIQUES IN GENETIC ENGINEERING [15 hrs]

Techniques in genetic engineering- Hybridization technique, Southern, Northern- Western blotting techniques, Site directed mutagenesis, Restriction mapping, DNA

profiling in forensic science, Chromosome walking, Chromosome jumping, DNA sequencing, PCR. Basic concepts of Intellectual property rights.

TEXT BOOKS:

1. Primrose s. B., Twyman, R.M., and Old, R.W. Principles of gene manipulation. Sixth edition. Blackwell Publishers.2001.
2. Sandhya Mitra, Genetic Engineering. Macmillan India Limited. 2005.

REFERENCES:

1. Primrose, Principles of Genome analysis. Blackwell Sciences.2003.
2. Watson. Recombinant DNA. Second edition. American Publishers.1992.
3. Sambrook, J., Fritsch, E. F., and T. Maniatis, Molecular Cloning,
4. A Laboratory Manual, Second edition. Cold Spring Harbor Laboratory Press, New York, 1989.
5. Joseph M. Fernandez and James P. Hoeffler. Gene expression systems.Academic Press, 1999.

PBCP303 - CLINICAL BIOCHEMISTRY PRACTICALS
PRACTICAL III

1. Estimation of blood glucose by OT method
2. Estimation of serum cholesterol
3. Estimation of serum triglycerides
4. Estimation of phospholipids
5. Estimation of serum creatinine
6. Estimation of LDL/HDL cholesterol
7. Estimation of SGPT and SGOT in serum
8. Estimation of alkaline phosphatase in serum
9. Estimation of acid phosphatase in serum
10. Estimation of glutathione peroxidase
11. Estimation of blood urea
12. Estimation of vitamin A
13. Estimation of vitamin E
14. Estimation of vitamin C
15. Estimation of SOD & Catalase

HEMATOLOGY

1. Collection of Blood
2. Blood Grouping
3. Clotting Time
4. Bleeding Time
5. ESR
6. RBC Count
7. WBC Count
8. Hb Estimation

URINE ANALYSIS-Normal and abnormal constituents

TECHNIQUES:

1. Immunoelectrophoresis
2. Separation of DNA by submarine electrophoresis

M.PHIL BIOCHEMISTRY
MBC101 - RESEARCH METHODOLOGY

UNIT I Scientific Research (35 hours)

Research . definition, importance & need for research ethics, selection of topic, hypothesis. Research schedules, Sample collection techniques,. Data collection , review of literature & its use in designing a research work. Mode of collection of literature .year books, books & monographs, journals, conference proceedings, abstracting & indexing journals, notes & index cards, internet, magazines, CD- ROMS. Preparation of manuscript- plan of the report, designing of methodology, interpretation of data & thesis layout. Scientific writing .characteristic of scientific writing, essential features of an abstract, presentation of data, writing of results & discussions.Computer application in scientific research. World Wide Web. Finding scientific articles . Pub med . Public biological databases. Power point features, slide preparation.

UNIT II Bioinformatics (25 hours)

The scope of bioinformatics. The internet. The world wide web. File formats. Biological data bases-sequence and structure-NCBI,PDB. Data retrieval – the Entez system. Searching sequence databases – sequence similarity searches, substitution matrices. Database search-FASTA and BLAST.Protein multiple sequence alignments- CLUSTAL.Protein docking

UNIT III Biostatistics (25 hours)

Collection and classification of data – diagrammatic and graphic representation of data – measurement of central tendency – standard deviation – standard error-normal distribution – test of significance based on large samples – small samples – student t test – F test- correlation and regression – Chi square test for independents of attributes – ANOVA. Use of SPSS . Multiple Duncan's test

UNIT IV (25 hours)

Blotting techniques, CD-spectra,Capillary electrophoresis, working and applications. ELISA. Spectroscopy-general principle and applications-Mass spectroscopy,XRD-DNA sequencing- sangers and pyrosequencer, 2D electrophoresis, MALDI-TOF, COMMET assay,PCR,peptide mass finger printing

UNIT V Bioethics and Patenting (25 hours)

Bioethics involved in animal studies,Patents-process and product, copyright, TRIPs, IPR, plant breeder's right, conditions for patenting; patenting of liveforms.

REFERENCE BOOKS.

1. R.A.Day. How to write a scientific paper. Cambridge university press.
2. Cooray P.G.Guide to scientific and technical writing.
3. Carter V Good and Douglas E seats Methods of Research.
4. Alley, Michael. The craft of scientific writing Englewood Cliffs.N.N.Prentic 1987.
5. M.C. Sharma, Desk Top Publishing on PC, BPB Publications, 1887.
6. Lesk, A.M. Introduction to Bioinformatics Oxford 2002.
7. Krane et al fundamental concepts of bioinformatics Benjamin Cummings.
8. Sundar Rao, Jesudian Richard – An introduction to Biostatistics.
9. S.P.Gupta – Fundamentals of statistics, Sultan Chand.
- 10.Ethics and the use of alternatives to animals in research and education.Shiranee Pereira.CPCSEA.
- 11.CPCSEA guidelines for laboratory animal (CPCSEA) – No.13 Scaward road, Valmiki NagerChennai – 41.
- 12.Ethical guidelines for biomedical research on human subjects. ICMR,New Delhi, 2000.
- 13.Dickson. Molecular and cell biology of human gence therapeutics. SeriesChapman and Hall 1995.
- 14.Research and Development Funding Schemes of Central GovernmentDepartments and Agencies. Ministry of Science and Technology,Departement of Science and Technology, New Mehrauli Road,New Delhi- 110106.
- 15.Biostatistical analysis-Zar 5th *Edition Publisher*: Prentice Hall
- 16.Molecular cloning-sambrook,ManitiesVol-I,II, and III
- 17.Current protocols in molecular biology,Ausubel *Publisher: Current Protocols*

MBC102 - BIOCHEMICAL ASPECTS OF DISEASES

UNIT I

(25 hours)

Maintenance of blood sugar- Diabetes mellitus-classification- stages- complications and monitoring. carcinogenesis- molecular basis of cancer- oncogenes- mechanism- Antioncogenes-p53 pathway and its role

UNIT II

(25 hours)

Formation of free radicals, autoxidation initiated by oxygen radicals, Influence of free radicals in metal toxicity. Free radical hepatotoxins- CCl₄ model .free radicals and cancer .Oxidative process in tissue injury. Detection of free radicals and radical ions. Role of free radicals in diseases.

UNIT III

(25 hours)

Marker enzymes in hepatobiliary disease, myocardial infarction, atherosclerosis, renal dysfunction.
Cancer markers for oral, prostate, colorectal breast and GI tract cancer, oncofetal cancer markers.

UNIT IV

(25 hours)

Enzymic antioxidants- Chemistry, mechanism, antioxidant effect of SOD, catalase, Glutathione Peroxidase. Non Enzymic antioxidants- source, chemistry, toxicity, biochemical functions, bioavailability, bioassays, Antioxidant effects of Vit A, Vit C, Vit E, glutathione and selenium.

UNIT V

(35 hours)

Toxic mechanism- Carcinogenesis, teratogenesis & immunotoxicity, LD₅₀, ED₅₀, TI Heavy metal toxicity - effects of physiochemical and biological factors. Bioassays for heavy metal toxicity, pathological and histopathological examinations for heavy metal toxicity.

REFERENCES:

1. Biochemistry oxygen toxicity, Annual review of Biochemistry Enrique cadinar, Vol 58, 1989, pp 78-110
2. Free radicals in biology by William a. Pryor, Academic press 1980., pp 96-150.
3. Heavy metal toxicity testing in environmental samples, Reviews of environmental contamination and toxicology in chul, Kong , Gabriel Bitton, Benkoopan, vol 142, 1995, pp 130-136.

4. Methods of plant analysis, Phytochemical analysis by J.B. Harborne, Chapman & Hall Ltd. 1973 pp 1-26.
5. Pharmacology of medicinal plants and natural products by S.A. Dhanukar, R.A. Kulkarni, W.N. Rege, Indian Journal of Pharmacology, 2000 S81-S118.