





**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 .

St. Joseph's College, Cuddalore.

**SEMESTER – I INTERMEDIARY METABOLISM - PBC703S****OBJECTIVE:**

To understand catabolic and anabolic pathways of carbohydrate, lipids, amino acids and porphyrin metabolism and its biological functions.

**UNIT I BIOENERGETICS [15 hrs]**

Biological oxidation-reduction reactions, redox potentials, High energy phosphate compounds – phosphate group transfer, Glycolysis-regulation and energetic- PDH complex-citric acid cycle, regulation and energetics ETC –oxidative phosphorylation-regulation and inhibition- uncouplers.

**UNIT II CARBOHYDRATES METABOLISM [15 hrs]**

Pentose phosphate pathway. Gluconeogenesis – glycogenesis & glycogenolysis metabolism - regulation, glyoxylate cycle and Gamma aminobutyrate shunt pathways, Cori cycle, anapleurotic reactions, glucuronate pathway. Hormonal regulation of carbohydrate metabolism. MTOR pathway

**UNIT III AMINO ACID METABOLISM [15 hrs]**

Amino Acids – General reactions of amino acid metabolism - Transamination, decarboxylation, oxidative & non-oxidative deamination of amino acids. catabolism of carbon skeletons of amino acids tyrosine and aliphatic amino acids. Urea cycle and its regulation

**UNIT IV LIPID METABOLISM [15 hrs]**

Introduction, hydrolysis of tri-acylglycerols,  $\alpha$ -,  $\beta$ -,  $\omega$ - oxidation of fatty acids. Oxidation of odd numbered fatty acids, PUFA- fate of propionate, role of carnitine, degradation of complex lipids. Fatty acid biosynthesis, Acetyl CoA carboxylase, fatty acid synthase, biosynthetic pathway for tri-acylglycerols, phosphoglycerides and sphingomyelin. Metabolism of cholesterol and its regulation. Energetic of fatty acid cycle.

**UNIT V NUCLEIC ACID METABOLISM [15 hrs]**

Nucleotides – Biosynthesis of Purines (de nova and salvage) and biosynthesis of Pyrimidines - catabolism and regulation of purine and pyrimidine biosynthesis.

Biosynthesis of  $\text{NAD}^+$ / $\text{NADP}^+$  and  $\text{FAD}^+$ .

**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' 5<sup>th</sup> 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.

St. Joseph's College, Cuddalore.

**SEMESTER – I CLINICAL NUTRITION- EPBC704S****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: sources-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.L Publishers, New Delhi
2. Mahan, L. Kand Escott-Stump, S (2000): Krause's Food Nutrition and Diet therapy, 10<sup>th</sup> ed, W-13 Saunders Ltd

**REFERENCES:**

1. Mahan, L. Kand Escott-Stump, S (2000): Krause's Food Nutrition and Diet therapy, 10<sup>th</sup> ed, W-13 Saunders Ltd
2. Shills, ME, Olson, JA, Shike, M and Ross, A.C (1999): Modern Nutrition in Health and Disease, 9<sup>th</sup> ed, A. Vaiiams and willons
3. Williams, SR (1993): Nutrition and Diet Therapy, 7<sup>th</sup> 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.L Publishers, New Delhi

**SEMESTER – I PRACTICAL- PBCP101**

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

**SEMESTER – II MOLECULAR BIOLOGY PBC805S****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 (brief description), central dogma of molecular biology The genomes of bacteria, viruses, mitochondria and chloroplast-Gene transfer in microorganisms- conjugation-Hfr transfer, chromosomal transfer and the mediation by F plasmids, transformation-competence, transduction - protoplasmic fusion.

**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-Discontinuous replication, replication of circular DNA and linear DNA. Mitochondrial replication

**UNIT-III TRANSCRIPTION [10 hrs]**

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

**UNIT-IV GENETIC CODE AND TRANSLATION [15 hrs]**

Genetic code-features and deciphering of genetic code. 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 .Operon concept-lac, arabinose and trp operon, wobble hypothesis.

**UNIT-V DNA REPAIR [15 hrs]**

DNA repair-photoreactivation, Excision repair, recombination and SOS repair. Protein targeting-Heat shock proteins ,glycosylation; SNAPs and SNAREs. Repetitive DNA-Highly repetitive, moderately repetitive and unique DNA sequences. satellite DNA, transposons, retrotransposons and IS elements in bacteria, Gene dosage and gene amplifications

**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



**SEMESTER – II ENZYMES PBC806S****UNIT I****ENZYME & THERMODYNAMICS****[15 hrs]**

Introduction –classification and nomenclature of enzymes, Factors affecting enzyme activity- Active site-definition: Investigation of active site structure, Trapping ES complex, Use of substrate analogues. Modification of amino acid side chain by single chemical procedures, Enzyme modification by treatment with proteases, Enzyme modification by site directed mutagenesis. General characteristics of enzyme activity, Turnover number.

**UNIT II****KINETICS OF ENZYME ACTION****[15 hrs]**

Concept of ES complex, Active site, specificity, derivation of Michaelis Menten equation for uni substrate reaction. Different plot for the determination of  $K_m$ ,  $V_{max}$  &  $K_{cat}$  and their significance. Collision, transition state theories and energy of activation. The rate of expression for bisubstrate reaction for ping pong, random and ordered bi- bi mechanisms.

**UNIT III****MECHANISM OF ENZYME ACTION****[15 hrs]**

Acid base catalysis, covalent catalysis, metal ion catalysis, proximity, orientation effect. Strain and distortion theory. Lock and chemical modifications of active site groups. Site directed mutagenesis of enzyme. Mechanism of action of Chymotrypsin, Lysozyme, glyceraldehydes 3-phosphate dehydrogenase, and ribonuclease.

**UNIT IV****ENZYME REGULATION****[15 hrs]**

General mechanism of enzyme regulation, product inhibition. Reversible (glutamine synthase and phosphorylase) and irreversible (protease) covalent modification of enzymes. Feed back inhibition and feed forward stimulation. Allosteric enzymes, Flipflop mechanism, positive and negative cooperativity with special reference to aspartate transcarbamoylase and PFK. Protein ligand binding measurement, analysis of binding isotherms, Hill and Scatchard plot.

**UNIT V****ENZYME INHIBITION****[15 hrs]**

Irreversible-reversible –competitive, non competitive, uncompetitive inhibition-Kinetic differentiation and graphical analysis. Suicide inhibition. Immobilized enzymes –methods of immobilization –applications of immobilized enzymes.

**TEXTBOOKS:**

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

**SEMESTER – II ANALYTICAL BIOCHEMISTRY PBC807****UNIT I 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 II 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 III ELECTROPHORESIS AND ELECTROCHEMICAL TECHNIQUES [15 hrs]**

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

**UNIT IV 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 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.

**SEMESTER – II ENDOCRINOLOGY EPBC808****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, IP<sub>3</sub>, Ca<sup>2+</sup>, 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. 4<sup>th</sup> ed. Freeman, 2004

**SEMESTER – II PRACTICAL-II- PBCP202**

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