ST.JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

III SEMESTER **BIOCHEMISTRY** TIME:4Hrs/Week

BCH 3803 (3) **ENZYMOLOGY, BIOENERGETICS AND INTERMEDIARY METABOLISM** Marks:100

w.e.f. 21AI Batch  **SYLLABUS**

**OBJECTIVES : To enable the students to-**

* Comprehend basic concepts of enzymology and learn about their commercial applications
* Realize importance of Bioenergetic with respect to physiological processes
* Sketch the entire carbohydrate metabolism and its energetics
* Comprehend lipid metabolism and its role in human body maintenance
* Explain amino acid metabolism, and Nucleic acid metabolism and interpret its usage in cancer therapy

**Course Outcomes- Students will be able to:**

**CO1:**Describethechemicalnatureofenzymes and use appropriate nomenclature

**CO2**:Quantify bioenergetics and elaborate physiological adaptations of plants and animals

**CO3:** Identify major pathways of carbohydrate and lipid metabolism

**CO4:**.Define major pathways of amino acids metabolisms

**CO5:** Analyze the reasons for various inborn errors of metabolism

**Unit-I: Enzymology**:**12 hours**

Introduction to Biocatalysis, differences between chemical and biological catalysis. Nomenclature and classification of enzymes. Definition of holo-enzyme, apo-enzyme, coenzyme, cofactor. Active site, Enzyme specificity. Principles of energy of activation, transition state. Interaction between enzyme and substrate-lock and key, induced fit models. Fundamentals of enzyme assay, enzyme units. Outlines of mechanism of enzyme action, factors affecting enzyme activity. Commercial application of enzymes.

**Unit- II: Bioenergetics and Biological oxidation:** **12 hours**

Bioenergetics: Thermodynamic principles – Chemical equilibria; free energy, enthalpy (H), entropy (S). Free energy change in biological transformations in living systems; High energy compounds. Energy, change, oxidation-reduction reactions.

Organization of electron carriers and enzymes in mitochondria. Classes of electron-transferring enzymes, inhibiters of electron transport. Oxidative phosphorylation. Uncouplers and inhibitors of oxidative phosphorylation. Mechanism of oxidative phosphorylation.

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**Unit-III: Carbohydrate Metabolism:** **12 hours**

Concept of anabolism and catabolism. Glycolytic pathway, energy yield. Fate of pyruvate-formation of lactate and ethanol, Citric acid cycle, regulation, energy yield, amphipathic role. Anaplerotic reactions. Glycogenolysis and glycogenesis. Pentose phosphate pathway. Gluconeogenesis. Photosytnthesis- Light and Dark reactions, Calvin cycle, C4 Pathway. Disorders of carbohydrate metabolism- Diabetes Mellitus*.*

**Unit-IV: Lipid Metabolism:** **12 hours**

Catabolism of fatty acids (β- oxidation) with even and odd number of carbon atoms,Ketogenesis, *DE NOVO* synthesis of fatty acids, elongation of fatty acids in mitochondria and microsomes, Biosynthesis and degradation of triacylglycerol and lecithin. Biosynthesis of cholesterol. Disorders of lipid metabolism.

**Unit-V: Metabolism of Amino acids:** **12 hours**

General reactions of amino acid metabolism- transamination, decarboxylation and deamination, Urea cycle and regulation, Catabolism of carbon skeleton of amino acids- glycogenic and ketogenic amino acids. Metabolism of glycine, serine, aspartic acid, methionine, phenylalanine and leucine. Biosynthesis of creatine. Inborn errors of aromatic and branched chain amino acid metabolism.

**Recommended books:**

1. Understanding enzymes: Palmer T., Ellis Harwood ltd., 2001.
2. Enzyme structure and mechanism. Alan Fersht, Freeman & Co. 1997
3. Principles of enzymology for food sciences: Whitaker Marc Dekker 1972.
4. Principles of Biochemistry, White. A, Handler, P and Smith.
5. Biochemistry, Lehninger A.L.
6. Biochemistry, LubertStryer.
7. Review of physiological chemistry, Harold A. Harper.
8. Text of Biochemistry, West and Todd.
9. Metabolic pathways – Greenberg.
10. Mitochondria, Munn.
11. Biochemistry, 2nd Edition, G. Zubay.

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