

SRI VENKATESWARA UNIVERSITY: TIRUPATI

BIOCHEMISTRY - Minor

w.e.f. 2024-25 AY onwards

COURSE STRUCTURE

Year	Semester	Course	Title	No. Hrs./ Week	No. of Credits
	II	1	Biomolecules - (T)	3	3
			Biomolecules - (P)	2	1
II	III	2	Analytical techniques- (T)	3	3
			Analytical techniques- (P)	2	1
	IV	3	Bioenergetics and Metabolism of Carbohydrates and Lipids- (T)	3	3
			Bioenergetics and Metabolism of Carbohydrates and Lipids- (P)	2	1
	IV	4	Enzymology- (T)	3	3
			Enzymology- (P)	2	1
III	V	5	Nutritional Biochemistry - (T)	3	3
			Nutritional Biochemistry - (P)	2	1
		6	Clinical Biochemistry- (T)	3	3
			Clinical Biochemistry- (P)	2	1

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IV -SEMESTER

Course No-3: BIOENERGETICS AND METABOLISM OF CARBOHYDRATES AND LIPIDS

COURSE OBJECTIVES

1. To acquire knowledge related to the intermediary metabolism and the role of TCA cycle in central carbon metabolism.
2. To learn basic concepts of Bioenergetics, the importance of high energy compounds, electron transport chain, synthesis of ATP, mechanisms of oxidative phosphorylation and photophosphorylation.
3. To understand the fundamentals of cellular metabolism of carbohydrates their association with various metabolic diseases.
4. To learn biosynthesis and degradation of Lipids, fatty acids and cholesterol, Metabolism of lipoproteins and Ketone bodies.

UNIT-I

Principles of thermodynamics, free energy, enthalpy and entropy, Free energy changes in biological transformations in living systems. Redox potential, phosphate group transfer potential and ATP, High-energy compounds, oxidation and reduction reactions.

UNIT-II

Oxidative phosphorylation, Mitochondria ultrastructure, Reducing equivalents, Electron transport and its carriers-Complex I, II, III, IV; Mitchell's Hypothesis, P: O ratio, ATP synthesis by F1-FO ATP synthase, Oxidation and reduction enzymes, utilization of oxygen by oxygenase's, superoxide dismutase and catalase. Respiratory control, Mechanism, and theories of oxidative phosphorylation. Respiratory chain inhibitors and uncouplers of oxidative phosphorylation.

UNIT-III

Approaches for studying intermediary metabolism. Glycolysis, and its regulation. TCA cycle – function and regulation, Glyoxylate cycle, Gluconeogenesis, and its regulation, HMP shunt and its significance, Uronic acid pathway, Glycogenesis & Glycogenolysis, Inborn errors of carbohydrate metabolism.

UNIT-IV

Lipid metabolism – Oxidation of fatty acids, Biosynthesis of fatty acids and regulation, Ketogenesis, Biosynthesis of triglycerides & degradation of triglycerides, lipoproteins.

UNIT-V

Metabolism of phospholipids, sphingolipids. Biosynthesis of cholesterol and its regulation, Role of liver and adipose tissue in lipid metabolism. Inborn errors of lipid metabolism.

Course Outcome:

1. Student can describe the principles of Thermodynamics
2. Student can explain electron transport mechanism.
3. Student acquire knowledge on Carbohydrate metabolism.
4. Student acquire knowledge on Lipid metabolism.
5. Student can explain synthesis of cholesterol and role of liver in lipid metabolism.

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IV - SEMESTER

Course No-3: BIOENERGETICS AND METABOLISM OF CARBOHYDRATES AND LIPIDS

PRACTICAL SYLLABUS

1. Isolation of casein from milk
2. Preparation of lactalbumin from milk
3. Estimation of reducing sugar by DNSA (dinitro salicylic acid) method
4. Titration of glucose by Benedict's method
5. Estimation of creatinine in serum
6. Estimation of cholesterol by ZAK's method

COURSE OUTCOMES

After the completion of this course, the student will be able to

1. Can isolate casein from milk and prepare lactalbumin from milk.
2. Can estimate creatinine serum.
3. Can estimate cholesterol and estimation of Glucose by Benedicts method.

RECOMMENDED BOOKS

1. Principles of Biochemistry, White. A, Handler, P and Smith.
2. Biochemistry, Lehninger A.L.
3. Biochemistry, David E. Metzler.
4. Biochemistry, Lubert Stryer.
5. Text Book of Biochemistry, West and Todd.

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IV -SEMESTER

Course No-4: ENZYMOLOGY

COURSE OBJECTIVES

1. To enlighten the students about enzyme kinetics.
2. To help the students to understand the mechanism of action of enzymes.
3. To help the students to learn the applications of enzymes.

UNIT-I

Introduction to enzymes: Holoenzyme, apoenzyme, prosthetic group. Interaction between enzyme and substrate- lock and key model, induced fit model, enzyme specificity and types. IUB system of classification and nomenclature of enzymes (Class and subclass with one example) Ribozymes, Abzymes.

UNIT-II

Enzyme kinetics: Importance, order of reaction, study of the factors affecting the velocity of enzyme catalyzed reaction- enzyme concentration, temperature, pH, substrate concentration, inhibitors and Derivation of Michaelis -Menten equation and K_m value determination and its significance. Definition of V_{max} value of enzyme and its significance. Lineweaver- Burk plot (Only for single substrate enzyme catalyzed reaction).

UNIT-III

Methods of measurements and expression of enzyme activity. Units of enzyme activity - definition and importance. Enzyme inhibition: Reversible and irreversible – examples. Reversible- competitive, noncompetitive and uncompetitive inhibition- explanation of double reciprocal plot with examples.

UNIT-IV

Enzyme regulation – covalently modulated enzymes with examples of adenylation and phosphorylation and allosteric regulation- example Aspartate trans-carbamylase. Isoenzymes- Lactate dehydrogenase and creatine phosphokinase. Zymogens.

UNIT-V

Immobilization of enzymes, methods of immobilization. Industrial uses of enzymes: Detergent enzymes, thermo stable alpha amylase, papain, and chymotrypsin.

Course Outcome:

1. Students can describe the classification of enzymes.
2. Student can explain enzyme kinetics.
3. Students acquire knowledge on units of enzyme activity and enzyme inhibition.
4. Student gain knowledge on enzyme regulation.
5. Student can explain about Immobilization of enzymes.

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IV -SEMESTER

Course No-4: ENZYMOLOGY

PRACTICAL SYLLABUS

- 01 Assay of α - amylase activity in saliva
- 02 Determination of optimum pH of a plant/animal or microbial enzyme.
- 03 Studying the effect of different temperatures during enzyme activity measurements.
- 04 Studying the effect of different pH during enzyme activity measurements.
- 05 Substrate saturation and determination of K_m value from Michaelis-Menten curve.

COURSE OUTCOMES

After completing this course, the student will:

- 1) Understand the effect of Temperature, pH during enzyme activity measurements
- 2) Study the enzyme activity of different enzymes

Recommended Books:

1. Enzymes: M. Dixon and E. C. Webb. Longman Publication
2. Enzymology: Nicholas and Price
3. Biochemistry: D.Voet and J. G. Voet, John Wiley C sons Inc. New York
4. Biochemistry: L. Stryer and Hall, J.E., Library of congress cataloguing-in publication Data, Bery, Jeremy mark ISBN -0-7167-4684-0.
5. Enzymes: Trevor Palmer Affiliated East- West Press Pvt. Ltd, New Delhi ISBN 81 7671-04