ANDHRA KESARI UNIVERSITY ::ONGOLE

Model Syllabus for Biochemistry (Minor) in consonance with Curriculum framework w.e.f. AY 2025-26

COURSE STRUCTURE

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	III	1	Analytical techniques	3	3
			Analytical techniques-Practical	2	1
	IV	2	Enzymology	3	3
			Enzymology-Practical	2	1
III	V	3	Nutritional Biochemistry	3	3
			Nutritional Biochemistry-Practical	2	1
		4	Intermediary Metabolism- I	3	3
			Intermediary Metabolism- I-Practical	2	1
	VI	5	Intermediary Metabolism -II	3	3
			Intermediary Metabolism -II-Practical	2	1
		6	Clinical Biochemistry	3	3
			Clinical Biochemistry-Practical	2	1

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SEMESTER-III

COURSE 1: ANALYTICAL TECHNIQUES

Theory **Credits: 3** **3 hrs/week**

Course objectives:

1. To understand the basic concepts of analytical techniques.
2. To gain knowledge about the latest advances in analytical techniques.
3. To apply these techniques in research.

UNIT-I

Methods of tissue homogenization. Salt and organic solvent extraction and fractionation, ultra filtration, lyophilization Chromatography: principle, procedure and application of partition chromatography, adsorption chromatography, ion exchange chromatography, gel chromatography, affinity chromatography.

UNIT-II

Electrophoresis: Principle, procedure and application of free flow, zone electrophoresis (Paper electrophoresis, Gel electrophoresis, PAGE, SDS-PAGE) Isoelectric focusing, Immunoelectrophoresis.

UNIT-III

Centrifugation: Principle of sedimentation technique. Different types of centrifuge and rotors. Principle, procedure and application of differential centrifugation, density gradient centrifugation, ultra centrifugation, rate zonal centrifugation, isopycnic centrifugation.

UNIT-IV

Colorimetry and spectrophotometry: Laws of light absorption -Beer - Lambert's law. UV and visible absorption spectra, molar extinction co-efficient. Principle and instrumentation of colorimetry and spectrophotometry. Spectroflurimetry.

UNIT-V

Important stable radioisotopes used in biochemical research. P 32, I 125, I131, Co 60. C 14 etc. Radiation hazards and precautions taken while handling radioisotopes. Units of Radioactivity, Principle and application of RIA. Measurement of radioactivity by GM counter and Scintillation counter.

SEMESTER-III

COURSE 1: ANALYTICAL TECHNIQUES

Practical | **Credits: 1** | **2 hrs/week**

Practical syllabus:

1. Estimation of ascorbic acid
2. Separation and estimation of total carotenoids and β-carotene
3. Extraction and estimation of vitamin A, vitamin E, niacin and free amino
4. Estimation of phosphorus by Fiske and Subbarow method. Characterization of fats – estimation of saponification number, iodine number, acid number and R. M. Number
5. Extraction of Phytoconstituents by Soxhlet and quantification

Course Outcome:

After completing this course, the student will

1. Understand the basic concepts and principles of biochemical techniques namely Spectrophotometry, Fluorimetry, Chromatography and Centrifugation.
2. Analyse biochemical compounds such as Carotenoids, Vitamins, Alkaloids and Flavonoids.
3. Identify the compounds by various biochemical techniques and interpret the results
4. Apply the laboratory skills and concepts in carrying out experiments using sophisticated instruments.

Recommended Books:

1. Physical Biochemistry- Application to Biochemistry and Molecular Biology: Friefelder D. WH Freeman and Company
2. Principles and Techniques of Biochemistry and Molecular Biology: - Ed. K. Wilson and J. Walker, Cambridge Univ. Press.
3. The Tools of Biochemistry: Cooper T.G., John Wiley and Sons Publication.
4. Biophysical chemistry. Principles and Techniques: Upadhayay A, Upadhayay K and Nath N., Himalaya publishing house.
5. Experimental Biochemistry. Cark Jr J. M. and Switzer R.L, W.H. Freeman and Company.
6. Research Methodology for Biological Sciences: Gurumani.N. M.J.P. Publishers., Chennai, India.
7. Instrumental Methods of Chemical Analysis: Chatwal. G and Anand.S. Himalaya Publishing House, Mumbai, India.
8. A Biologist's Guide to Principles and Techniques of Practical Biochemistry: Williams.B.L and Wilson.
   K. (ed.) Edward Arnold Ltd. London
9. Jayaraman, J. (2011). Laboratory Manual in Biochemistry, New Age International (P) Ltd.
10. Sadasivam, S. and Manickam, A. (2005). Biochemical Methods, Second edition, New Age Int. (P) Ltd.

SEMESTER-IV

COURSE 2: ENZYMOLOGY

Theory **Credits: 3** **3 hrs/week**

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 Km value determination and its significance. Definition of Vmax 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. Unit 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 carbamoylase. 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.

SEMESTER-IV

COURSE 2: ENZYMOLOGY

Practical **Credits: 1** **2 hrs/week**

Practical syllabus:

1. Assay of α- amylase activity in saliva
2. Determination of optimum pH of a plant/animal or microbial enzyme.
3. Studying the effect of different temperatures during enzyme activity measurements.
4. Studying the effect of different pH during enzyme activity measurements.
5. Substrate saturation and determination of Km value from Michaelis Menten curve.

Course Outcome:

After completing this course, the student will:

1. Acquire the knowledge of structure and organization of protein
2. Identify the different classes of enzymes, the methods used for purification of enzymes and describe enzyme kinetics for bisubstrate and multisubstrate reactions.
3. Do research in a contemporary action of enzyme and enzyme inhibition.
4. Explain the enzyme regulation and multienzyme complex.
5. Explore the applications of enzymes in clinical and various industrial sectors

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 Chischester Brisbane, Toronto, Singapore ISBN 0-471-58651-X
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