23SC803 ANALYTICAL BIOCHEMISTRY 4 0 0 4

Course Outcome (COs)

From this course, student will be familiarized with the various concepts related to Analytical methods of biochemistry

1. To get the student familiarize with different analytical methods.
2. To understand the basics of investigations with microorganisms and their mutants.
3. To know about the different types of extraction for biochemical investigations.
4. To train the student with the various microscopic techniques.
5. To get an overview of the principle, instrumentation and applications of ultra-filtration.

Syllabus

Unit 1: Overview of Biochemical Investigations: Introduction to biochemistry, outline of strategies in biochemical investigations employing whole animal studies, isolated organs, tissues, and cell cultures. Specific investigations with isolated organelles; mitochondria and ER.

Unit 2: Investigations with microorganisms and their mutants: yeast, *Ceanorhabditis elegans, Arabidopsis thaliana* and *Drosophila melanogaster* as model specimen for biochemical investigations. Basic equipment's and methods, and safety considerations in animal cell culture. Types of animal cells and their characteristics in culture, culture media and common animal cell lines for laboratory investigation. Plant cell culture, media for plant cell culture, potential of plant cell culture in biochemical investigations.

Unit 3: Extractions*:* Preparation of extracts for biochemical investigations, physicochemical properties of metabolites and drugs extracts from biological materials. Physico-chemical properties of solvents, solubility and miscibility, ionic bonds, and salting out. Partition, ionization, buffering and their effect on extraction. Choice of solvent for solvent extraction, mixed solvents, solid phase extraction.

Unit 4: Microscopic techniques: Review of light microscope, resolution of microscopes, Optical
contrast, phase contrast, and dark field microscopy, preparation of specimen for biochemical investigations. Electron microscopy; Working principle and applications, specimens for electron microscopy, fixatives, immune-gold microscopy and its advantages. Metal shadowing, design and applications of scanning electron microscopy (SEM), Transmission electron microscopy (TEM), and cryo-electron microscopy. 3-D images, negative staining, single particle reconstruction.

Unit 5: Fluorescence Microscopy: Fluorophores, principle and applications of fluorescence microscopy, design and uses of Epifluorescence microscopy, and immuno-fluorescence microscopy. Imaging live cells and tissues; time lapse imaging, fluorescence stains of living cells, reporter molecules, multidimensional imaging. Measuring cellular dynamics; calcium

imaging in live cells, fluorescence recovery after photo bleaching (FRAP), Fluorescence resonance energy transfer (FRET). Use of ion-selective electrodes, light emitting indicators and optical tweezers in study of cellular dynamics.

Unit 6: Ultra-filtration: Principle, instrumentation and application. Dialysis, principle and uses of equilibrium dialysis, Precipitation; methods and applications. Flow Cytometry; Principle and design of flow cytometer, cell sorting. Detection strategies in flow cytometry and parameters measured by flow cytometry. Biocalorimetry, Manometry, Radio isotopic methods of analysis

REFERENCES

1. Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer (2011)

2. Basic Methods for the Biochemical Lab; Martin Holtzhauer, Springer, (2007).

3. Principles and Techniques of Biochemistry and Molecular Biology,7th Edn. Keith Wilson and John Walker, Cambridge University Press, (2010).

4. Principles of Gene Manipulations; 6th Edn. S.B. Primrose, R.M. Twyman, and R.W. Old, Blackwell Science (2012).

5. Techniques in Molecular Biology, Walker and Gastra, Croom Helm, (1983)

6. Biochemistry LabFax, Ed. J.A.A. Chambers and D. Rickwood,, Blackwell Science, (1993),

7. Protein Purification Applications, S.L.V. Harris and Angal IRL Press, (1990)

8. Laboratory Techniques in Biochemistry and Molecular Biology, Work and Work Vol. I & II, North Holland, (1969).

9. Nucleic Acid Blotting; D C Darling, P M Bricknell; Garland Science; (1994)

10. Introduction to Proteomics; Daniel C. Liebler, Humana Press (2002),.

11. Introduction to Bioinformatics; T K Attwood & D J Parry-Smith, Pearson Education (2002).

12. Biophysical Tools for Biologists In Vivo Techniques; John Correia H. Detrich, III Elsevier (2008).

13. Recent Advances in Electron Microscopy- Part-A; B.V. Venkartarma prasad, and Steve Ludtke, Academic Press (2010).

EVALUATION AND GRADING

Internal *(Weightage = 50%)*		**External** *(Weightage = 50%)*	**Total**
Components	*Weightage*	Examination = 100 Marks	Internal+ External = 100
Midterm Exam	30%		
Assignments / seminar / class test	20%		

ACTIVITIES/ CONTENT WITH DIRECT BEARING ON EMPLOYABILITY/ ENTERPRENEURSHIP/ SKILL DEVELOPMENT (based on NAAC Criteria):

The learner will get a clear understanding of the concepts and ideas regarding the technical and theoretically relevant area which is explored in the course. This course will equip the learner to build a career as a researcher and academician in Chemical/Environmental Sciences.