ZOS 404: TOOLS AND TECHNIQUES IN BIOLOGY

Teaching hours **10hrs /Unit**

COURSE OUTCOME:

1. Here students are taught to deal with different tools and techniques applicable in biological research including various types of microscopes, centrifuges, electrophoresis, chromatography etc.
2. The theory session mainly focuses on understanding the principles and working mechanisms of different instruments.
3. Learn microbiological techniques, media preparation and sterilization.
4. Fermentation methods to study product yield.
5. Get acquainted with Cytological and histological techniques
6. Develop skills of advanced instrumentation.

UNIT-I

Solution chemistry and Microscopy: Acids and bases, pH measurement of biological fluids, types of buffers, Molarity and Normality of solutions. Microscopy, principle & applications.Light microscopy- bright field microscope, darkfeild microscope, Phase contrast microscope, Fluorescence microscope, UV microscope.Electron microscopy-SEM and TEM.Confocal microscopy.X-Ray crystallography.

UNIT-II

Microbiological techniques: Media preparation for bacteria and fungi. Sterilization- physical and chemical, Inoculation, pure culture techniques and growth monitoring, Microbialassays - Microbial identification (cytological staining methods for bacterial and fungal strains).Types and Uses of fermenters.

UNIT-III

Microtomy and Histological Techniques: Types and applications. Collection & preservation of animal tissue – fixation, embedding, Sectioning, Staining, Identification of deferent components.Tissue preparation for light microscopy and electron microscopy.Staining techniques for the localization of proteins and carbohydrates.Cryotechniques: Cryopreservation of cells, tissues, organs and organisms. Cryosurgery, Cryotomy, Freeze fracture and freeze drying.

UNIT-IV

Separation Techniques: General principle and applications of Colorimeter, Spectrophotometer,IR, NMR and MASS specrtoscory. Flame photometer, Beer and Lamberts law. Centrifugation: differential and density gradient centrifugation,Organelle separation by

centrifugation. Chromatography: partition, adsorption, Ion exchange, gel permeation and affinity, TLC,GC,HPLC. Electrophoresis: PAGE and agarose gel electrophoresis. one and two dimensional gel electrophoresis, isoelectro focusing gels.

UNIT V

Molecular Techniques: Southern, Northern Western and Eastern blot techniques, DNAfinger printing, Fluorescent in Situ Hybridization (FISH), GISH. Protein and DNA sequencing methods,, Polymerase Chain Reaction- principle, RFLP, RAPD and AFLP techniques. Bioinformatics tools: sequence analysis tools, BLAST (Basic Logical Alignment Search Tool) FASTA, Multiple Alignment, Sequence analysis, using EMBOSS, DNA micro array technique.

REFERENCES

1. Braun,R.(1988)Introduction to instrumental analysis, J. Chem. Educ., 65 (12), pp A336.
2. Boyer, R.F. (1993) Modern Experimental Biochemistry, 2nd edition, BenjaminCummings.
3. Clark, J.M. and Swizer R.L. (2000) Experimental Biochemistry, 3rd edition, W.H. Freeman & Co Ltd.
4. Cooper, G.M. (1997) The Cell-A Molecular Approach. ASM press.
5. Freifelder, D.M. (1982) Physical Biochemistry, W.H. Freeman and Co.
6. Masters, J. R.W. (2000) Animal Cell culture- A practical approach. 3 edition, OUP Oxford.
7. Practical Biochemistry By Plummer
8. Principles and techniques of Practical Biochemistry Ed. B.L. Williams & K. Wilson, Arnold Publishers
9. Wilson, K. and Goulding K.H.(1986) A biologist Guide to principles and Techniques of Practical Biochemistry London.
10. Wilson, K.and Walker J.(2000) Practical Biochemistry, 5th edition, Cambridge University Press