

Syllabus for module 3

Certificate course in Tools and Techniques in Biosciences

Unit:1

Basic Instruments and techniques: Working principles, basic operation and application of Microtome, weighing balance, PH meter, autoclave, Oven, laminar air flow, Water Baths, CO₂ Incubators, Shaking Incubators, Hot Air Ovens, Bio-Safety Hoods, Fume Hoods, Pipettes and MiliQ water system. Principle of asepsis and sterilization technique.

Unit:2

Microscopy and its modifications – Working principles, basic operation and application of Light, phase contrast and interference, Fluorescence, Confocal, Electron (TEM and SEM)

Centrifugation: Working principles, basic operation and application of micro-centrifuge, ultracentrifuge and density gradient centrifugation, applications (isolation of cell components), determination of molecular weight by sedimentation velocity and sedimentation equilibrium methods

Unit:3

Electrophoretic and PCR techniques: Working principles, basic operation and application of agarose, polyacrylamide and SDS-polyacrylamide gel electrophoresis, capillary electrophoresis, 2-D electrophoresis, pulsed field gel electrophoresis.

Working principles, basic operation and application of Gradient PCR, RT-PCR and Gel Documentation system.

Unit: 4

Chromatography techniques: Working principles, basic operation and application of TLC, gel permeation, ion exchange and affinity chromatography, HPLC.

Spectroscopy technique: Working principles, basic operation and application of UV-visible spectroscopy, fluorescence, NMR, ESR, plasma emission spectroscopy, Atomic Absorption Spectroscopy, GC-MS, LC-MS, FTIR and X-ray crystallography

Unit: 5

Calibration, Validation, and certification of instruments like PCR's, Ovens, Incubators, Volumetric Dispensers, Spectrophotometers, and Electronic Balances etc. using International Standards.

Documentation for Instrumentation systems and procurement procedures, design of typical laboratory, safety measurement and IPR's.

Practicals:

Practicals based on theory papers

Suggested Readings:

1. Freifelder D., Physical Biochemistry, Application to Biochemistry and Molecular Biology, W.H. Freeman and Company, San Fransisco.
2. Wilson, K. and Walker, J. Principles and Techniques of Practical Biochemistry Cambridge University Press.
3. Holmeand, D. and Peck, H. Analytical Biochemistry. Longman
4. Scopes, R. Protein Purification - Principles and Practices. Springer Verlag.
5. Patabhi V and Gautham N. Biophysics, Kluwer Academic Publishers.
6. Narayanan P. Essentials of Biophysics, New Age International Pvt Ltd.
7. Volkenshtein, M.V. General Biophysics Academic Press, Inc.
8. Daniel, M. Basic Biophysics for biologists Agrobios.
9. Van, Holde, Johnson, K. E., Cutis, W. and Shing Ho, P. Principles of physical biochemistry, Pearson education Pvt. Ltd.