Subject Code : ECNPC

Elective Course III (EC) – Biological Techniques

Unit I Microscopy and Related Techniques

Light Microscopy : Microscopic optics, components of microscopes. Basic principles and method of Bright field, Dark field, Phase contrast. Fluorescence, Polarization and confocal microscopes.

Applications of various types of microscopy such as immunofluorescence – *In situ* hybridization.

Electron Microscopy – Principle, Techniques and applications of Transmission Electron microscope (TEM) and Scanning Electron Microscope (SEM), Atomic Force Microscope (AFM).

Photomicrography and Video micrography
Developing and printing of microphotographs

Unit II Analytical Techniques

Spectroscopic methods – UV-Visible, Atomic Absorption Spectrophotometer, Atomic Emission Spectroscopy.
Centrifugation – Principles, various types including centrifugation
Electroanalytical methods – electrolytic all 4 golvanic cell – Potentiometric, conductimetric, coulometric & voltametric analysis. Biosensors.
Radioactive Analysis : Principles of radioactivity, GM counter & LS counter.

Unit III Principles & Applications of Chromatographic Techniques :

Adsorption – Ion exchange and gel permeation – affinity chromotography for separation of compounds including GC and HPLC.

Unit IV - Electrophoresis Techniques

Electropohoretic techniques – protein – nucleic acid – immuno – two dimensional electrophoresis.

Unit V Molecular Biological Techniques

a) Microbiological techniques – purification, storage, measurement of microbial growth rate.
b) Isolation and amplification of nucleic acid – Plasmid isolation, chromosomal DNA isolation. Polymerase chain reaction.
c) Gene cloning techniques – Restriction digestion and Phosphatase treatment of cloning vectors. Cloning technique, separation and staining of DNA, qualification of DNA, gene transfer mechanisms – chemical and electroporation.

d) Methods of detection of clones – Nucleic acid transfer by blotting, Hybridization plaque, colony hybridization, histochemical detection of β - galactosidase, antibody screening including colour development reaction.

Reference:

1. Cynthia Gibas & Per Jambek (2001). Developing Bioinformatics Computer Skills, Shroff Publishers & Distributors Pvt. Ltd., O'reilly) Mumbai.
2. Demain, A.L. and Davies, J.E. (1999). Manual of Industrial Microbiology & Biotechnology, ASM Press.
3. Glick, B.R. and Pasternak, J.J. (1994). Molecular Biotechnology, ASM Press.
4. John G. Webster. (2004). Bioinstrumentation. University of Wisconsin, John Wiley & Sons, Inc.
5. Misener, S. and Krawetz, S.A. (2000). Bioinformatics Methods and Protocols. Human Press, Totowa, New Jersey.
6. Rashidi, H.H., and Buehler, L.K. (2002). Bioinformatics Basics: Applications in Biological Science and Medicine, CRC Press, London.
7. Sambrrok, J. and Ruseell, D.W. (2001) Molecular Cloning – A Laboratory Manual (3rd eidition, Vol. 1, 2, 3) Cold Spring Laboratory Press, New York.
8. Savile Pradbury. (1991). Basic measurement techniques for light microscopy, Oxford University Press, Royal Microscopical Society.
9. Surzeki, S. (2000). Basic Techniques in Molecular Biology, Springer.
10. Westermeier, R (1993). Electroporesis in practice – VCH – Federal Republic of Germany.
11. Willett, J.E. (1991). Gas Chromatography, John Wiley & Sons.
12. Wilson, K. and Walker (1995). Practical Biochemistry Principles and Techniques, Cambridge University Press.