

**NORTH MAHARASHTRA UNIVERSITY
JALGAON**



NAAC Reaccredited "B" Grade
(CGPA 2.88)

**SYLLABUS FOR
COURSE WORK
PAPER-II
DOCTOR OF PHILOSOPHY
In
LIFE SCIENCES**

w.e.f. 2012-2013

Paper II : Bioanalytical techniques and its applications in Life Sciences

1) Separation Techniques:

- i) Solvent extraction: Efficiency of extraction, Selectivity of extraction, Extraction systems. Extraction of uncharged metal chelates. Methods of extraction and its applications.
- ii) Solid phase extraction: Solid phase sorbents, Extraction formats, Automated Solid Phase Extraction (SPA) and Microextractions (SPME), Applications of SPA and SPME.
- iii) Chromatography : TLC, HPTLC, GC and HPLC (Principle, Design and Applications), Examples from basic and applied studies. Gel filtration (size exclusion chromatography).
- iv) Electrophoresis: Agarose and Polyacrylamide gel electrophoresis (Native and Denatured), Isoelectric Focusing, Density gradient gel electrophoresis, (Principle, Design and Applications), Examples from basic and applied studies.
- v) Centrifugation: Ultracentrifugation (Principles, Types of rotors, Preparative and analytical), Application examples from Life Sciences.
- vi) Membrane techniques: Ultrafiltration (Tangential flow separation)

2) Spectroscopy:

UV-visible spectrophotometry, Fourier Transform Infrared Spectroscopy, Atomic Absorption Spectroscopy, Spectrofluorometry and Liquid Chromatography-Mass Spectroscopy (Principle, instrumentations and applications), Examples from basic and applied studies.

3) Immunological methods:

Production of antibodies from laboratory animals.

Principle, Methodology and Applications of Radioimmunoassay (RIA), Fluorescent Immunoassay, Immunoelectrophoresis, ELISA (Direct, Indirect, Sandwich).

4) Techniques in Molecular Biology :

Southern, Western and Northern Blotting – Hybridization techniques

Polymerase Chain Reactions and its applications

DNA sequencing methods (Sanger, Maxam and Gilbert), Sequencing strategies

5) Homogenization techniques:

Methods and applications of Ultrasonication and Homogenization in basic and applied studies

References:

- Principles & Techniques of Biochemistry & Molecular Biology Seventh Edition by K. Wilson and J. Walker. Cambridge University Press, Cambridge (2010).
 - Principles and Practice of Analytical Chemistry, Fifth Edition by F.W. Fifield and D. Kealey. Blackwell Science Ltd., Cambridge, UK (2000).
 - Physical Biochemistry: Applications to Biochemistry and Molecular Biology, Second Edition by D. Freifelder. W.H. Freeman and Company, New York (1999).
 - Biophysical Chemistry. By Nath, Upadhye and Upadhye. Himalaya Pub Co., Nagpur (2000).
 - Biophysical Chemistry. By Kalsi and Mahanta, New Age International (2011).
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