

# BTPC2005 – Bio-Analytical Tools and Techniques

**Discipline:** B.Tech in Biotechnology

**Semester:** 4th

**No. of Days/Week:** 3

**No. of Weeks:** 15

**Name of the Teaching Faculty:** Dr. Gayatri Nahak

Week	Class Day	Topics
1st	1st	Introduction to analytical tools and microscopy
	2nd	Light Microscopy: Brightfield, Phase-contrast
	3rd	Fluorescence and Confocal Microscopy
2nd	1st	Electron Microscopy: SEM and TEM
	2nd	Immunocytochemistry: principles and applications
	3rd	Electrochemical Cells and Potentiometry
3rd	1st	Voltammetry and Ion-selective electrodes
	2nd	pH electrode, Clark oxygen electrode
	3rd	Biosensors: types and applications
4th	1st	Flow cytometry: working and applications
	2nd	UV-Vis absorption spectroscopy
	3rd	Fluorescence spectroscopy
5th	1st	Instrumentation and applications of fluorescence spectroscopy
	2nd	Introduction to X-ray crystallography
	3rd	Mass Spectrometry: MALDI-TOF and ESI
6th	1st	Basics of Electrophoresis: SDS-PAGE, Native PAGE
	2nd	Agarose gel electrophoresis and Isoelectric focusing
	3rd	Gradient gels and their use
7th	1st	Principles of centrifugation
	2nd	Types of centrifuges

	3rd	Differential & ultracentrifugation
8th	1st	Adsorption and partition chromatography
	2nd	Paper and thin-layer chromatography
	3rd	Gel exclusion and ion exchange chromatography
9th	1st	Affinity chromatography
	2nd	Gas Chromatography
	3rd	HPLC and FPLC
10th	1st	Instrumentation overview (spectrometer, chromatographs)
	2nd	Case studies using tools in industry/research
	3rd	Advantages and limitations of each technique
11th	1st	Data interpretation from analytical outputs
	2nd	Validation of analytical methods
	3rd	GMP and GLP in instrumentation labs
12th	1st	Revision of Modules I–III
	2nd	Quiz and discussion
	3rd	Class Test 1
13th	1st	Revision of Modules IV–V
	2nd	Analytical case study presentation
	3rd	Hands-on lab planning discussion
14th	1st	CO Mapping
	2nd	Doubt Clearing
	3rd	PYQ Discussion
15th	1st	Internal Assessment Test
	2nd	Review and recap
	3rd	Course wrap-up

