

Subject Code: 2SC1010402	Subject Title: Analytical Techniques
Course Type: Core Course	

Course Objective: This course is designed to enable students to acquire basic knowledge of instruments and techniques related to analysis of processes & products and the separation procedures routinely used in biotechnology laboratories and industries.

Teaching scheme (hours) per week		Credit			Theory Marks		Practical Marks		Total
Theory	Practical	Theory	Practical	Total	Uni. Assessment	Cont. Assessment	Uni. Assessment	Cont. Assessment	
3	-	3	-	3	70	30	-	-	100

A. Biotechnology Theory:

Unit	Content	Lectures	Weight (%)
1	Spectroscopy - Interaction of EM radiation with matter : Overview of Electromagnetic spectrum; physical phenomenon : Absorption, Resonance fluorescence, Emission, Refraction, Diffraction, Scattering, Raman Scattering, Resonance Raman Scattering, Beer-Lambert's Laws. - UV-Vis spectrophotometer: Principle, Instrumentation, working and Application - Atomic spectroscopy: Principles and application of Atomic Absorption/ Emission Spectrometer	11	25%
2	Chromatography - Chromatography :Basic Theory of Chromatography, Partition theory and solvent extraction theory - Introduction to key terms: retention time, retardation factor (Rf), elution - Partition and adsorption chromatography - Different techniques of chromatography: Principle, stationary and Mobile phase, operation ,Detection/elution of solute, Application - Planner - Chromatography, (Paper Chromatography, TLC) , GC, Ion exchange chromatography, Gel exclusion chromatography, Affinity chromatography, HPLC and FPLC .	16	35%
3	Electrophoresis : - Theory & principle of electrophoresis - Agarose electrophoresis of nucleic acid - Electrophoresis of protein- polyacrylamide gel (native and SDS-PAGE), Iso-electric focusing of protein - Overview of 2D Gel Electrophoresis	18	40%

	Centrifugation: • Theory of centrifugation and sedimentation, • use and design of different types of rotors • Types of centrifuges: Preparative and analytical centrifugation • Density gradient centrifugation (zonal and isopycnic), differential Centrifugation, Application of centrifugation for preparative and analytical purpose.		
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Learning Outcome:

This course will enable the students to understand the basic of the instruments used in the biotechnology laboratories and industries.

Reference book:

- Principles and techniques of biochemistry & molecular biology by Keith Wilson & John Walker
- Instrumental methods of analysis by B. Sivasankar
- Biophysical chemistry: Principle and techniques by Upadhyay & Nath
- Instrumental methods of analysis by Willard, Merritt, Dean & Settle
- Instrumental analysis by D.A. Skoog, Holler & Crouch
- Physical Biochemistry by David Freifelder
- Instrumental Methods of Chemical Analysis by Chatwal G and Anand, S.
- Chemical analysis and Instrumentation by B.k.Sharma