

SABANCI UNIVERSITY

Faculty of Eng. & Natural Sci.

BIO-335

Analytical Techniques

Instructor(s)

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Course Content

A general introduction to basic techniques used in characterization and separation of biological systems and molecules. Topics include microscopy, centrifugation, liquid chromatography methods, spectroscopy and electrophoresis. Lab sessions will give a chance to use these techniques individually.

Objectives

To teach students the basic concepts of bioanalytical techniques in both, theory and practice, which are relevant to biologists and bioengineers but also students from different fields.

Recommended or required reading

Textbooks:

Bioanalytics: Analytical Methods and Concepts in Biochemistry and Molecular Biology
Friedrich Lottspeich (Editor), Joachim W. Engels (Editor)
ISBN: 978-3-527-33919-8

Readings:

Course slides updated annually.

Course Outline

Module 1: Microscopy
Module 2: Electrophoresis Techniques
Module 3: Centrifugation Techniques
Module 4: Spectroscopic Techniques
Module 5: PCR Techniques
Module 6: Chromatography and Mass spectrometry

Learning Outcomes

Upon completion of the course, students will have a general knowledge of basic laboratory techniques for characterization and separation of biological systems and molecules.

Students would be able to perform basic laboratory techniques.

Module 1 Microscopy: Students will have a deeper understanding of both, theory and application in the following topics:

Basic Concepts in Microscopy
Light microscopy
Fluorescence microscopy
Confocal Microscopy
Live-cell imaging and Sensor techniques

Module 2 Electrophoresis Techniques: Students will learn how to use Gel electrophoresis techniques for analysis of nucleic acids and proteins for both, diagnostic purposes and preparative purposes, which includes:

Basic Concepts in Electrophoresis
Horizontal and Vertical Electrophoresis
2D Gel Electrophoresis and Protein Detection Methods
Electrophoresis of Nucleic Acids

Module 3 Centrifugation Techniques:

Basic Concepts of Centrifugation Techniques
Types of Centrifuges and analytical ultracentrifugation techniques
Separation methods and preparative ultracentrifuges
Types of rotors

Module 4 Spectroscopic Techniques:

Introduction and basic concepts of Spectroscopic Techniques
UV-VIS Spectroscopy
Infrared and fluorescence spectroscopy
Circular dichroism (CD) spectroscopy
NMR Spectroscopy and X-ray crystallography
Atomic Spectroscopy and Mass spectroscopy

Module 5 PCR Techniques:

Principles of Polymerase Chain reaction
Preparative and Diagnostic PCR
DNA Sequencing methods
Sanger Sequencing, Next Generation Sequencing Methods

Module 6 Chromatography and Mass spectrometry:

Basic Principles of Chromatography
Thin layer chromatography
Liquid Chromatography
Gas Chromatography
Principles of MALDI-TOF
Electrospray Ionization Mass Spectrometry

Course Policies

Class attendance not required but strongly recommended.
Lab sessions are obligatory.

Each week in the lab sessions one quiz to the related topic.
Protocols for the experiments should include a brief introduction, presentation of the results and a short discussion.

	Percent	Number of
Final	30 %	
Midterm	30 %	3
Group Project	40 %	