

SABANCI UNIVERSITY

Faculty of Eng. & Natural Sci.
BIO-355 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, liquid chromatography methods, spectroscopy, PCR and electrophoresis. Lab sessions will give a chance to use these techniques individually.

Course consist of a regular class 2x50 min session (on Mondays) and a proseminar which means that two students together each week are expected to present a selected paper (provided by the instructor) for max 40 min with a 10 min discussion (on Thursdays).

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: PCR and Sequencing Techniques
Module 4: Spectroscopic Techniques
Module 5: 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:

- Basic Concepts in Microscopy
- Light microscopy (Brightfield, Phasecontrast, DIC)
- Fluorescence microscopy
- Confocal Microscopy
- Live-cell imaging and Sensor techniques

Module 2 Electrophoresis Techniques:

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

Module 4 Spectroscopic Techniques:

- Introduction and basic concepts of Spectroscopic Techniques
- UV-VIS 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
- Principles of MALDI-TOF

Course Policies

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

Lab Experiments

Will be every second week in line with the topics discussed in the lecture.

1. Lab safety, pipetting and calibration
2. Light microscopy (Compound and Phasecontrast)

3. Fluorescence microscopy, Fluorescence acquisition cell sorting, fluorescence plate reader
4. Restriction digestion and DNA Gel electrophoresis
5. CHAPS and protein isolation (Chemical, mechanical and enzymatic) and horizontal gel electrophoresis: SDS-PAGE
6. Thin layer chromatography, affinity chromatography and Size exclusion chromatography

	Percent	Number
Final	40%	
Midterm	40%	1
Labs	20%	