

## Biochemical Analysis

### Scope:

The course is directed to graduate students who specialize or are interested in **analytical, pharmaceutical, or clinical chemistry**, as well as **biochemistry, biotechnology, systems biology**, and related areas. The main focus is on detection, analysis and characterization of biomolecules in cells and biofluids.

### Contents:

1. Introduction
2. Classes of biomolecules
  - small molecules, metabolites
  - lipids
  - carbohydrates
  - proteins (incl. enzymes)
  - nucleic acids
3. Classical analytical techniques in biochemistry
4. Colorimetry and spectrophotometry
5. Paper and thin-layer chromatography
6. Liquid chromatography
7. Electrophoresis
  - planar gel electrophoresis
  - capillary electrophoresis
8. Gas chromatography
9. \* Mid-term exam
10. Mass spectrometry (MS)

- electrospray ionization MS
- ambient MS techniques
- matrix-assisted laser desorption/ionization MS

11. Isotopic labels in biochemistry
12. Affinity-based techniques in biochemistry
13. Biomolecular probes
14. Fluorescence microscopy
15. Calorimetry
16. \* Students' presentations
17. Applications of biochemical analysis methods
  - genomics
  - proteomics
  - metabolomics
18. \* Final exam

Evaluation:

\* Final mark will be based on the results of the mid-term exam (30%), presentation (30%), and the result of the final exam (40%). Additional points (up to 15%) can be gained for active participation in the class.

Requirements:

Students who have completed the Analytical Chemistry course are encouraged to participate.

Study material:

Handouts and review articles will be provided for selected topics.

Useful links: (This section will be expanded.)

[Adrenoleukodystrophy](#)

[The movie "Lorenzo's Oil"](#)

[Classic Kit: Soxhlet extractor](#)

[The Reaction of Naphthoquinone-4-Sulfonate with Imino Acids](#)

[Southern blot](#)

[Column phases in GC](#)

[Carrier Gases for GC](#)

[Techniques for Improving the Reproducibility of GC Analysis](#)

[Analytical instruments in the "Curiosity" probe on Mars](#)

[How an ion trap works](#)