Raman spectroscopy for soft matter and bioanalysis, 4.0 credits

Ramanspektroskopi för mjuka material och bioanalys, 4.0 hp

Third-cycle education course

6FIFM86

Department of Physics, Chemistry and Biology

Valid from: First half-year 2025

Approved by **Approved**

Registration number

Entry requirements

Entry requirement for studies on third-cycle education courses

- second-cycle degree,
- 240 credits in required courses, including at least 60 second-cycle credits, or
- acquisition of equivalent knowledge in some other manner

Specific entry requirements for this course:
Basic knowledge of optics and modern physics.

Specific information

The course is suitable for students in Physics, Chemistry, Biology, Materials Science or Engineering who are interested in spectroscopic analysis of soft matter or biological systems.

Learning outcomes

By the end of the course the students will be able to:

- Understand the fundamental principles and selection rules in Raman spectroscopy
- Understand enhancement mechanisms available for Raman and the principles for
- Understand how spectral processing can be carried out and its implications for analysis of the obtained spectra
- Perform Raman spectroscopy experiments
- Process, analyze and interpret Raman spectra of different types of organic molecules and materials
- Design and plan experiments using Raman spectroscopy suitable for specific needs and samples types.

Contents

Introduction to vibrational spectroscopy, theory of Raman spectroscopy, equipment, types of Raman spectroscopy, data processing, spectrum interpretation, Raman spectroscopy of Biomolecules. Fundamentals of SERS, use of nanoparticles and nanostructures for SERS, quantitative SERS analysis, GERS, Raman spectroscopy in complex systems; tissue, cells, and plants

Examination

Homework exercises distributed after each lecture. A written report and an oral presentation summarizing the mandatory experimental work.

Grading

Two-grade scale

Course literature

Recommended introductory literature:

- Larkin P.J. Infrared and Raman Spectroscopy, Principles and Spectral Interpretation. Second edition. Elsevier 2018.
- Vandenabeele P. Practical Raman Spectroscopy: An Introduction. Wiley 2013.
- Cheng Zong et al. Surface-Enhanced Raman Spectroscopy for Bioanalysis: Reliability and Challenges, *Chemical Reviews* 2018, **118** (10), 4946-4980 DOI: 10.1021/acs.chemrev.7b00668

General information

The course is planned and carried out according to what is stated in this syllabus. Course evaluation, analysis and suggestions for improvement should be fed back to the Research and PhD studies Committee (FUN) by the course coordinator.