Photoelectron Spectroscopy and its Applications: An Introduction, 6.0 credits

Fotoelektronspektroskopi och dess tillämpningar: en introduktion, 6.0 hp

Third-cycle education course

6FIFM28

Department of Physics, Chemistry and Biology

Valid from: First half-year 2024

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 information

Photoelectron spectroscopy is an important tool for researchers to probe the electronic structure of materials, both at interfaces and in the bulk. It is widely used in physics, chemistry and biology with a wide range of applications, i.e., in the materials and nanosciences. Photoelectron spectroscopy is a non-destructive tool that provides information about chemical environment of the elements in the materials, which can be used to track the chemical reaction steps by monitoring the variation of the special element.
This course prepares for both practical use of the photoelectron spectroscopy technique in the research work and the theoretical fundamental knowledge of photoelectron spectroscopy. In addition, selected other relevant experimental instruments and techniques used to modify electronic properties of materials in-situ will also be covered. Our current work on organic electronics with photoelectron spectroscopy will be presented as an application.

Learning outcomes

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

- to understand the basic photoelectron spectroscopy technique, and analyze the photoelectron data
- run the photoelectron spectrometer, collect the correct spectra
- investigate their own scientific samples with our photoelectron spectrometers, and aim to use the results in their scientific publications

Contents

- The theoretical background of photoelectron process and spectroscopy.
- The structure of photoelectron spectrometer, vacuum system
- X-ray photoelectron spectroscopy.
- Ultraviolet photoelectron spectroscopy.
- Synchrotron-based photoelectron spectroscopy and near ambient pressure photoelectron spectroscopy.
- Analysis of photoelectron data and usage of different (free and commercial) programs
- Applications of photoelectron spectroscopy in physics, chemistry, biology, materials science and nanoscience.
- A detailed case on studying organic electronics with photoelectron spectroscopy.
- Laboratory work with our photoelectron spectrometers in the actual research.

Educational methods

Educational methods applied in this course are lectures, lab visit, and lab work.

Examination

Written report and oral presentation of individual project

Grading

Two-grade scale

Course literature

A list of recommended literature will be provided by the course coordinator before the start of the course.

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.
If the course is withdrawn or is subject to major changes, examination according to this syllabus is normally offered at three occasions within/in close connection to the two following semesters