

Optical Spectroscopy of Materials (E027300)

Course size *(nominal values; actual values may depend on programme)*

Credits 4.0

Study time 120 h

Course offerings in academic year 2024-2025

Lecturers in academic year 2024-2025

Offered in the following programmes in 2024-2025

crdts

offering

Teaching languages

English

Keywords

optical spectroscopy, vibrations, luminescence, Raman spectroscopy

Position of the course

Make the students acquainted with a number of important spectroscopic techniques for the investigation of the electronic and the vibrational properties of solid materials. This includes both the theoretical background of the techniques and their practical application.

Contents

- UV-VIS-NIR Spectrophotometry: Introduction, Applications
- Infrared and Raman Spectroscopy: Introduction, Vibrational transitions in materials, Electronic transitions in materials
- Luminescence Spectroscopy: PL (photoluminescence), CL (cathodoluminescence)

Initial competences

solid state physics

Final competences

- 1 Estimate the complex refractive index of an arbitrary material from optical measurements.
- 2 Understand the concepts optical density, infrared- and Raman-active modes, excitation spectrum, emission spectrum, configuration coordinate diagram.
- 3 Have insight in the relation between resolution, dynamic range, measurement time and signal to noise ratio in optical measurements.
- 4 Interpret the infrared absorption spectra of solid materials.
- 5 Understand the origin of different luminescent processes in solids.
- 6 Understand the possibilities and limitations of ellipsometric measurements in comparison with photometric measurements.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, Practical, Independent work

Extra information on the teaching methods

The course partly consists of lectures where the experimental techniques and the

interpretation of the measurements are described.

Next to this, the students have a number of lab sessions (in groups) where they conduct measurements (under guidance). They make a lab report (individually or in group) on their measurements.

Study material

None

References

- G. Blasse, B.C. Grabmaier, Luminescent Materials, Springer, Berlin (1994)

Course content-related study coaching

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment

Examination methods in case of periodic assessment during the second examination period

Oral assessment

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible

Extra information on the examination methods

Periodic evaluation: oral exam discussing the contents of the theoretical lectures and the interpretation of measurements (based on the written lab reports).

Calculation of the examination mark

50% on written lab reports; 50% on oral exam.