

## Optical Spectroscopy of Materials (C003128)

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

**Credits 4.0**

**Study time 120 h**

**Course offerings and teaching methods in academic year 2024-2025**

A (semester 1)

English

Gent

practical

lecture

independent work

**Lecturers in academic year 2024-2025**

Poelman, Dirk

WE04

lecturer-in-charge

Vrielinck, Henk

WE04

co-lecturer

**Offered in the following programmes in 2024-2025**

**crdts**

**offering**

Master of Science in Teaching in Science and Technology(main subject Physics and Astronomy)

4

A

Master of Science in Photonics Engineering

4

A

Master of Science in Physics and Astronomy

4

A

Master of Science in Physics and Astronomy

4

A

Exchange Programme in Physics and Astronomy (Master's Level)

4

A

**Teaching languages**

English

**Keywords**

Optical spectroscopy, vibrational spectroscopy, luminescence, Raman spectroscopy, spectrophotometry, ellipsometry, thin film optics

**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: thin film optics
- Spectroscopic ellipsometry
- Infrared and Raman Spectroscopy: Introduction; Vibrational transitions in materials; Electronic transitions in materials
- Luminescence Spectroscopy: PL (photoluminescence); CL (cathodoluminescence)

**Initial competences**

Having successfully followed the course Introduction to 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 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**

Type: Syllabus

Name: Optical spectroscopy of materials

Indicative price: Free or paid by faculty

Optional: no

Language : English

Number of Pages : 60

Available on Ufora : Yes

Online Available : Yes

Available in the Library : No

Available through Student Association : No

Type: Handouts

Name: Optical spectroscopy of materials

Indicative price: Free or paid by faculty

Optional: no

Language : English

Available on Ufora : Yes

Online Available : Yes

Available in the Library : No

Available through Student Association : No

Usability and Lifetime within the Course Unit : intensive

Usability and Lifetime within the Study Programme : intensive

Usability and Lifetime after the Study Programme : occasionally

### **References**

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

### **Course content-related study coaching**

Interactive support using Ufora (forums, e-mail); personal support after electronic appointment (no fixed consulting hours) or before and after lectures

### **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 work reports; 50% on oral exam

