GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2015-2016

Optical Materials (E024800)

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

Credits 6.0 | Study time 180 h | Contact hrs 60.0 h

Course offerings and teaching methods in academic year 2016-2017

A (semester 1)	English	project	1.25 h
		lecture	30.0 h
		seminar: practical	7.5 h
		seminar: coached	20.0 h

Lecturers in academic year 2016-2017

Neyts, Kristiaan	TW06	lecturer-in-charge
Danckaert, Jan	VUB	co-lecturer

Offered in the following programmes in 2016-2017	crdts	offering
Bridging Programme European Master of Science in Photonics	6	A
Bridging Programme Master of Science in Photonics Engineering	6	A
Elective Course List European Master of Science in Nuclear Fusion Science and Engineering Physics	6	A
Master of Science in Electrical Engineering (main subject Communication and Information Technology)	6	A
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	6	A
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	6	A
Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)	6	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	6	A
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	6	A
European Master of Science in Photonics	6	A
Master of Science in Photonics Engineering	6	A
European Master of Science in Nuclear Fusion and Engineering Physics	6	A
European Master of Science in Nuclear Fusion and Engineering Physics	6	A
Master of Science in Photonics Engineering	6	A
Master of Science in Engineering Physics	6	A

Teaching languages

English

Keywords

microscopic, anisotropy, non-linearity, optical properties

Position of the course

Introducing the microscopic origin of optical phenomena and transferring concepts from microscopic to macroscopic descriptions. Illustrating optical properties like anisotropy, non-linearity and variation by means of electric, elastic, acoustic or magnetic effects in basic components. All lectures are held in Gent, co-lecturer from VUB: Jan Danckaert.

Contents

- Introduction: Introduction
- Properties of linear isotropic materials: examples, microscopic theory, definitions
- Light propagation in anisotropic dielectrics: polarisation, propagation, matrix formalism, reflection
- Properties of linear anisotropic dielectrics: tensors, types of materials, optical activity
- Modification of optical properties: microscopic theory, electro- photo- elasto- acousto- magneto- optic effects
- Liquid crystals: types of ordering, switching behavior Non-linear optical materials: second-order effects, phase-relations, OPO, material examples

Initial competences

bachelor in applied physics or bachelor in electrotechnical engineering

Final competences

1 Understand and explain the microscopic and macroscopic theory of linear (isotropic and anisotropic) optical materials and light propagation.
2 Understand and explain mechanisms for modifying the optical properties of materials: electric, magnetic, elastic and acoustic methods, including liquid crystals.
3 Understand and explain basic non-linear optical effects
4 Solve exercises that are based on linear (isotropic and anisotropic) optical materials, modifcation of optical properties and liquid crystals.
5 Calculate the propagation of light based and the change in polarization with the Jones calculus.
6 Make written and oral reports about an optical phenomenon or device

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, project, seminar: coached exercises, seminar: practical PC room classes

Extra information on the teaching methods

lectures about theory
work sessions: guided exercises, PC practicum, literature study with presentation and report

Learning materials and price

English syllabus (identical to syllabus at VUB).

References

- Optical Waves in Crystals, A. Yariv and P. Yeh, John Wiley and Sons, New York
- Introduction to Complex Mediums for Optics and Electromagnetics, Weiglhofer and Lakhtakia, SPIE press, Bellingham

Course content-related study coaching

Help with solving exercices and with the PC practicum.

Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination, open book examination, oral examination

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

Written examination, open book examination, oral examination

Examination methods in case of permanent evaluation

Report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

During examination period:
1. theory exam: closed-book exam with oral examination;
2, problem solving exam: the syllabus can be used.
During semester:
graded project reports; graded oral presentation. Frequency: 1 computerpracticum

(written report): 10%, week 10. 1 literature study (written report and oral presentation): 20%, week 12.

Calculation of the examination mark

Special conditions: In the exam period: 70%. During the lecturing time: 10% + 20%. The scores obtained during the lecturing time are transferred to the second exam session.