

Course Specifications

Valid as from the academic year 2015-2016

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 2017-2018

Offering	Language	Teaching Method	Hours
A (semester 1)	English	seminar: coached	20.0 h
		exercises	
		lecture	30.0 h
		seminar: practical PC	7.5 h
		room classes	
B (semester 1)	Dutch	project	1.25 h
		guided self-study	30.0 h
		seminar: coached	20.0 h
		exercises	
		seminar: practical PC	7.5 h
		room classes	
		project	1.25 h

Lecturers in academic year 2017-2018

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

Offered in the following programmes in 2017-2018

Programme	crdts	offering
European Master of Science in Photonics	6	A
Master of Science in Photonics Engineering	6	B

Teaching languages

Dutch, 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 CONCEPTS: polarization, jones matrix, anisotropic media, electro-optic effect, acousto-optic effect, liquid crystals, second harmonic generation, phase matching,

- optical parametric oscillation
- 2 INSIGHT: in microscopic theory, macroscopic theory, energy contributions, elementary quantum transitions
 - 3 SKILLS: use of formalisms for polarization, crystalsymmetry, electro-optics, matrixcalculation with PC
 - 4 ATTITUDES: application of theory, problem solving, literature study

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

Guided self-study, 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 exercises 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: open-book exam. 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%.