

Course Manual LMW

Light-Matter-Interaction

Version: 1 | Last Change: 29.09.2019 18:32 | Draft: 0 | Status: vom verantwortlichen Dozent freigegeben

– General information

Long name Light-Matter-Interaction

Approving CModule [LMW_BaET](#),
[LMW_BaOPT](#)

Responsible Prof. Dr. Uwe Oberheide
Professor Fakultät IME

Valid from winter semester
2022/23

Level Bachelor

Semester in the year winter semester

Duration Semester

Hours in self-study 78

ECTS 5

Professors Prof. Dr. Uwe Oberheide
Professor Fakultät IME

Literature

Pedrotti - Optik für Ingenieure, Springer

Saleh, Teich - Grundlagen der Photonik, Wiley-VCH

Final exam

Details taxonomy levels
understanding and
application:
Description of
elementary applications
and interaction
processes in an
idealized application
environment
taxonomy level
analyzing:
Selection of suitable
optical components and
processes based on real
application cases

Minimum standard 50 % of the questions
correctly answered

Exam Type EN mündliche Prüfung,
strukturierte Befragung

Requirements

Physics:
oscillator, wave
propagation, index of
refraction

Material science:
electrical material
properties
(permeability, band
gap)
electrical dipole

Mathematics:
linear algebra (vector /
matrix calculations)

Optics:
radiometric and
photometric properties,
geometrical optics,
wave optics

Language

German

Separate final exam

Yes

– Lecture / Exercises

Learning goals

Goal type	Description	
Knowledge	Propagation of electromagnetic waves: <ul style="list-style-type: none">- Lorentz oscillator- permeability	
	Interaction processes of light and matter: <ul style="list-style-type: none">- (complex) refractive index- absorption- scattering- luminescence	
	Generation of polarized light	
	Birefringence <ul style="list-style-type: none">- polarization- phase plates	
	Energy levels: <ul style="list-style-type: none">- atomic spectra- fluorescence / phosphorescence- band structure	
	Detection of electromagnetic radiation: <ul style="list-style-type: none">- semiconductor detectors- measuring systems for spatial distributions	
	Light-induced material processing: <ul style="list-style-type: none">- lithography- ablation	
	Photonic crystals	
	<hr/>	
	Skills	Recognizing and transfer of analogies of known physical processes (excited, damped oscillator -> Lorentz oscillator) Transfer of idealized systems to real systems and derivation of the qualitative behavior of the system Describing and explaining relationships between quantities (absorption / refractive index) and transferring them to real materials Analyze technical applications and questions, break them down into individual processes and solve them via known light-matter-interaction processes.

Special requirements

none

Accompanying material

Presentation slides for the lecture
Links to Internet resources with basic information

Separate exam

No

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	3
Exercises (whole course)	1
Exercises (shared course)	0
Tutorial (voluntary)	0