Technology
Arts Sciences
TH Köln

Course Manual LMW

Light-Matter-Interaction

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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: - Lorentz oscillator - permeability Interaction processes of light and matter: - (complex) refractive index - absorption - scattering - luminescence Generation of polarized light Birefringence - polarization - phase plates Energy levels: - atomic spectra - fluorescence / phosphorescence - band structure Detection of electromagnetic radiation: - semiconductor detectors - measuring systems for spatial distributions Light-induced material processing: - lithography - ablation Photonic crystals
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