Technology
Arts Sciences
TH Köln

Course
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
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
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

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

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

Lecture / Exercises

Learning goals

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.

Expenditure classroom teaching

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

Separate exam

none