Technology
Arts Sciences
TH Köln

Course
PBO - Project-based optics

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General information

Long name	Project-based optics
Approving CModule	PBO_BaET
Responsible	Prof. Dr. Michael Gartz Professor Fakultät IME
Level	Bachelor
Semester in the year	summer semester
Duration	Semester
Hours in self-study	78
ECTS	5
Professors	Prof. Dr. Michael Gartz Professor Fakultät IME
Requirements	Geometric optics Optical metrology wave optics Mathematics 1/2 Physics 1/2 elementary geometry
Language	German
Separate final exam	Yes

Final exam

Details

Oral examination in which the taxonomy levels of understanding, applying, analysing, synthesising and evaluating are tested by students presenting and explaining their projects carried out during the semester and showing that they can understand and apply the technical terms, theories and

procedures developed in the lecture, have analysed the requirements of their project task and have synthesised a solution to their project task and can evaluate it in the examination interview.

Minimum standard

50 % of the questions and tasks out of all parts of the examination correctly answered

Exam Type

Oral examination in which the taxonomy levels of understanding, applying, analysing, synthesising and evaluating are tested by students presenting and explaining their projects carried out during the semester and showing that they can understand and apply the technical terms, theories and procedures developed in the lecture, have analysed the requirements of their project task and have synthesised a solution to their project task and can evaluate it in the examination interview.

Lecture

Learning goals

Knowledge

Matrix Sensors
CCD sensors
superstructure
mode of action
sensitivity
noise sources
CMOS sensors
superstructure
mode of action
sensitivity
noise sources
Image error corrections
dark current correction
flat field correction
interfaces
Analog / BAS
Firewire 1394
USB
Ethernet / GigE

Holographic interferometry
double exposure holography
basics
superstructure
evaluation
applications
time-average holography
basics
superstructure
evaluation
applications

laser light sectioning
basics
superstructure
evaluation
applications

Chromatic longitudinal aberrations
basics
superstructure
evaluation
applications

Chapters of students' choice
Laser Material Processing
basics
cold ablation
thermal processing
laser types
applications
Optical Shop Testing
Twyman Green Interferometer
Fizeau Interfermometer
Laser Doppler Anemometry
Interferometric speed measurement
heterodyne principle
applications
... (Students' suggestions)

Skills

calculate
the dynamics of a CCD sensor
of deformations in holographic interferometry
of oscillation amplitudes in holographic interferometry
the working range of the chromatic longitudinal aberration
sensor
the resolution of the light section sensor

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define
the resolution of matrix sensors
the working range depending on a measuring task

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determine
of the wavefront aberrations
of the sensitivity of a CDD sensor

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assess
of the measuring signal of a light section sensor
of the usability of a matrix sensor for a specific measurement
task

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Lecture	2
Tutorial (voluntary)	0

Separate exam

none

Project

Learning goals

Skills

Adjusting optical superstructures

Recording and documenting of measurement series

Create diagrams

Ergebnisse auf Plausibilität überprüfen

Recognizing and understanding of interrelationships

error calculation

analyse an optical measuring task
Independently recognized measuring task can be analyzed
Analyzing a given measuring task

design a solution approach for the analyzed optical measuring task
Consideration of laboratory resources
Consideration of the available time quota

Presentation of a project outline
Describe the task
outline the approach
Present results in a clearly structured way
Discuss results in technical and scientific manner

Milestone presentation to check the progress of the project
Describe the task
outline the approach
Present results in a clearly structured way
Discuss results in technical and scientific manner

Final presentation with presentation of the realized solution approach
Describe the task
outline the approach
Present results in a clearly structured way
Discuss results in technical and scientific manner

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realize basic optical structures yourself
build
adjust
Carry out function test

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investigate scientific/technical principles with an optical structure
Plan measurement series
Estimate error influences
Check the suitability of the superstructure

Evaluate self-acquired measurement series
Graphic display of measured values
Calculate implicit quantities from measured values math.
correctly
discover and name logical errors
Simulate measured values using predefined formulas

Work on complex technical tasks in a team
Organize into subtasks
Discuss measurement results
complement each other meaningfully

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Project	2
Tutorial (voluntary)	0

Separate exam

none