

Course

PBO - Project-based optics

Version: 2 | Last Change: 13.10.2019 18:19 | Draft: 0 | Status: vom verantwortlichen Dozent freigegeben

^

General information

|                      |                                                                                                               |
|----------------------|---------------------------------------------------------------------------------------------------------------|
| Long name            | Project-based optics                                                                                          |
| Approving CModule    | <a href="#">PBO BaET</a>                                                                                      |
| Responsible          | Prof. Dr. Michael Gartz<br>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<br>Professor Fakultät IME                                                             |
| Requirements         | Geometric optics<br>Optical metrology<br>wave optics<br>Mathematics 1/2<br>Physics 1/2<br>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 Interferometer

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

---

define

the resolution of matrix sensors

the working range depending on a measuring task

---

determine

of the wavefront aberrations

of the sensitivity of a CDD sensor

---

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

---

realize basic optical structures yourself

build

adjust

Carry out function test

---

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