Hochschule Aalen

Module Number: 33001 SPO-Version: 33

Module Name: Project / Soft Skills

Degree Program	Applied Photonics
Module Manager	Prof. Dr. A. Harth
Modul Type	Mandatory Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester, Summer Semester
Credits	5 CP
Workload Class	90 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	LV 33101: English

Module Objectives

General
The student can organize and structure solutions to a particular problem. The students are able to determine fundamental data concerning signal power and noise by evaluation. They can use and perform basic measurements.

Professional Competence
The laboratory work enables students to gain practical experience, as they are able to carry out experiments and create measurement set-ups etc. on their own responsibility or in small teams.

Interdisciplinary Competence
The students can independently develop new subject areas, evaluate information, draw practical conclusions, develop new solutions and take social as well as ecological and economic aspects into account. The goals associated with civic engagement, such as promoting the holistic education of students, are achieved.

Course Content

Literature

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33101	Projects / Soft Skills	Prof. Dr. A. Harth	L	4	5

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33101	PLS, PLR	100%	

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:

Last Update: 22.03.2023, Fritz

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Hochschule Aalen

Module Number: 33002 SPO-Version: 33

Module Name: Interferometry

Degree Program	Applied Photonics
Module Manager	Prof. Dr. Rainer Börret
Modul Type	Mandatory Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	
Use in other SG	
Language	LV 33102: English

Module Objectives

General
The student can organize and structure solutions to a particular problem. The students are able to determine fundamental data concerning signal power and noise by evaluation. They can use and perform basic measurements.

Professional Competence
Students will be able to apply and perform the basic concepts and applications of inferferometry and optical measurement techniques. They will be able to interpret and discuss the results as well as alternative methods and solutions.

The Students are able to choose and specify suitable interferometric setups for different applications, choose and specify suitable light sources, sensors and components for interferometric setups and applications and design an interferometric setup for different applications by means of the learned methods and information.

They can specify and select the principles of fringe analysis and the appropriate assessment techniques.

They are able to select a suitable calibration technique to qualify an interferometer and are able to specify the range, resolution and accuracy of an interferometric setup.

They are able to apply the methods listed above in the lab and analyze and review critical the results

Interdisciplinary Competence
Students can discuss, debate and work in groups about specific problems and about the best solutions and applications related to a particular measurement problem.

They are enabled to systematically select the suitable metrology setup for various measurement problems. They are able to calibrate an interferomter and design and execute a process to define the Capability of aMeasurement System

Course Content Lecture:

- Basic principles of interference
- Interferometers
- Detection techniques and algorithms
- Calibration techniques
- Accuracy and error sources
- Testing the quality of optical materials
- Examples for Application of Interferometry
- Testing the geometry of optical components

Literature

- Hand-out, detailed manuscript with exercises
- Dörband, Müller, Gross: "Handbook of Optical Systems, Vol. 5"
- Hecht „Optics“ (Fundamentals)
- Malacara „Optical Shop Testing“

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33102	Interferometry	Prof. Dr. Rainer Börret	V, L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33102	PLM (20 Minutes)	50 %	
	PLP	50 %	

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:

Last Update: 22.03.2023, Fritz; 26.09.2023 R.Boerret

1 *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

2 *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33003 SPO-Version: 33

Module Name: Advanced Mircoscopy

Degree Program	Applied Photonics
Module Manager	Prof. Dr. A. Walter
Modul Type	Mandatory Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	LV 33103: English

Module Objectives

General
The students will acquire a deep technical, mathematical, and application-oriented knowledge of modern optical and non-optical microscopy methods, including their optical fundamentals - from lens aberrations to Fourier optics and point spread function. The microscopy techniques encompass advanced modalities such as super-resolution, surpassing the Abbe diffraction limit, as well as non-optical techniques such as electron, X-ray, or ion microscopy and their physical principles and biomedical applications. Additionally, the construction and image processing of the respective techniques will be covered.

Professional Competence
The students learn to analyze and delve into peer-reviewed current literature on the development of microscopy, present an overview in a short presentation, and work on laboratory and research projects in 2 hands-on sessions as a team.
The independent handling of specific topics, taking into account previous subject knowledge, literature, and scientific methodology, prepares the students for the requirements of the master's thesis.

Interdisciplinary Compentence
The subject is highly interdisciplinary, covering engineering, optics, physics, image processing, and biology/biomedical sciences.

Course Content

1. **Motivation & Introduction**
2. **Fundamentals of Microscopy**
   a. Geometric Optics
   b. Waves
   c. Gaussian Beams
   d. Fourier Optics
   e. Diffraction
   f. Diffraction Limit
   g. OTF & PSF
3. **Introduction to Cell Biology**
   a. Cell Organelles
   b. Cell Culture
4. **Light Microsopy**
   a. Setup & Ray Path
   b. Abbe Theory of Image Formation
   c. Contrast Mechanisms
5. **Fluorescence & Confocal Microscopy**
   a. Fluoreszence & Absorption
   b. Setup
   c. Confocal Microscopy
   d. Dynamic Techniquews: From Fluorescence Correlation Spectroscopy to Fluorescence Recovery After Photobleaching
6. **Super-Resolution Microscopy**
   a. Structured Illumination Microscopy
   b. STED
   c. PALM/STORM
7. **Microscopy of Thick Tissues**
   a. Light Sheet Microscopy
   b. Multiphoton Microscopy
8. **Electron & Ion Microscopy**
   a. Transmission Electron Microscopy
   b. Scanning Electron Microscopy
   c. Ion Microscopy
9. **Atomic Force Microscopy**
10. **X-Ray Microscopy**

Literature

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33103	Advanced Mircoscopy	Prof. Dr. A. Walter	V	4	5

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33103	Oral Exam	100%	

Requirements for Admission to the Module Exam
The students will need to give a 15-minutes talk on one of the topics of the course content.

Further Study-Related Feedback
None

Comments:

Last Update:

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33004 SPO-Version: 33

Module Name: Quantum Optics

Degree Program	Applied Photonics
Module Manager	Prof. Dr. A. Harth
Modul Type	Mandatory Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Mathematics, physics of technical bachelor degree
Use in other SG	
Language	LV 33201: English

Module Objectives

Professional Competence
Students are able to describe and understand quantum optical phenomena mathematically and to interpret the theoretical predictions in terms of experimental relevance.

Interdisciplinary Competence
The students solve exercises and laboratory tasks alone and in groups and present their results. The students learn to apply quantum physical principles to technical applications.

Course Content

- Introduction: Classical optics
- Semi-classical: Radiative transitions in atoms
- Photon statistics
- Entanglement
- Quantum Computer

Literature Tipler: Physik; Mark Fox: Quantum Optics

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33201	Quantum Optics	Prof. Dr. A. Harth	V	4	5

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33201	PLK (45 Minutes)	80 %	
33201	PLL	20 %	

Requirements for Admission to the Module Exam
Passed Pre-exam

Further Study-Related Feedback
None

Comments:

Last Update: 04.04.2023, AnHa

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33005 SPO-Version: 33

Module Name: Physical Optics

Degree Program	Applied Photonics
Module Manager	Prof. Dr. Andreas Heinrich
Modul Type	Mandatory Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	LV 33202: English

Module Objectives

Professional Competence
Students can understand wave optics. They can understand phenomena that describe the interaction of light waves with material. This will illustrate the difference between beam and wave optics. Students will be able to identify the limits of beam optics and describe improved optical effects using wave optics.

Interdisciplinary Competence
Students are able to discuss the advantages and disadvantages of different approaches in a team. They can express themselves scientifically and complete their knowledge. Students are able to analyse literature. They can differ between relevant and non-relevant information and evaluate and judge optical phenomena.

Course Content
basics of wave optics, light interference, light diffraction / inverse diffraction, light polarization, light scattering

Literature
Monographien und Originalartikel
B. E.A. Saleh, M.V. Teich: Fundamentals of Photonics

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33202	Physical Optics	Prof. Dr. Andreas Heinrich	V	4	5

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33202	PLK (60 Minutes)	100%	Allowed Exam Materials: none

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:

Last Update: 23.03.2023, Fritz

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33801 SPO-Version: 33

Module Name: Non-linear Optics

Degree Program	Applied Photonics
Module Manager	Prof. Dr. A. Harth
Modul Type	Elective Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	4
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	
Use in other SG	
Language	LV 33104: English

Module Objectives

Professional Competence
Professional competence (professional knowledge and skills, professional expertise):
Students are able to describe and understand non-linear optical laser phenomena mathematically, to interpret the theoretical predictions in terms of experimental relevance, to analyse tolarances and specify non-linear crystals.

Interdisciplinary Competence
The students simulate, design and validate crystals with the SNLO program. The results are presented by the respective groups. The students are able to search specifications and physical properties of non-linear crystals to design non-linear laser devices for industrial applications.

Course Content Polarization optics, crystal optics, non-linear optics of second and third order

Literature Lecture notes with bibliography

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33104	Non-linear Optics	Prof. Dr. A. Harth	V, L	4	5

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33104	PLK (60 Minutes)	100%	

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:

Last Update: 23.03.2024, M.Wagner

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Hochschule Aalen

Module Number: 33802 SPO-Version: 33

Module Name: Photonics Detectors and Devices

Degree Program	Applied Photonics
Module Manager	Prof. Dr. Andreas Heinrich
Modul Type	Elective Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Basic knowledge in Optics & Math
Use in other SG	
Language	LV 33105: English

Module Objectives

Professional Competence
The student can name and classify optical parts and electro-optical components. He can understand and apply the basic principles of this component.

Interdisciplinary Competence
The student can evaluate the advantages and disadvantages of different concepts and discuss them in a team. The student is able to communicate scientifically and apply his in-depth knowledge. The students can evaluate scientific research and relevant literature.

Course Content

- advanced optical components
  gradient-index lenses, diffusers, Fresnel lenses, light pipes, tapers, Axicons,
  optical filters (absorption filters, Fabry Perot filters, Interference filters, electrical tuneable filters, gratings)

- electro-optical components
  light sources and illumination (LED, SMD, OLED, structured illumination, requirements for an adequat
  illumination)
  projectors (SLMs, LCOS, LCDs, GLVs, DMDs, DLPs)
  detectors (CCD, CMOS, polarization camera, plenoptical camera)
  displays (3D Displays and imaging: stereoscopic, autoscopic, holographic)

Literature

Herbert Gross: Optical Systems

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33105	Photonics Detectors and Devices	Prof. Dr. Andreas Heinrich	V	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33105	PLR	100%	Allowed Aids: none

Requirements for Admission to the Module Exam
accomplished group work

Further Study-Related Feedback
None

Comments:

Last Update: 23.03.2023, Fritz

1 *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*
2 *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33803 SPO-Version: 33

Module Name: Applications of Photonics Detectors

Degree Program	Applied Photonics
Module Manager	Prof. Dr. P. Zipfl
Modul Type	Elective Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	LV 33106: English

Module Objectives

General
The student can organize and structure solutions to a particular problem. The students are able to determine fundamental data concerning signal power and noise by evaluation. They can use and perform basic measurements.

Professional Competence
The laboratory work enables students to gain practical experience, as they are able to carry out experiments and create measurement set-ups etc. on their own responsibility or in small teams.

Interdisciplinary Competence
The goals associated with civic engagement, such as promoting the holistic education of students, are achieved.

Course Content

Literature
Recommendation: 3 to 5 references to basic literature;
explicitly mark further literature

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33106	Applications of Photonics Detectors	Prof. Dr. P. Zipfl	V, L	4	5

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33106	PLS, PLR	100%	

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:

Last Update: 23.03.2023, Fritz

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33804 SPO-Version: 33

Module Name: Advanced Image Processing

Degree Program	Applied Photonics
Module Manager	Prof. Dr. A. Heinrich
Modul Type	Elective Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	
Use in other SG	none
Language	LV 33107: English

Module Objectives

General
The student can organize and structure solutions to a particular problem wrt. image processing. The students are able to determine fundamental data concerning signal power and noise by evaluation in images. They can use and perform basic image correction alogrithmen and work out strategies to enhance image quality.

Professional Competence
The laboratory work enables students to gain practical experience, as they are able to carry out experiments and create measurement set-ups etc. on their own responsibility or in small teams.

Interdisciplinary Competence
The goals associated with civic engagement, such as promoting the holistic education of students, are achieved.

Course Content

Advanced Image Restoration Techniques: Covering methods to correct images that have been degraded by known sources of distortion, including deblurring, denoising, and the removal of artifacts due to sensor imperfections or transmission errors.

Computational Imaging: Introduction to computational techniques that enhance or extend the capabilities of photographic systems, including light field photography, holography, and computational microscopy.

High Dynamic Range Imaging (HDR): Techniques for capturing, processing, and displaying images with a higher dynamic range than conventional imaging methods allow, including the handling of scenes with very bright and dark areas.

3D Image Processing and Analysis: Methods for acquiring, processing, analyzing, and visualizing three-dimensional data, including stereoscopic imaging techniques, depth mapping, and volumetric rendering.

Machine Learning and Deep Learning in Image Processing: An overview of how machine learning algorithms, particularly deep learning, are applied to tasks such as image classification, segmentation, and enhancement.

Image Compression and Encoding: Advanced methods for reducing the storage and bandwidth requirements for image transmission while preserving essential information, including lossless and lossy compression techniques and the latest standards.

Spectral Imaging and Analysis: Techniques for capturing and analyzing images across multiple wavelengths, including multispectral and hyperspectral imaging, with applications in remote sensing, medical imaging, and quality control.

Literature

"Digital Image Processing" by Rafael C. Gonzalez and Richard E. Woods
"Computer Vision: Algorithms and Applications" by Richard Szeliski
"The Image Processing Handbook" by John C. Russ

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33107	Advanced Image Processing	Prof. Dr. A. Heinrich	V, L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33107	PLS, PLR	100%	

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Comments: -

Last Update: 21.03.24 Andreas Heinrich

Module Number: 33805 SPO-Version: 33

Module Name: Advanced Laser Technology

Degree Program	Applied Photonics
Module Manager	Prof. Dr. A. Harth
Modul Type	Elective Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	LV 33108: English

Module Objectives

General
The student can organize and structure solutions to a particular problem. The students are able to determine fundamental data concerning signal power and noise by evaluation. They can use and perform basic measurements.

Professional Competence
The laboratory work enables students to gain practical experience, as they are able to carry out experiments and create measurement set-ups etc. on their own responsibility or in small teams.

Interdisciplinary Competence
Es werden die mit dem zivilgesellschaftlichen Engagement verbundenen Ziele, wie die ganzheitliche Bildung der Studierenden zu fördern, erreicht.

Course Content

1.Lasers:
Type of lasers, Laser Characterisitcs, Continous lasers, pulsed lasers.
2. Guiding the laser to the work piece:
Fokussing, Gaussian beam, Beam parameter Product (BPP)
3. Laser meets the work piece:
Wavelength, incident angular, temperature surface dependent absorption; pulse overlap

Literature

Laser Material Processing, Steen;
Lasermaterialbearbeitung, Bliedtner;
Fertigungsverfahren, Klocke

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33108	Advanced Laser Technology	Prof. Dr. A. Harth	V, L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33108	PLK (120min)	100%	

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:
None

Last Update: 21.04.2024, Harth

1 *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

2 *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33806 SPO-Version: 33

Module Name: Current Topics in Photonics 1

Degree Program	Applied Photonics
Module Manager	Prof. Dr. A. Walter
Modul Type	Elective Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	English

Module Objectives

General
The student will possess the capability to comprehend scientific presentations, analyze the content with a critical eye, and glean fresh perspectives from cutting-edge international research in photonics. They will expand their knowledge base while simultaneously delving deeply into specific areas of interest, achieving a thorough understanding of chosen topics.

Professional Competence
The lectures provide students with the opportunity to remain at the forefront of cutting-edge research in photonics, offering insights into a diverse range of optical subjects that will inform their interests and equip them to approach research questions in a scientifically rigorous manner.

Interdisciplinary Competence
Robust interdisciplinary approach: Encompassing an extensive array of optics subjects, spanning from image processing to biophotonics, students will gain the ability to autonomously explore emerging themes from contemporary research, assess information critically, and derive practical conclusions.

Course Content

Optical Topics will be covered from a multitude of interdisciplinary fields, including for example:

- Astronomy
- Biomedicine
- Biophotonics
- Microscopy & Bioimaging
- Additive Manufacturing
- Computational Optics
- Automotive Optics
- Metrology
- Machine Vision

…

Literature Each talk will be made available to all students and provide further references and literature for the specific topic.

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33109	Current Topics in Photonics 1	Prof. Dr. A. Walter	V, L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33109	PLS, PLR	100%	

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:

Last Update: 20.03.2024, Andreas Walter

1 *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

2 *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33807 SPO-Version: 33

Module Name: Optical Systems Workshop

Degree Program	Applied Photonics
Module Manager	M.Sc. Dipl. Ing. (FH) Michael Wagner
Modul Type	Mandatory Module
Academic Semester	1. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	LV 33110: English

Module Objectives

Professional Competence
Students can implement optical systems and wave optics. Parallel to the theoretical lecture, students can build up experiments and apply their theoretical knowledge. They are able to illustrate, analyze and discuss different experimental solutions.

Interdisciplinary Competence
The students can discuss and convince their opponents with a scientific discussion. They can find a common solution. Students can set up and carry out experiments, transfer theoretical knowledge and identify and solve problems that arise in practice.

Course Content

- Reflection and refraction
- Paraxial optics and lenses
- Matrix optics and ray tracing
- Optical instrument
- Waves and interference
- Gaussian beams
- Polarization

Literature

Hand-out, detailed manuscript
Fundamentals of Photonics, B.E. Saleh et al, Wiley (1991)
Principles of Optics, M. Born et al., Pergamon Press (1977)
Optics, Hecht, Addison (1980)

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33110	Optical Systems Workshop	M.Sc. Michael Wagner	V, L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33110	PLK (60 minutes)	100%	

Requirements for Admission to the Module Exam
all reports need to be handed in on time

Further Study-Related Feedback
None

Comments:

Last Update: 13.02.2024, Wagner

1 *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

2 *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33809 SPO-Version: 33

Module Name: Advanced Optical Communications Technology

Degree Program	Applied Photonics
Module Manager	Prof. Dr. J. Krapp
Modul Type	Elective Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	English

Module Objectives

Professional Competence
Students will be able to explain and evaluate a sound knowledge of fiber optic networks, including structure, functionality and properties of the corresponding components. They will be able to compare sustainable network concepts and understand the principles of coherent optical transmission.

Interdisciplinary Competence
Methodically this subject emphasizes on self-reliant learning by guided seminars.
The student can analyze the corresponding literature on his own responsibility and differentiate between relevant and irrelevant information. He is able to present solutions and results.

Course Content

LAN, MAN, WAN, PDH, SDH/SONET, ATM, QAM, xDSL, AON, PON, HFC/CATV, FSO, Satellite Communication, DWDM, OTN (Optical Transport Network), OMUX/ODMUX, OADM, ROADM, Optical Switches Technologies, Fiber Nonlinearities, Raman Fiber Amplifier, NRZ and RZ transmission, Duobinary optical transmission, DPSK and RZ-DPSK, Coherent Transmission.

Literature

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33203	Advanced Optical Communications Technology	Prof. Dr. J. Krapp	V	4	5

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33203	PLK (90 minutes)	80%	
	PLR	20 %	

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:

Last Update: 22.03.2023, Fritz

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33810 SPO-Version: 33

Module Name: Optics Technology

Degree Program	Applied Photonics
Module Manager	Prof. Dr. Rainer Börret
Modul Type	Elective Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	English

Module Objectives

Professional Competence

The students are able to describe and apply their profound knowledge of optical technologies and measurement techniques by themselves.

The Students are able to analyze the optical specifications in order to choose the right technologies and suppliers.

They are able to set up an adequate process chain for specific optical components due to the technical and economic constraints in companies.

Interdisciplinary Competence

Students can present and defend their results. They can work in a team. They can interpret and apply the DIN ISO specification.

Course Content

- specifications: From ISO 10 110 to power spectral density
- errorbudget optics
- selected processes for fabrication of different optical elements
- new moulding processes for glass and plastics
- coating design and coating technology
- design, specifications and fabrication of diffractive optical elements

Literature

Manuscript and publications

J. Bliedtner, G. Grafe, R. Hector, Optical Technology

Braunecker, Hentschel, Tiziani, Advanced Optics with Aspherics

J.D. Rancourt, Optical Thin Films

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33206	Optics Technology	Prof. Dr. Rainer Börret	V, L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33206	PLM (20 Minutes)	100%	

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:

Last Update: 23.03.2023, Fritz, 04.04.2023 R.Boerret

1 *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*
2 *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33811 SPO-Version: 33

Module Name: Current Topics in Photonics 2

Degree Program	Applied Photonics
Module Manager	Prof. Dr. Andreas Walter
Modul Type	Elective Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	LV 33207: English

Module Objectives

General
The student will be able to follow scientific talks, evaluate the information critically, and gain new insights into international state-of-the-art research on photonics. The student will be able to broaden his horizon while, at the same time, focus on a dedicated topic of his/her interest and understand this in great detail.

Professional Competence
The lectures allow the students to stay ahead with state-of-the-art research in the field of photonics and get insights into a variety of optical topics that will help guide their interests and enable them to address research questions scientifically.

Interdisciplinary Competence
Strong interdisciplinarity: a wide range of optics topics are covered, from image processing to biophotonics. Students will be able to independently develop new topics from the latest research, evaluate information, and draw practical conclusions.

Course Content

Optical Topics will be covered from a multitude of interdisciplinary fields, including for example:

- Astronomy
- Biomedicine
- Biophotonics
- Microscopy & Bioimaging
- Additive Manufacturing
- Computational Optics
- Automotive Optics
- Metrology
- Machine Vision
- …

Literature

Each talk will be made available to all students and provide further references and literature for the specific topic.

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33207	Current Topics in Photonics 2	Prof. Dr. Andreas Walter	V, L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33207	PLS, PLR	100%	

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:

Last Update: 05.06.2023, Andreas Walter

1 *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

2 *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33812 SPO-Version: 33

Module Name: Optical Systems

Degree Program	Applied Photonics
Module Manager	Prof. Dr. Andreas Heinrich
Modul Type	Elective Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Basic knowledge in Optics & Math and Matlab
Use in other SG	
Language	LV 33204: English

Module Objectives

Professional Competence
Students can implement optical systems and perform system tests. Parallel to the theoretical lecture, students can build up experiments and apply their theoretical knowledge. They are able to illustrate, analyze and discuss different experimental solutions.

Interdisciplinary Competence
The students can discuss and convince their opponents with a scientific discussion. They can find a common solution. Students can set up and carry out experiments, transfer theoretical knowledge and identify and solve problems that arise in practice.

Course Content

- basics in optical systems design
- Aberreations
- Image Quality
- Tolerancing
- Materials
- Optimechanics
- Coating
- Analysis
- optical System testing

Literature

Hand-out, detailed manuscript with exercises

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33204	Optical Systems	Prof. Dr. Andreas Heinrich	V, L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33204	PLK (60 minutes)	100%	

Requirements for Admission to the Module Exam
all reports need to be handed in on time

Further Study-Related Feedback
None

Comments:

Last Update: 23.03.2023, Fritz

1 *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

2 *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Hochschule Aalen

Module Number: 33813 SPO-Version: 33

Module Name: Laser Photonics

Degree Program	Applied Photonics
Module Manager	Prof. Dr. A. Harth
Modul Type	Elective Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	LV 33209: English

Module Objectives

Professional Competence
The students are able to understand and validate different laser types.

Interdisciplinary Competence
The laboratory work enables students to apply theoretical knowledge. They are able to perform experiments in a self-reliant way within a small team. The students are able to design, analyse and validate resonator optics, align lasers and determine their performance experimentally.

Course Content

Laser dynamics, pulsed lasers and pulse dispersion, laser clocks, advanced resonator design, femtosecond lasers, coherence and stochastic optics

Literature

Laser photonics lecture notes with bibliography

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33209	Laser Photonics	Prof. Dr. A. Harth	V, L	4	5

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33209	PLM (30 Minutes)	100%	

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:

Last Update: 23.03.2023, Fritz

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33816 SPO-Version: 33

Module Name: Optical Design Strategies

Degree Program	Applied Photonics
Module Manager	Dr. A. Epple
Modul Type	Elective Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	LV 33205: English

Module Objectives

Professional Competence
The students are able to design optical systems and analyze optical aberrations to optimize optical system performance and to compare and validate different approaches.

Interdisciplinary Competence
The project work enables students to design various parts of an optical system and combine them within a team for the development of optomechanical devices. They are able to handle tool elements of an optical design program to design, simulate and analyze optical system.

Course Content

Introduction to Optical Design (Overview of optical systems and their applications Historical perspective and evolution of optical design, Basic principles of geometrical optics)

Fundamentals of Light and Optics (Wave optics: interference, diffraction, and polarization, Ray optics: reflection, refraction, and the principles of image formation, Optical materials and their properties)

Optical Aberrations and Their Correction (Types of optical aberrations (spherical, chromatic, astigmatism, coma, distortion), Strategies for aberration correction and control, Role of aperture and field stops in optical design)

Design of Optical Systems (Lens design fundamentals: thin lens, thick lens, and lens systems, Mirror and prism design, Optical system layout and the role of stops and pupils)

Optical System Performance Evaluation (Modulation Transfer Function (MTF) and other performance metrics, Tolerance analysis for manufacturability and cost control, Introduction to adaptive optics and wavefront correction)

Optical Design Software Tools (Overview of software used in optical design (e.g., Zemax, Code V, LightTools), Practical sessions on using design software for simulation and optimization, Case studies of real-world optical design problems and solutions)

Project Work and Case Studies (Students will undertake a project to design, simulate, and optimize an optical system for a given application. Discussion of case studies highlighting innovative optical design strategies in industry and research.)

Literature“

"Introduction to Lens Design: With Practical Zemax Examples" by Joseph M. Geary
"Optical System Design" by Robert F. Fischer
"Modern Optical Engineering" by Warren J. Smith
"Practical Optical System Layout: And Use of Stock Lenses" by Warren J. Smith

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33205	Optical Design Strategies	Dr. A. Epple	V, L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33205	PLM (60 Minutes)	100%	

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

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1 *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

2 *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Comments:

Last Update: 21.03.24 Andreas Heinrich

Module Number: 33817 SPO-Version: 33

Module Name: Advanced Optical Design

Degree Program	Applied Photonics
Module Manager	Prof. Dr. A. Heinrich
Modul Type	Elective Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	LV 33208: English

Module Objectives

Professional Competence
Students are able to design advanced optical systems with the optical design program CodeV, simulate physical optical phenomena, design and simulate illumination systems.

Interdisciplinary Competence
The students simulate, design and validate optical systems with an optical design program to develop optomechanical systems. The results are presented by the respective groups. Students are able to select and apply methods for the analysis and validation of optical systems to optimize and develop innovative solutions.

Course Content
Aberration theory, correction strategies, programming and handling of optical design programs

Literature
Lecture notes and data sheets

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33208	Advanced Optical Design	Pretorius/Frasch	V, L	4	5

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33208	PLK (90 Minutes)	100%	Allowed Exam Materials: Calculator

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:

Last Update: 23.03.2023, Fritz

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33818 SPO-Version: 33

Module Name: Illumination

Degree Program	Applied Photonics
Module Manager	Prof. Dr. Andreas Heinrich
Modul Type	Elective Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	none
Use in other SG	
Language	LV 33210: English

Module Objectives

Professional Competence
Students can understand the lighting in a basic way. They can describe their knowledge of phenomena that describe the interaction of light waves in optical systems. This allows them to represent the difference between beam and wave optics. This will allow students to see the limits and describe improved optical effects. In addition, students can apply simulation software and transfer their understanding of lighting system design.

Interdisciplinary Competence
They can discuss and evaluate the advantages and disadvantages of different approaches in a team. They can express themselves scientifically and apply their knowledge. Students are able to analyse literature and distinguish between relevant and irrelevant information. They can evaluate and judge optical phenomena.

Course Content The students can choose out of this topics:
1 Introduction
2 Radiometry and apertures
3 Illumination in Imaging Systems
4 Illumination in Nonimaging Systems
5 Spectoradiometric Quantities
6 Radiometric and Photometric quantities
7 Color
8 Scattering of Light
9 Illumination Properties of Materials
10 Sources of Illumination
11 Coherence
12 Fibers, Lightpipes and Ligthguides
13 Classical Illumination Design
14 Uniform Illumination
15 Source Modeling Methods
16 Nonimaging Compound Concentrators
17 Displays
18 Characterizing Illumination Systems
19 Software Modelling
20 Architectural Illumination
21 Light and Visual Performance
22 Lighting Design
23 Illumination in Photography
24 Luminaire for Open-Plan Office
25 Daylight Compensation
26 Exterior Lighting
27 Parking
28 Roadway Lighting
29 Resolution Enhancement by Illumination in Microscopy and Photolithography
30 Special Illumination Techniques for Measurements
31 Illumination in Particle Optics

Literature

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33210	Illumination	Dr. Johannes Eisenmenger	L	4	5

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33210	PLK (90 Minutes)	100%	

Requirements for Admission to the Module Exam
None

1 *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*
2 *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Further Study-Related Feedback
None

Comments:

Last Update: 23.03.2023, Fritz

Hochschule Aalen

Module Number: 33819 SPO-Version: 33

Module Name: Fourier Optics

Degree Program	Applied Photonics
Module Manager	Prof. Dr. Andreas Heinrich
Modul Type	Elective Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Mathematics, physics of technical Bachelor degree
Use in other SG	
Language	LV 33211: English

Module Objectives

Professional Competence
Students are able to do Fourier analysis and calculations in the field of optics
The students learn to convince their team partners by a scientific discussion to come to a common accepted solution. The students will get a fundamental understanding Fourier methods techniques in order to apply Fourier Methods to simulate optical Elements for light propagation. Thereby Matalb will be used on order to perform the simulations.

Interdisciplinary Competence
The learning goal of the students' self study is to reach the level of optical knowledge regarding Diffractive optics. Setting up experiments enables the students to transfer their theoretical knowledge and to realize problems to be faced in a practical environment.

Course Content Refraction, reflection, paraxial optical systems, optical devices, polarization, interference

Literature lecture notes with bibliography

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33211	Fourier Optics	Prof. Dr. Andreas Heinrich	V, L	4	5

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33211	PLK (60 minutes)	100%	Allowed Exam Materials: none

Requirements for Admission to the Module Exam

Further Study-Related Feedback
None

Comments:

Last Update: 27.03.2023, Fritz

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Module Number: 33824 SPO-Version: 33

Module Name: Introduction to Diffractive Optics

Degree Program	Applied Photonics
Module Manager	Prof. Dr. Andreas Heinrich
Modul Type	Elective Module
Academic Semester	2. Semester
Module Duration	1 Semester
Number LV	1
Offered	Summer Semester
Credits	5 CP
Workload Class	60 Hours
Workload Self-Study	90 Hours
Participation Requirements	Mathematics, physics of technical Bachelor degree
Use in other SG	
Language	LV 33216: English

Module Objectives

Professional Competence
Students are able to do Fourier analysis and calculations in the field of optics
The students learn to convince their team partners by a scientific discussion to come to a common accepted solution. The students will get a fundamental understanding on diffractive elements and are able to apply Fourier methods and other techniques in order to Design Difractive optical Elements for light propagation, Transmittance. Additional knowledge will be obtained on special diffractive elements like Gratings etc.

Interdisciplinary Competence
The learning goal of the students' self study is to reach the level of optical knowledge regarding Diffractive optics. Setting up experiments enables the students to transfer their theoretical knowledge and to realize problems to be faced in a practical environment.

Course Content Refraction, reflection, paraxial optical systems, optical devices, polarization, interference

Literature lecture notes with bibliography

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
33216	Introduction to Diffractive Optics	Prof. Dr. Andreas Heinrich	V, L	4	5

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
33216	PLK (60 minutes)	100%	Allowed Exam Materials: none

Requirements for Admission to the Module Exam

Further Study-Related Feedback
None

Comments:

Last Update: 27.03.2023, Fritz

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*

Hochschule Aalen

Module Number: 9999 SPO-Version: 33

Module Name: Master Thesis

Degree Program	Applied Photonics
Module Manager	Prof. Dr. A. Heinrich
Modul Type	Mandatory Module
Academic Semester	3. Semester
Module Duration	1 Semester
Number LV	1
Offered	Winter Semester, Summer Semester
Credits	30 CP
Workload Class	-
Workload Self-Study	900 Hours
Participation Requirements	50 credit points reduced by 5 credits for every extra-occupational semester, module 33001 (project) passed
Use in other SG	
Language	LV 9999: English

Module Objectives

Professional Competence
The students can apply the contents of the curriculum independently in a scientific paper. They can analyze demanding specialist literature. They can analyze and evaluate the results and carry out experimental measurements in research areas. They are able to defend the results of the Master's thesis in an oral presentation and document them in a written report.

Course Content Actual work in different fields of photonics

Literature Subject specific books and publications

Included Courses (LV)

LV-Nr.	Course Name	Professor	Type[1]	SWS	CP
9999	Master Thesis	All Photonics Professors	P		24
9998	Colloquium	All Photonics Professors	K		6

[1] *Type of course according to: Allgemeiner Teil der SPO (§ 63 BA-TA-18-1; § 55 MA-TA-20-1).*

Module Examination (Prerequisite for the Award of Credit Points)

LV-Nr.	Type and Duration of Proof of Performance[2]	Determination of Module Grades	Comments
9999	PLA	80 %	All parts of the thesis have to be performed individually; participation of more than one student is not permitted; each student works on its own topic.
	PLM	20 %	slides of presentation in English

Requirements for Admission to the Module Exam
None

Further Study-Related Feedback
None

Comments:

- Oral part of examination consists of an oral presentation in English (mandatory) of 15 minutes duration and 15 minutes oral questioning in English shared by first and second examiner. Student has to answer in English.
- Written report may be in English or German language according the requirement of first adviser/examiner.
- Maximum prolongation in case of delay that student doesn't take responsibility for is 8 weeks; prior approval of dean of students
  required.
- Submission of Master thesis includes (delivery signed in student`s separation form)
  - Abstract of thesis in English
  - Information sheet for database
  - PDF-file of thesis

Last Update: 22.03.2023, Fritz

[2] *Types of examinations according to: Allgemeiner Teil der SPO (§ 20a BA-TA-18-1; § 18a MA-TA-20-1).*