	Faculty Optics and Mechatronics	Module Description SPO 31
	Degree Program Applied Photonics (Master)	
	Module Coordinator Prof. Dr.J. Krapp/ Prof. Dr. A. Heinrich	

Module Name		Projects / Soft Skills				Module No : 33001	
CP	SHW ¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150	60	90	<input checked="" type="checkbox"/> Winter Semester <input type="checkbox"/> Summer Semester	1	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective		Module Type (PM/WPM/WM)		Division (Upper/Lower)		Incorporated in Degree Programs	
Master of Science		PM - Compulsory Module		HS - Hauptstudium		Photonics	
Study Form		<input type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input checked="" type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input checked="" type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Prerequisites		no					

Supporting Modules / Courses							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
33101	Project / Soft Skills	Prof. Dr. Krapp	L	4	5	1	PLL benotet PLM 20 benotet
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
	PM - Compulsory			Photonics			


Allowed Exam Materials/ Restrictions	<ul style="list-style-type: none"> • all kinds of literature • all parts of the project has to be performed individually; participation of more than one student is not permitted; each student works on its one topic.
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¹ SHW = Semester Hours per Week

Learning Goals / Competences			
Professional competence (professional knowledge and skills, professional expertise):			
In photonics, 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.			
Over professional competence (social skills und ability to work independently):			
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.			
Special (methods) skills, if applicable:			
Students can analyse literature and can separate from non-relevant and relevant information. Students are able to present the results of their comolitions.			
Die Studierenden können selbstständig neue Themengebiete erarbeiten, Informationen bewerten, praktische Schlussfolgerungen ziehen, neue Lösungen entwickeln und dabei sowohl gesellschaftliche/ soziale als auch ökologische und ökonomische Aspekte berücksichtigen. Dadurch sind die mit dem zivilgesellschaftlichen Engagement verbundenen Ziele, wie die ganzheitliche Bildung der Studierenden zu fördern, erreicht.			
Competence Area	Heavy	Medium	Light
Technical Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Course Contents			

Language	<input type="checkbox"/> German	<input checked="" type="checkbox"/> English	<input type="checkbox"/> Spanish	<input type="checkbox"/> French
	<input type="checkbox"/> Chinese	<input type="checkbox"/> Portuguese	<input type="checkbox"/> Russian	Other:
Literature				
Composition of Final Grade	Written report (PLL) 80 % Oral presentation (PLM 20) 20 %			
Comments / Other	Final oral presentation will be on the beginning of summer semester according to the announcement on notice-board			
Last Updated	22.02.2017; J. Krapp /Wa			

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description SPO 31
	Course of Study Applied Photonics (Master)	
	Module Coordinator Prof. Dr. Rainer Börret	

Module Name		Interferometry				Modul No : 33002	
CP	SHW¹	Workload	Contact Time	Self-Study	Offering Begin	Sem	Duration
5	4	150h	60 h	90 h	<input checked="" type="checkbox"/> Winter Semester <input type="checkbox"/> Summer Semester	1	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Target Degree		Module Type (PM/WPM/WM)		Study Division	Use in Courses of Study		
Master of Science		PM - Compulsory Module					
Form of Studies		<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input checked="" type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Admission Requirement		33035 Fundamental Optics					

Supporting Mini-Modules / Courses								
Subjekt No.	Title of the Mini-Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Modul Exam Type/ Length/ Marked	
33102	Interferometry	Prof. Dr. Rainer Börret	V	4	5	1	PLM 20	
	Mini- Module Type (PM/WPM/WM)	Study Division	Use in Courses of Study					
	WPM - Compulsory							
Subjekt No.	Title of the Mini-Module / Course	Lecturer	Type	SHW ¹	CP	Sem		
	Mini- Module Type (PM/WPM/WM)	Study Division	Use in Courses of Study					
Allowed Aid		-						


¹ SHW = Semester Hours per Week

Learning Goals / Competences			
Professional competence (professional knowledge and skills, professional expertise):			
Students will be able to apply and perform the basic concepts and applications of interferometry 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			
Over professional competence (social skills und ability to work independently):			
Students can discuss and debate in groups about specific problems and about the best solutions and applications related to a particular measurement problem.			
Special (methods) skills, if applicable:			
They are enabled to systematically select the suitable metrology setup for various measurement problems.			
Competence Area	Concentration	Mini-Concentration	In Small Amounts
Professional Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Teaching Contents			
Lecture:			
<ul style="list-style-type: none"> - 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 			

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	<ul style="list-style-type: none"> - Hand-out, detailed manuscript with exercises - Dörband, Müller, Gross: "Handbook of Optical Systems, Vol. 5" - Hecht „Optics“ (Fundamentals) - Malacara „Optical Shop Testing“
Composition of the Final Mark	50 % PLP, 50 % PLM (20 min)
Comments / Other	
Last Updated	20.10.2020/ 04.04.2023 Börret

¹ SHW = Semester Hours per Week

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description
	Degree Program Photonics (Master)	
	Module Coordinator Prof. Dr. T. Hellmuth	

Module Name		Quantum optics				Module No : 33003	
CP	SHW ¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150h	90h	60h	<input type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	1	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective		Module Type (PM/WPM/WM)		Division (Upper/Lower)		Incorporated in Degree Programs	
Master of Science		PM - Compulsory Module					
Study Form		<input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Prerequisites		Mathematics, physics of technical bachelor degree					

Supporting Modules / Courses							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
33103	Quantum optics	Hellmuth	V Ü	4	5	1	PLK 60 benotet
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
	PM - Compulsory						


¹ SHW = Semester Hours per Week

Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
	Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs				
Allowed Exam Materials		lecture notes, calculator					

Learning Goals / Competences			
<p>Professional competence (professional knowledge and skills, professional expertise): Students are able to describe and understand quantum optical phenomena mathematically and to interpret the theoretical predictions in terms of experimental relevance.</p> <p>Special (methods) skills: The students learn to apply quantum physical principles to technical applications.</p> <p>Professional competence (social skills und ability to work independently): The students solve exercises in groups and present their results.</p>			
Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Course Contents			
Teaching Contents			
Stochastics, linear algebra, quantum physics, quantum optics.			

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	Quantum optics , lecture notes with bibliography
Composition of Final Grade	PLK (100%);
Comments / Other	
Last Updated	20.04.2020 TH

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description SPO 31
	Course of Study Applied Photonics (Master)	
	Module Coordinator Prof. Dr. Andreas Heinrich	

Module Name		Photonic Detectors and Devices				Modul No : 33004	
CP	SHW¹	Workload	Contact Time	Self-Study	Offering Begin	Sem	Duration
5	4	150h	60 h	90 h	<input checked="" type="checkbox"/> Winter Semester <input type="checkbox"/> Summer Semester	1	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Target Degree		Module Type (PM/WPM/WM)		Study Division	Use in Courses of Study		
Master of Science		PM - Compulsory Module					
Form of Studies		<input type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input checked="" type="checkbox"/> Seminar <input checked="" type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Admission Requirement		Basic knowledge in Optics & Math					


Supporting Mini-Modules / Courses								
Subjekt No.	Title of the Mini-Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Modul Exam Type/ Length/ Marked	
33104	Photonic detectors and devices	Prof. Dr. Andreas Heinrich	V	4	5	1	PLR	
	Mini- Module Type (PM/WPM/WM)	Study Division	Use in Courses of Study					
	PM - Compulsory							
Subjekt No.	Title of the Mini-Module / Course	Lecturer	Type	SHW ¹	CP	Sem		
	Mini- Module Type (PM/WPM/WM)	Study Division	Use in Courses of Study					
Allowed Aids		none						

¹ SHW = Semester Hours per Week

Learning Goals / Competences			
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.			
Over professional competence (social skills und ability to work independently):			
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.			
Special (methods) skills, if applicable:			
The students can evaluate scientific research and relevant literature.			
Competence Area	Concentration	Mini-Concentration	In Small Amounts
Professional Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Teaching Contents			
<ul style="list-style-type: none"> - 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 adequate illumination) projectors (SLMs, LCOS, LCDs, GLVs, DMDs, DLPs) detectors (CCD, CMOS, polarization camera, plenoptical camera) displays (3D Displays and imaging: stereoscopic, autoscopic, holographic) 			

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	Herbert Gross: Optical Systems
Composition of the Final Mark	oral presentation (100%)
Comments / Other	precondition for exam: accomplished group work
Last Updated	Oct. 9th, 2019 / Wa

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description
	Degree Program Photonics (Master)	
	Module Coordinator Prof. Dr. T. Hellmuth	

Module Name		Nonlinear optics				Module No : 33005	
CP	SHW¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150h	60h	90h	<input checked="" type="checkbox"/> Winter Semester <input type="checkbox"/> Summer Semester	2	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective		Module Type (PM/WPM/WM)		Division (Upper/Lower)		Incorporated in Degree Programs	
Master of Science		PM - Compulsory Module					
Study Form		<input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Prerequisites		Mathematics, physics of technical bachelor degree					

Supporting Modules / Courses							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
33201	Laser and non-linear optics		V Ü	4	5	2	PLK 60 benotet
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
	PM - Compulsory						

¹ SHW = Semester Hours per Week


Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
	Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs				
Allowed Exam Materials		lecture notes, calculator					

Learning Goals / Competences			
<p>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 tolerances and specify non-linear crystals.</p> <p>Special (methods) skills: The students are able to search specifications and physical properties of non-linear crystals to design non-linear laser devices for industrial applications.</p> <p>Professional competence (social skills und ability to work independently): The students simulate, design and validate crystals with the SNLO program. The results are presented by the respective groups.</p>			
Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Course Contents			
Teaching Contents			
Polarization optics, crystal optics, non-linear optics of second and third order			

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	Lecture notes with bibliography
Composition of Final Grade	PLK (100%)
Comments / Other	
Last Updated	20.04.2020 TH

¹ SHW = Semester Hours per Week

¹ SHW = Semester Hours per Week

 Hochschule Aalen	Faculty Optics and Mechatronics	Module Description SPO 31
	Degree Program Applied Photonics (Master)	
	Module Coordinator Prof. Dr.J. Krapp	


Module Name		Advanced Optical Communications Technology				Module No : 33006	
CP	SHW¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150	60	90	<input type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	2	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective			Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs		
Master of Science			PM - Compulsory Module	HS - Hauptstudium	Photonics		
Study Form			<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input checked="" type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report				
Prerequisites			proved knowledge of optical fiber communication (admission for exam)				

Supporting Modules / Courses								
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded	
33202	Advanced Optical Communications Technology	Prof. Dr. J. Krapp	V	4	5	2	PLK 90 benotet PLR benotet	
	Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs					
	PM - Compulsory	HS - Hauptstudium	Photonics					
Allowed Exam Materials		none						

¹ SHW = Semester Hours per Week

Learning Goals / Competences			
Professional competence (professional knowledge and skills, professional expertise):			
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.			
Special (methods) skills, if applicable:			
Methodically this subject emphasize 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.			
Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Course Contents			
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.			

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input checked="" type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	
Composition of Final Grade	PLR seminar presentation 20%, PLK examinations 80%
Comments / Other	
Last Updated	19.03.2019; J. Krapp

	Faculty Optics and Mechatronics	Module Description SPO 31
	Course of Study Applied Photonics (Master)	
	Module Coordinator Prof. Dr. Andreas Heinrich	

Module Name		Optical Systems				Modul No : 33007	
CP	SHW¹	Workload	Contact Time	Self-Study	Offering Begin	Sem	Duration
5	4	150h	60 h	90 h	<input type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	2	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Target Degree		Module Type (PM/WPM/WM)		Study Division	Use in Courses of Study		
Master of Science		PM - Compulsory Module					
Form of Studies		<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Admission Requirement		Basic knowledge in Optics & Math and Matlab					

Supporting Mini-Modules / Courses								
Subjekt No.	Title of the Mini-Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Modul Exam Type/ Length/ Marked	
33203	Optical Systems	Prof. Dr. Andreas Heinrich	V L	4	5	2	PLK 60	
	Mini- Module Type (PM/WPM/WM)	Study Division	Use in Courses of Study					
	PM - Compulsory							
Subjekt No.	Title of the Mini-Module / Course	Lecturer	Type	SHW ¹	CP	Sem		
	Mini- Module Type (PM/WPM/WM)	Study Division	Use in Courses of Study					
Allowed Aids		none						


¹ SHW = Semester Hours per Week

Learning Goals / Competences			
Professional competence (professional knowledge and skills, professional expertise):			
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.			
Over professional competence (social skills und ability to work independently):			
The students can discuss and convince their opponents with a scientific discussion. They can find a common solution.			
Special (methods) skills, if applicable:			
Students can set up and carry out experiments, transfer theoretical knowledge and identify and solve problems that arise in practice.			
Competence Area	Concentration	Mini-Concentration	In Small Amounts
Professional Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Teaching Contents			
<ul style="list-style-type: none"> - basics in optical systems design - Aberreations - Image Quality - Tolerancing - Materials - Optimechanics - Coating - Analysis - optical System testing 			

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	Hand-out, detailed manuscript with exercises
Composition of the Final Mark	PLK (100%)
Comments / Other	in order to take part in the exam all reports need to be handed in on time
Last Updated	March, 14th, 2021 Andreas Heinrich April 17th, 2020 Andreas Heinrich January 15th, 2019 Andreas Heinrich June 15th, 2016

¹ SHW = Semester Hours per Week

¹ SHW = Semester Hours per Week

 Hochschule Aalen	Faculty Optics and Mechatronics	Module Description SPO 31
	Degree Program Applied Photonics (Master)	
	Module Coordinator Prof. Dr. Andreas Heinrich	

Module Name		Physical Optics				Module No : 33008	
CP	SHW ¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150h	60 h	90 h	<input type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	2	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective		Module Type (PM/WPM/WM)		Division (Upper/Lower)		Incorporated in Degree Programs	
Master of Science		PM - Compulsory Module					
Study Form		<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input checked="" type="checkbox"/> Other: Paper, Report					
Prerequisites		none					

Supporting Modules / Courses							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
33204	Physical Optics	Prof. Dr. Andreas Heinrich	V	4	5	2	PLK 60 benotet
Allowed Exam Materials		none					

¹ SHW = Semester Hours per Week

Learning Goals / Competences

Professional competence (professional knowledge and skills, professional expertise):

Studiernede 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.

Special (methods) skills, if applicable:

Students are able to analyse literature. They can differ between relevant and non-relevant information and evaluate and judge optical phenomena.

Over professional competence (social skills und ability to work independently):


Students are able to discuss the advantages and disadvantages of different approaches in a team. They can express themselves scientifically and complete their knowledge.

Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Course Contents

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

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	Monographien und Originalartikel B. E.A. Saleh, M.V. Teich: Fundamentals of Photonics
Composition of Final Grade	PLK (100%)
Comments / Other	in order to take part in the exam all reports need to be handed in on time
Last Updated	April 17th, 2020 Andreas Heinrich March 10th, 2019 Andreas Heinrich

	Faculty Optics and Mechatronics	Module Description SPO 32
	Degree Program Applied Photonics (Master)	
	Module Coordinator Prof. Dr.J. Krapp	

Module Name		Photonics Communications Engineering				Module No : 33030	
CP	SHW¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	6	150	90	60	<input checked="" type="checkbox"/> Winter Semester <input type="checkbox"/> Summer Semester	1	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective		Module Type (PM/WPM/WM)		Division (Upper/Lower)		Incorporated in Degree Programs	
Master of Science		PM - Compulsory Module		HS - Hauptstudium		Photonics	
Study Form		<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Prerequisites		no					


Supporting Modules / Courses							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
33130	Photonics Communications Engineering	Prof. Dr. J. Krapp	V E	6	5	1	PLK 90 benotet
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
	WM - Elective Module	HS - Hauptstudium		Photonics			
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
Allowed Exam Materials		none					

¹ SHW = Semester Hours per Week

Learning Goals / Competences			
<p>competence:</p> <p>The students can describe and use their knowledge of fiber optic communication systems, the structure and properties of the corresponding components. Students will be able to obtain basic data about signal power and noise by evaluation.</p> <p>The students are able to expand their knowledge and develop new consolidating insights. They are able to answer, evaluate and develop questions on the individual topics.</p> <p>soft skills and self-reliance:</p> <p>The student</p> <ul style="list-style-type: none"> • is able to understand and handle complex problems and experiments • has an increased ability to abstract thinking <p>special (methods) skills, if applicable:</p> <p>Students can analyze literature and distinguish between relevant and irrelevant information.</p>			
Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Course Contents			
STRUCTURE AND LIGHT PROPAGATION IN FIBERS, FIBER ATTENUATION, FIBER DISPERSION, FIBER OPTIC SOURCES, FIBER COUPLING; OPTICAL AMPLIFIERS WITH ERBIUM DOPED FIBERS, PHOTODETECTORS; RECEIVERS			

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	
Composition of Final Grade	final examination PLK
Comments / Other	
Last Updated	25.07.2017; J. Krapp

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description SPO 32
	Degree Program Applied Photonics (Master)	
	Module Coordinator Prof. Dr.J. Krapp	

Module Name		Photonics Communications Engineering				Module No : 33030	
CP	SHW¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	6	150	90	60	<input checked="" type="checkbox"/> Winter Semester <input type="checkbox"/> Summer Semester	1	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters <input type="checkbox"/> Semesters
Degree Objective		Module Type (PM/WPM/WM)		Division (Upper/Lower)		Incorporated in Degree Programs	
Master of Science		PM - Compulsory Module		HS - Hauptstudium		Photonics	
Study Form		<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Prerequisites		no					

Supporting Modules / Courses							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
33130	Photonics Communications Engineering	Prof. Dr. J. Krapp	V E	6	5	1	PLK 90 benotet
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
	WM - Elective Mo	HS - Hauptstudium		Photonics			
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
Allowed Exam Materials		none					

¹ SHW = Semester Hours per Week

Learning Goals / Competences

competence:

The students can describe and use their knowledge of fiber optic communication systems, the structure and properties of the corresponding components.

Students will be able to obtain basic data about signal power and noise by evaluation.

The students are able to expand their knowledge and develop new consolidating insights. They are able to answer, evaluate and develop questions on the individual topics.

soft skills and self-reliance:

The student

- is able to understand and handle complex problems and experiments
- has an increased ability to abstract thinking

special (methods) skills, if applicable:


Students can analyze literature and distinguish between relevant and irrelevant information.

Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Course Contents

STRUCTURE AND LIGHT PROPAGATION IN FIBERS, FIBER ATTENUATION, FIBER DISPERSION, FIBER OPTIC SOURCES, FIBER COUPLING; OPTICAL AMPLIFIERS WITH ERBIUM DOPED FIBERS, PHOTODETECTORS; RECEIVERS

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	
Composition of Final Grade	final examination PLK
Comments / Other	
Last Updated	25.07.2017; J. Krapp

	Faculty Optics and Mechatronics	Module Description SPO 31
	Course of Study Applied Photonics (Master)	
	Module Coordinator Prof. Dr. P. Zipfl	

Module Name		Applications of Photonics Detectors				Modul No : 33031	
CP	SHW¹	Workload	Contact Time	Self-Study	Offering Begin	Sem	Duration
5	4	150	60	90	<input checked="" type="checkbox"/> Winter Semester <input type="checkbox"/> Summer Semester	1	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Target Degree		Module Type (PM/WPM/WM)		Study Division		Use in Courses of Study	
Master of Science		WPM - Compulsory Elec					
Form of Studies		<input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Admission Requirement							


Supporting Mini-Modules / Courses							
Subjekt No.	Title of the Mini-Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Modul Exam Type/ Length/ Marked
33131	Applications of Photonics Detectors	Zipfl	V L	4	5	1	PLM 20 benotet
	Mini- Module Type (PM/WPM/WM)	Study Division		Use in Courses of Study			
	PM - Compulsory						
Subjekt No.	Title of the Mini-Module / Course	Lecturer	Type	SHW ¹	CP	Sem	
	Mini- Module Type (PM/WPM/WM)	Study Division		Use in Courses of Study			
Allowed Aids		Text Books, Calculator, any kind of communication is forbidden					

¹ SHW = Semester Hours per Week

Learning Goals / Competences			
<p>Professional competence (professional knowledge and skills, professional expertise): The students are able to inform about elements of photonic specific signal chains at the interface between optical and electronic signals. They can select suitable optical sensors for certain applications. Under practical aspects, they can set up appropriate electronics for signal preprocessing of the optical sensor signals. They are able to analyze and implement circuits for photonic applications. Students can calculate signal transmission characteristics and perform noise analyses.</p> <p>Translated with www.DeepL.com/Translator</p> <p>Over professional competence (social skills und ability to work independently): Students can put theoretical knowledge into practical laboratory work, work in teams and write laboratory reports.</p> <p>Special (methods) skills, if applicable: The students are able to analyze and construct electronic circuits or systems with a focus on photonic applications. They are able to design circuits taking into consider a non-ideal behavior of the circuit elements. Furthermore, basic integrated circuits and discrete electronics can be adapted to the special needs of photonic applications.</p>			
Competence Area	Concentration	Mini-Concentration	In Small Amounts
Professional Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Teaching Contents			
<p>Linear photonics specific sensors and systems in Laplace- and time-domain. Linear photonic circuits for analog signal processing. Nonideal behaviour of photonic specific circuits under realistic considerations. Noise sources, spectral densities of noise and transfer functions. Simulation techniques using SPICE and computer algebra software.</p>			

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	Zipfl: Script und several application notes (intranet), Graeme: Amplifiers for Photonic Application, Wilmshurst: Signal Recovery, Motchenbacher, Connelly: Low-Noise Electronic System Design.
Composition of the Final Mark	Oral Examination PLM 20 minutes
Comments / Other	
Last Updated	20.06.2016 Zipfl

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description SPO 31
	Degree Program Applied Photonics (Master)	
	Module Coordinator Prof. Dr. Harald Riegel	


Module Name		Laser Application Technology				Module No : 33033	
CP	SHW¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150h	60h	90h	<input checked="" type="checkbox"/> Winter Semester <input type="checkbox"/> Summer Semester	1	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters <input type="checkbox"/> Semesters
Degree Objective		Module Type (PM/WPM/WM)		Division (Upper/Lower)		Incorporated in Degree Programs	
Master of Science		WPM - Compulsory Elec					
Study Form		<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Prerequisites		Basic knowledge in Optics, Physics (Thermodynamics) and Mathematics					

Supporting Modules / Courses							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
33133	Laser-Application-Technology	Prof. Dr. Harald Riegel	V L	4	5	1	PLK 60 benotet
	Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs				
	WM - Elective Mo						
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
	Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs				
Allowed Exam Materials		non programmable calculator					

¹ SHW = Semester Hours per Week

Learning Goals / Competences			
<p>The students can apply a detailed and well-founded knowledge in the technologies of laser material processing. They can develop advanced principles of the technologies, optimize processes, distinguish suitable lasers and develop complex and modified experimental set-ups for practical work.</p> <p>The students could discuss and explain the advantages and disadvantages of different methods. They can express themselves scientifically and apply their specialist language skills.</p> <p>Students can analyse and interpret scientific papers and corresponding literature and combine them with the content of the lecture.</p>			
Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Course Contents			
Teaching Contents			
<p>1) Basics: Laser, beam propagation, process efficiency 2) Fresnel absorption (cutting), 3) Melt flow in weld bath (welding) 4) Isophotes (drilling) 5) Undisturbed weld bath (polishing) 5) Interaction with no weld bath (ultra-short-pulsed lasers) Questions are encouraged in English language. Teaching will be done on elected topics bilingual.</p>			

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	script to lecture Stehen, Mazumder, Laser Material Processing, Springer Verlag Poprawe, Tailored Light 2, Springer Verlag Bliedtner, Müller, Barz, Lasermaterialbearbeitung Hanser Verlag
Composition of Final Grade	written exam, PLK (100%)
Comments / Other	
Last Updated	22.042016 HR

	Faculty Optics and Mechatronics	Module Description SPO 31
	Course of Study Applied Photonics (Master)	
	Module Coordinator Prof. Dr. Andreas Heinrich	

Module Name		Simulation of Sensor Systems				Modul No : 33024	
CP	SHW¹	Workload	Contact Time	Self-Study	Offering Begin	Sem	Duration
5	4	150h	60 h	90 h	<input checked="" type="checkbox"/> Winter Semester <input type="checkbox"/> Summer Semester	1	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Target Degree		Module Type (PM/WPM/WM)		Study Division		Use in Courses of Study	
Master of Science		WPM - Compulsory Elec					
Form of Studies		<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Admission Requirement		Basic knowledge in Optics & Math					

Supporting Mini-Modules / Courses								
Subjekt No.	Title of the Mini-Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Modul Exam Type/ Length/ Marked	
33134	Simulation of Sensor Systems	Prof. Dr. Andreas Heinrich	V L	4	5	1	PLK 90 benotet	
	Mini- Module Type (PM/WPM/WM)	Study Division	Use in Courses of Study					
	WPM - Compuls							
Subjekt No.	Title of the Mini-Module / Course	Lecturer	Type	SHW ¹	CP	Sem		
	Mini- Module Type (PM/WPM/WM)	Study Division	Use in Courses of Study					
Allowed Aids		Matlab Help function						

¹ SHW = Semester Hours per Week

Learning Goals / Competences

Professional competence (professional knowledge and skills, professional expertise):

Students can recognize the Matlab programming language and use it to solve mathematical problems and simulate systems and image analyses.

In this way, students can build and simulate models for experimental systems, including the evaluation of measurement data or results of an optical imaging system, as required for industrial applications.

Over professional competence (social skills und ability to work independently):

The students are able to structure their abilities in the division of a problem and to extend and transfer them to partial areas. They can solve complex problems.

Special (methods) skills, if applicable:

The students are able to design and simulate models with Matlab.

Competence Area	Concentration	Mini-Concentration	In Small Amounts
Professional Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>


Teaching Contents

- introduction into Matlab
- setting up a model to describe an experimental set-up
- setting up a simulation for the model using Matlab
- evaluate the simulation results
- sensor system based on image analysis

The teaching contents are based on case studies (sarting from easy experimental findings like light propagation through optical components to Metrology systems based on image processing)

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	Hand-out, detailed manuscript with exercises
Composition of the Final Mark	written exam (100%);
Comments / Other	
Last Updated	October, 2017 Andreas Heinrich

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description
	Degree Program Photonics (Master)	
	Module Coordinator MSc. Dipl. Ing. (FH) Micheal Wagner	

Module Name		Fundamental Optics				Module No : 33035	
CP	SHW ¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150	50 h	100 h	<input type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	1	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective		Module Type (PM/WPM/WM)		Division (Upper/Lower)		Incorporated in Degree Programs	
Master of Science		WPM - Compulsory Elec					
Study Form		<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Prerequisites		Mathematics, physics of technical Bachelor degree					

Supporting Modules / Courses							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
33135	Fundamental Optics	MSc. Micheal Wagner	V L Ü	4	5	1	PLK 60 benotet
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
	WPM - Compulsory						

¹ SHW = Semester Hours per Week


Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
	Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs				
Allowed Exam Materials		oral exam					

Learning Goals / Competences			
<p>Professional competence (professional knowledge and skills, professional expertise): Students are able to design and analyze simple optical systems.</p> <p>Special (methods) skills: The students are able to apply methods of paraxial optics, interference, polarization, total reflection and other basic optical effects in order to develop simple optical systems.</p> <p>Professional competence (social skills und ability to work independently): The learning goal of the students' self study is to reach the level of optical knowledge regarding paraxial optics and optical instruments addressed in optical textbooks. The project work enables students to apply theoretical knowledge. They are able to perform experiments in a self-reliant way within a small team to set-up and validate optical systems in practice.</p>			
Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Course Contents			
Refraction, reflection, paraxial optical systems, optical devices, polarization, interference			

Language	<input checked="" type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	lecture notes with bibliography
Composition of Final Grade	PLM 100%
Comments / Other	
Last Updated	17.02.2023, Wagner

¹ SHW = Semester Hours per Week

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description
	Degree Program Photonics (Master)	
	Module Coordinator Prof. Dr. T. Hellmuth	

Module Name		Optical design strategies				Module No : 33036	
CP	SHW¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150	60 h	90 h	<input type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	2	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective		Module Type (PM/WPM/WM)		Division (Upper/Lower)		Incorporated in Degree Programs	
Master of Science		WPM - Compulsory Elec					
Study Form		<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input type="checkbox"/> Lab <input type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Prerequisites		Lecture "Fundamental Optics"					

Supporting Modules / Courses							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
33236	Optical design strategies	Hellmuth	V Ü P	4	5	2	PLM 30 benotet
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
	WPM - Compuls						

¹ SHW = Semester Hours per Week


Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
	Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs				
Allowed Exam Materials		oral exam					

Learning Goals / Competences			
<p>Professional competence (professional knowledge and skills, professional expertise): The students are able to design optical systems and analyze optical aberrations to optimize optical system performance and to compare and validate different approaches.</p> <p>Special (methods) skills: They are able to handle tool elements of an optical design program to design, simulate and analyse optical system.</p> <p>Professional competence (social skills und ability to work independently): The project work enables students to esign various parts of an optical system and combine them within a team for the development of optomechanical devices.</p>			
Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Course Contents			
Seidel aberrations, Fourier optics, design strategies, analysis, visualisation and optimization of aberrations			

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	Optical design strategies, lecture notes with bibliography;
Composition of Final Grade	PLM 100%
Comments / Other	
Last Updated	20.04.2020, TH

¹ SHW = Semester Hours per Week

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description SPO 31
	Course of Study Applied Photonics (Master)	
	Module Coordinator Prof. Dr. R. Börret	

Module Name		Optics technology				Modul No : 33037	
CP	SHW ¹	Workload	Contact Time	Self-Study	Offering Begin	Sem	Duration
5	4	150h	60 h	90 h	<input type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	2	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Target Degree		Module Type (PM/WPM/WM)		Study Division		Use in Courses of Study	
Master of Science		WM - Elective Module					
Form of Studies		<input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input checked="" type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Admission Requirement		Module 33035 (Fundmental Optics) or equivalent course					

Supporting Mini-Modules / Courses							
Subjekt No.	Title of the Mini-Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Modul Exam Type/ Length/ Marked
33237	Optics technology	Börret	V L	4	5	2	PLM 20
	Mini- Module Type (PM/WPM/WM)	Study Division		Use in Courses of Study			
	WM - Elective Mo						
Subjekt No.	Title of the Mini-Module / Course	Lecturer	Type	SHW ¹	CP	Sem	
Mini- Module Type (PM/WPM/WM)	Study Division		Use in Courses of Study				
Allowed Aids							

¹ SHW = Semester Hours per Week

Learning Goals / Competences

Professional competence (professional knowledge and skills, professional expertise):

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.

Over professional competence (social skills und ability to work independently):

Students can present and defend their results. They can work in a team.

Special (methods) skills, if applicable:

They can interpret and apply the DIN ISO specification.


Competence Area	Concentration	Mini-Concentration	In Small Amounts
Professional Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Teaching Contents

- 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

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
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
Composition of the Final Mark	100 % PLM
Comments / Other	
Last Updated	28.02.2019/ 04.04.2023 R. Boerret

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description SPO 31
	Degree Program Applied Photonics (Master)	
	Module Coordinator Prof. Dr. Herbert Schneckenburger	

Module Name		Biophotonics				Module No : 33038	
CP	SHW ¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150h	60 h	90 h	<input type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	2	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective		Module Type (PM/WPM/WM)		Division (Upper/Lower)		Incorporated in Degree Programs	
Master of Science		WPM - Compulsory Elec					
Study Form		<input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Prerequisites		none					

Supporting Modules / Courses							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
33238	Biophotonics	Schneckenburger	V L	4	5	2	PLK 60 benotet
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
	PM - Compulsory						
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	
Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs				
Allowed Exam Materials		Manuscript, books, calculator					

¹ SHW = Semester Hours per Week

Learning Goals / Competences

Professional competence (professional knowledge and skills, professional expertise):

The students can recognize light-induced molecular and cellular mechanisms and describe photonic methods for the recognition and healing of diseases. They can apply knowledge about environmental effects on cells and organisms.

Over professional competence (social skills und ability to work independently):

Students can analyse literature and carry out laboratory and research projects as a team.

Special (methods) skills, if applicable:

Students can apply and transfer complex systems (e.g. lasers, spectrometers and microscopes) and their applications to laboratories and research projects. They are able to develop and document scientific results.


Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Course Contents

Molecular physics and biophysics, optical spectroscopy and microscopy, light propagation in tissue, interaction of laser radiation with cells and tissues, diagnostic and therapeutic applications.

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	relevant publications and exercises
Composition of Final Grade	PLK (100%);
Comments / Other	prerequisite laboratory work completed
Last Updated	13.10.2016, Schneckenburger

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description SPO 31
	Degree Program Applied Photonics (Master)	
	Module Coordinator Prof. Dr. Herbert Schneckenburger	

Module Name		Biophotonics				Module No : 33038	
CP	SHW ¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150h	60 h	90 h	<input type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	2	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective			Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs		
Master of Science			WPM - Compulsory Elec				
Study Form			<input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report				
Prerequisites			none				

Supporting Modules / Courses								
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded	
33238	Biophotonics	Schneckenburger	V L	4	5	2	PLK 60 benotet	
	Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs					
	PM - Compulsory							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem		
Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs						
Allowed Exam Materials		Manuscript, books, calculator						

¹ SHW = Semester Hours per Week

Learning Goals / Competences

Professional competence (professional knowledge and skills, professional expertise):

The students can recognize light-induced molecular and cellular mechanisms and describe photonic methods for the recognition and healing of diseases. They can apply knowledge about environmental effects on cells and organisms.

Over professional competence (social skills und ability to work independently):

Students can analyse literature and carry out laboratory and research projects as a team.

Special (methods) skills, if applicable:

Students can apply and transfer complex systems (e.g. lasers, spectrometers and microscopes) and their applications to laboratories and research projects. They are able to develop and document scientific results.


Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Course Contents

Molecular physics and biophysics, optical spectroscopy and microscopy, light propagation in tissue, interaction of laser radiation with cells and tissues, diagnostic and therapeutic applications.

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	relevant publications and exercises
Composition of Final Grade	PLK (100%);
Comments / Other	prerequisite laboratory work completed
Last Updated	13.10.2016, Schneckenburger

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description
	Degree Program Photonics (Master)	
	Module Coordinator Prof. Dr. T. Hellmuth	

Module Name		Advanced optical design				Module No : 33039	
CP	SHW¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150h	60 h	90 h	<input type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	2	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective			Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs		
Master of Science			WPM - Compulsory Elec				
Study Form			<input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report				
Prerequisites			Fundamental Optics				

Supporting Modules / Courses								
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded	
33239	Advanced design methods	Pretorius/Frasch	V	4	5	2	PLK 90 benotet	
	Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs					
	WPM - Compulsory							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem		
	Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs					

¹ SHW = Semester Hours per Week

Allowed Exam Materials	Calculator
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Learning Goals / Competences

Professional competence (professional knowledge and skills, professional expertise):

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

Special (methods) skills:

Students are able to select and apply methods for the analysis and validation of optical systems to optimize and develop innovative solutions.

Professional competence (social skills und ability to work independently):

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.


Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Course Contents

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

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	Lecture notes and data sheets
Composition of Final Grade	PLK (100%)
Comments / Other	
Last Updated	29.09.2016 TH

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description SPO 31
	Degree Program Applied Photonics (Master)	
	Module Coordinator Prof. Dr. T. Hellmuth	

Module Name		Laser photonics				Module No : 33040	
CP	SHW ¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150h	60h	90h	<input type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	2	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective		Module Type (PM/WPM/WM)		Division (Upper/Lower)		Incorporated in Degree Programs	
Master of Science		WPM - Compulsory Elec					
Study Form		<input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Prerequisites		Fundamental optics					

Supporting Modules / Courses								
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded	
33240	Laser photonics	Hellmuth	V L Ü	4	5	2	PLM 30 benotet	
	Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs					
	WPM - Compuls							


¹ SHW = Semester Hours per Week

Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
	Module Type (PM/WPM/WM)	Division (Upper/Lower)	Incorporated in Degree Programs				
Allowed Exam Materials		oral exam					

Learning Goals / Competences			
<p>Professional competence (professional knowledge and skills, professional expertise): The students are able to understand and validate different laser types.</p> <p>Special (methods) skills: The students are able to design, analyse and validate resonator optics, align lasers and determine their performance experimentally.</p> <p>Professional competence (social skills und ability to work independently): The laboratory work enables students to apply theoretical knowledge. They are able to perform experiments in a self-reliant way within a small team.</p>			
Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Course Contents			
Teaching Contents			
Laser dynamics, pulsed lasers and pulse dispersion, laser clocks, advanced resonator design, femtosecond lasers, coherence and stochastic optics			

Language	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	Laser photonics lecture notes with bibliography;
Composition of Final Grade	PLM (100%);
Comments / Other	
Last Updated	20.04.2020, TH

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description SPO 31
	Degree Program Applied Photonics (Master)	
	Module Coordinator Prof. Dr. Andreas Heinrich	

Module Name			Illumination			Module No : 33041	
CP	SHW ¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
5	4	150	560 h	4090 h	<input type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	2	<input checked="" type="checkbox"/> 1 Semester <input type="checkbox"/> 2 Semesters Semesters
Degree Objective			Module Type (PM/WPM/WM)		Division (Upper/Lower)	Incorporated in Degree Programs	
Master of Science			WM - Elective Module		HS - Hauptstudium	Photonics	
Study Form			<input checked="" type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report				
Prerequisites			no				

Supporting Modules / Courses							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
33241	Illumination	Dr. Johannes Eisenmenger	V	4	5	2	PLK 90 benotet
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
	WM - Elective Module	HS - Hauptstudium		Photonics			
Allowed Exam Materials		none					

¹ SHW = Semester Hours per Week

Learning Goals / Competences

Professional competence (professional knowledge and skills, professional expertise):

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. Special (methods) skills, if applicable:

Students are able to analyse literature and distinguish between relevant and irrelevant information. They can evaluate and judge optical phenomena.

Over professional competence (social skills und ability to work independently):

They can discuss and evaluate the advantages and disadvantages of different approaches in a team. They can express themselves scientifically and apply their knowledge.

Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Course Contents

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


Language

German English Spanish French

¹ SHW = Semester Hours per Week

	<input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	-
Composition of Final Grade	PLK (100%)
Comments / Other	
Last Updated	14.03.17 Andreas Heinrich

¹ SHW = Semester Hours per Week

	Faculty Optics and Mechatronics	Module Description SPO 31
	Degree Program Applied Photonics (Master)	
	Module Coordinator Prof. Dr. Jürgen Krapp	

Module Name		Master Thesis				Module No : 9999	
CP	SHW ¹	Workload	Contact Time	Self-Study	Begin	Sem	Duration
30		900 h			<input checked="" type="checkbox"/> Winter Semester <input checked="" type="checkbox"/> Summer Semester	3	<input checked="" type="checkbox"/> 1 Semester <input checked="" type="checkbox"/> 2 Semesters
Degree Objective		Module Type (PM/WPM/WM)		Division (Upper/Lower)		Incorporated in Degree Programs	
Master of Science		PM - Compulsory Module					
Study Form		<input type="checkbox"/> Lecture <input type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Self-Study <input type="checkbox"/> Seminar <input type="checkbox"/> Assignment <input checked="" type="checkbox"/> Projekt Work <input type="checkbox"/> Other: Paper, Report					
Prerequisites		50 credit points reduced by 5 credits for every extra-occupational semester; module 33001 (project) passed					

Supporting Modules / Courses							
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
9999	Master Thesis	All Photonics Professors	P		24		PLA benotet
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
	PM - Compulsory						
Course No.	Title of the Module / Course	Lecturer	Type	SHW ¹	CP	Sem	Module Exam Type/ Length/ Graded
9998	Colloquium	All Photonics Professors			6		PLM, Colloquium consists of 15 minutes oral presentation in English and 15 minutes questioning in English by first and second examiner
	Module Type (PM/WPM/WM)	Division (Upper/Lower)		Incorporated in Degree Programs			
	PM						

¹ SHW = Semester Hours per Week

Allowed Exam Materials/ Restrictions	<ul style="list-style-type: none"> • slides of presentation in English • all parts of the thesis has to be performed individually; participation of more than one student is not permitted; each student works on its one topic.
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Learning Goals / Competences

The students can apply the contents of the curriculum independently in a scientific paper. They can analyse demanding specialist literature. They can analyse 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.

Competence Area	Heavy	Medium	Light
Technical Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Methods Competence	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social Competence	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Course Contents

Actual work in different fields of photonics

Language of oral part of examination	<input type="checkbox"/> German <input checked="" type="checkbox"/> English <input type="checkbox"/> Spanish <input type="checkbox"/> French <input type="checkbox"/> Chinese <input type="checkbox"/> Portuguese <input type="checkbox"/> Russian Other:
Literature	Subject-specific books and publications
Composition of Final Grade	Oral part: 20%; Written report: 80%
Comments / Other	<ul style="list-style-type: none"> • 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) <ul style="list-style-type: none"> ➢ Abstract of thesis in English ➢ Information sheet for database ➢ PDF-file of thesis
Last Update	29.10.2019 Krapp / Wa

¹ SHW = Semester Hours per Week