Hochschule Aalen

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Part B:

Study and Examination Regulations for the Master's degree program Applied Photonics at Aalen University (Part MA-TB-APH-33)

dated February 05, 2025

Based on § 8 para. 5 in conjunction with § 32 of the Baden-Württemberg Higher Education Act (Landeshochschulgesetz LHG) in the version of January 1, 2005 (GBl. p.1), last amended by the law of November 12, 2024 (GBl. 2024 No. 97), the Senate of Aalen University adopted the following statutes on January 29, 2025.

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§ 1 General

The general regulations Part A "MA-TA-20-1" in the currently valid version also apply to these statutes.

§ 2 Study program Applied Photonics

I - Preamble - Qualification objectives

Upon completion of their studies, graduates are awarded the degree of Master of Science.

The degree program is a full-time degree program with a standard period of study of three semesters. It is offered as a full-time course.

As an alternative to the traditional study structure, this Master's degree program offers students the option of working part-time in relevant companies or at Aalen University's research centers. The organization of the courses allows for conflict-free practical work on a maximum of 3 days per week.

The degree program is a consecutive degree program with an application-oriented profile.

The courses are taught in English.

The Applied Photonics degree program combines in-depth knowledge of optics with practice-oriented applications of photonics. Fundamentals of physics and mathematics are combined with current topics in applied optics. The focus is on combining issues from biophotonics, laser physics, opto-electronics, optical measurement and production technology, optical design and artificial intelligence with fundamental knowledge, e.g. from physical optics, quantum optics, non-linear optics, medical optics or electronics.

The course qualifies graduates for a research and development-related career at the interface between technology development and practical application. Graduates are therefore ideally prepared to work in both scientific research and industrial product development, particularly in sectors that rely on optical technologies and photonics, such as the automotive industry, medical technology, environmental technology and telecommunications.

The degree program enables students to **focus on** a **career in** the following areas:
Optics and photonics, laser technology, optoelectronics, sensor technology, metrology and automation technology, image processing and computer vision, materials science and processing, medical technology and environmental technology, semiconductor technology, microsystems technology, lighting technology, research and development (R&D), product development, production and process optimization, technology transfer, project management in technical areas, technical consulting and support, technical sales and customer care.

Qualification goals

Graduates ...

- are able to independently solve problems in photonics and continuously evaluate new technologies and applications.
- are able to analyze complex photonic systems and select suitable optical and electronic components in order to develop new optical systems.
- are able to develop technical concepts and prototypes in the fields of laser technology, sensor technology and image processing.
- are able to design and carry out optical measurement procedures and critically interpret the results.
- are able to implement and optimize photonic systems in various fields of application, e.g. medical technology and environmental monitoring.
- are able to make and reflect on decisions in development projects, taking technological aspects into account.

- are able to present research results and technical developments in an understandable way, prepare relevant information for different target groups and publish it in scientific journals.
- are able to work in intercultural teams, make decisions and act independently and critically reflect on the possible consequences of their actions - especially in cooperation with external or international partners from business and science.
- are able to select suitable working methods, apply them to new situations and, if necessary, adapt them.
- are able to explain, present and defend complex issues precisely in writing and orally in English.
- are able to analyze photonic issues independently and in a team, present them scientifically, draw conclusions and develop new solutions. They can argue and defend their scientific findings in subject-specific discourses.
- are able to discuss current and historical topics, critically reflect on social processes, develop an understanding of different points of view and help shape social processes with a sense of responsibility and a democratic sense of community. They will be able to use soft skills and interdisciplinary competencies in their later professional life. These skills shape the personal development and also the future civic engagement as well as the political and cultural role of graduates.

The Master "Applied Photonics" at Aalen University awards the academic degree "Master of Science" as a prerequisite for a subsequent doctorate.

II - Program structure and scope

(1) In the Master's degree course in Applied Photonics, the standard course of study comprises three semesters. The duration of the entire course, including the Master's thesis, is a maximum of 6 semesters. If the maximum duration is exceeded, the examination entitlement expires, unless the student is not responsible for exceeding the deadline or arrangements have been made for a different pace.

(2) The total number of compulsory and compulsory elective courses required to successfully complete the degree program is 90 ECTS credits.

(3) The structure of the degree program, the modules / sub-modules, the courses with the number of hours per week per semester and the number of credit points (CP) can be found in the following tables and in the module descriptions in the module handbook of the degree program. The compulsory elective modules are listed as examples. At the beginning of each semester, the degree program publicly announces a list of possible compulsory elective modules and publishes it in the relevant media. There is no legal entitlement to the offer of certain elective modules.

(4) The Master's thesis includes an oral colloquium presentation (graded at 20% of the thesis) and a written report on the Master's thesis (graded at 80% of the thesis). A minimum of 40 ECTS credits and passing the Project module examination are required to register for the Master's thesis. The examination requirements for the Master's thesis are set out in the module handbook.

(5) The right to take the examination expires if

1. The student has achieved fewer than 15 credit points after the 1st semester of study or
2. if the student has achieved less than 30 credit points after the 2nd semester or
3. the student has not achieved at least 40 credit points after the 3rd semester.

The right to take examinations does not expire if the student is not responsible for not achieving these minimum values. The Examination Board will decide on this upon application. If the student is studying at a different pace, different deadlines are permitted by individual agreement with the Dean of Studies.

(6) Different pace

At the start of the course, but no later than 8 weeks after the start of the course, the student may apply for and obtain approval from the Dean of Studies to study the course at a different pace to the standard duration of study. In addition to the distribution of the modules over individual semesters, a definition can be made regarding the distribution of the Master's thesis over 2 semesters. The respective study concept must be coordinated accordingly with the Dean of Studies. Parallel professional activity is permitted after approval.

(7) For each approved and completed work-integrated semester, the requirement for registering for the Master's thesis is reduced by 5 ECTS credits. The "Project" module must always be passed before registering for the thesis.

(8) International semester ("International Photonics")

a) Upon application, students have the opportunity to complete credits from the 2nd semester abroad (module name: "International Module - Photonics 1-6"). The application must be submitted to the Examination Board. The application must be granted if the student can provide suitable evidence (in the form of a learning agreement and, if applicable, a contract with a research institute) that the stay abroad is organized in a way that is conducive to study; the competence objectives of the 2nd semester will be taken into account appropriately.

b) If not all of the agreed coursework in the "International Module - Photonics" is passed, the successfully completed coursework will nevertheless be credited to the corresponding modules of the 2nd semester in accordance with the Learning Agreement and/or contract with a research institute. The Examination Board decides on the corresponding recognition on the basis of suitable evidence.

c) If one or more modules "International Module - Photonics" are not successfully completed during the international semester, the missing CP must be earned by completing other modules of the 2nd semester of the degree program, which complement the modules completed abroad in a meaningful way.

(9) After passing the Master's examination, Aalen University - Engineering and Business - will award the following degree
the Master's degree Master of Science, abbreviated to "M.Sc." in the Applied Photonics degree program, stating the subject area

(10) Supplementary regulations:

Contrary to the regulations for the general studies of the general part TA-MA-20-1, no separate workload was defined in the curriculum, as this is already integrated in the standard course of study in module 33001 "Project / Soft Skills".

Curriculum

Start in the winter semester - compulsory section

No.	Module / Courses	Type	Sem.1 SWS	Sem. 2 SWS	Sem. 3 SWS	CP
33001	**Project / Soft Skills**					**5**
33101	Project / Soft Skills	L	4			5
33002	**Interferometry**					**5**
33102	Interferometry	V	4			5
33003	**Advanced Microscopy**					**5**
33103	Advanced Microscopy	V	6			5
33004	**Quantum Optics**					**5**
33201	Quantum Optics	V		4		5
33005	**Physical Optics**					**5**
33202	Physical Optics	V		4		5
9999	**Master Thesis**					**30**
9999	Master Thesis				X	30
	Total SWS		**14**	**8**		
	Total CP		**15**	**10**	**30**	
	Total examinations		**3**	**2**	**MA***	

*MA=Master's thesis

Start in winter semester - compulsory elective area

No.	Module / Courses	Type	Sem. 1 SWS	Sem. 2 SWS	Sem. 3 SWS	CP
Compulsory elective modules - Compulsory elective area part 1 - 1st semester In the 1st semester, 3 compulsory electives must be chosen (compulsory electives of 5 CP each)						
33006	**Compulsory elective module APH 1-1**		**X**			**5**
33007	**Compulsory elective module APH 1-2**		**X**			**5**
33008	**Compulsory elective module APH 1-3**		**X**			**5**
Compulsory elective modules - 1st semester[1]						
33801	**Non-linear Optics**					**5**
33104	Non-linear optics	V, L	4			5
33802	**Photonics Detectors and Devices**					**5**
33105	Photonics Detectors and Devices	V	4			5
33803	**Applications of Photonics Detectors**					**5**
33106	Applications of Photonics Detectors	V, L	4			5
33804	**Advanced Image Processing**					**5**
33107	Advanced Image Processing	V, L	4			5
33805	**Advanced Laser Technology**					**5**
33108	Advanced Laser Technology	V, L	4			5
33806	**Current Topics in Photonics 1**					**5**
33109	Current Topics in Photonics 1	V, L	4			5
33807	**Optical Systems Workshop**					**5**
33110	Optical Systems Workshop	V, L	4			5
33808	**Elective subject from the Master's program of Aalen University (after approval by the examination board)**					**5**
33111	Elective subject from the Master's program at Aalen University		X			5
	Total SWS		**14 + WB***	**8**		
	Total CP		**30 (15 PB* + 15 WB*)**	**10**	**30**	
	Total examinations		**6 (3 PB* + 3 WB*)**	**2**	**MA***	

*MA=Master's thesis, WB=elective area, PB=compulsory area

[1] The electives listed here are examples.

Start in winter semester - compulsory elective area

No.	Module / Course	Type	Sem. 1 SWS	Sem. 2 SWS	Sem. 3 SWS	CP
Compulsory elective area part 2 - 2nd semester In the 2nd semester, 4 elective subjects must be chosen (elective subjects of 5 CP each)						
33009	**Compulsory elective module APH 2-1**			**X**		**5**
33010	**Compulsory elective module APH 2-2**			**X**		**5**
33011	**Compulsory elective module APH 2-3**			**X**		**5**
33012	**Compulsory elective module APH 2-4**			**X**		**5**
Compulsory elective modules - 2nd semester[2]						
33809	**Advanced Optical Communications Technology**					**5**
33203	Advanced Optical Communications Technology	V		4		5
33810	**Optics Technology**					**5**
33206	Optics Technology	V, L		4		5
33811	**Current Topics in Photonics 2**					**5**
33207	Current Topics in Photonics 2	V, L		4		5
33812	**Optical Systems**					**5**
33204	Optical Systems	V, L		4		5
33813	**Laser Photonics**					**5**
33209	Laser Photonics	V, L		4		5
33816	**Optical Design Strategies**					**5**
33205	Optical Design Strategies	V, L		4		5
33817	**Advanced Optical Design**					**5**
33208	Advanced Optical Design	V, L		4		5
33818	**Illumination**					**5**
33210	Illumination	V, L		4		5
33211	**Fourier Optics**	V,L		4		5
33211	Fourier Optics					
33824	**Introduction to Diffractive Optics**	V,L		4		5
33216	Introduction to Diffractive Optics					

[2] The electives listed here are examples.

	Total SWS		**14 + WB***	**24 (8 PB + 16 WB)**		
	Total CP		**30 (15 PB* + 15 WB*)**	**30 (10 PB+ 20 WB)**	**30**	
	Total exams		**6 (3 PB* + 3 WB*)**	**6 (2 PB + 4 WB)**	**MA***	

*MA=Master's thesis, WB=elective area, PB=compulsory area

Start in summer semester - compulsory area

No.	Module / Courses	Type	Sem.1 SWS	Sem. 2 SWS	Sem. 3 SWS	CP
33001	**Project / Soft Skills**					5
33101	Project / Soft Skills	L		4		5
33002	**Interferometry**					5
33102	Interferometry	V		4		5
33003	**Advanced Microscopy**					5
33103	Advanced Microscopy	V		6		5
33004	**Quantum Optics**					5
33201	Quantum Optics	V	4			5
33005	**Physical Optics**					5
33202	Physical Optics	V	4			5
9999	**Master Thesis**					30
9999	Master Thesis				X	30
	Total SWS		8	14		
	Total CP		10	15	30	
	Total examinations		2	3	MA*	

*MA=Master's thesis

Start in summer semester - compulsory elective area

No.	Module / Course	Type	Sem. 1 SWS	Sem. 2 SWS	Sem. 3 SWS	CP
Compulsory elective area part 1 - 1st semester **In the 1st semester, 4 compulsory elective subjects must be chosen (compulsory elective subjects of 5 CP each)**						
33009	**Compulsory elective module APH 2-1**		X			5
33010	**Compulsory elective module APH 2-2**		X			5
33011	**Compulsory elective module APH 2-3**		X			5
33012	**Compulsory elective module APH 2-4**		X			5
Compulsory elective modules - 1st semester[3]						
33809	**Advanced Optical Communications Technology**					5
33203	Advanced Optical Communications Technology	V	4			5
33810	**Optics Technology**					5
33206	Optics Technology	V, L	4			5
33811	**Current Topics in Photonics 2**					5
33207	Current Topics in Photonics 2	V, L	4			5
33812	**Optical Systems**					5
33204	Optical Systems	V, L	4			5
33813	**Laser Photonics**					5
33209	Laser Photonics	V, L	4			5
33816	**Optical Design Strategies**					5
33205	Optical Design Strategies	V, L	4			5
33817	**Advanced Optical Design**					5
33208	Advanced Optical Design	V, L	4			5
33818	Illumination					5
33210	**Illumination**	V, L	4			5
33211	**Fourier Optics**	V,L	4			5
33211	Fourier Optics					

[3] The electives listed here are shown as examples.

33824	**Introduction to Diffractive Optics**	V,L	4			5
33216	Introduction to Diffractive Optics					
	Total SWS		**24 (8 PB + 16 WB)**	14		
	Total CP		**30 (10 PB* + 20 WB*)**	15	**30**	
	Total examinations		**6 (2 PB* + 4 WB*)**	3	**MA***	

***MA=Master's thesis, WB=elective area, PB=compulsory area**

Start in summer semester - compulsory elective area

No.	Module / Courses	Type	Sem. 1 SWS	Sem. 2 SWS	Sem. 3 SWS	CP
Compulsory elective modules - Compulsory elective area part 1 - 2nd semester In the 2nd semester, 3 elective subjects must be chosen (elective subjects of 5 CP each)						
33006	**Compulsory elective module APH 1-1**			X		5
33007	**Compulsory elective module APH 1-2**			X		5
33008	**Compulsory elective module APH 1-3**			X		5
Compulsory elective modules - 2nd semester[4]						
33801	**Non-linear Optics**					**5**
33104	Non-linear Optics	V, L		4		5
33802	**Photonics Detectors and Devices**					**5**
33105	Photonics Detectors and Devices	V		4		5
33803	**Applications of Photonics Detectors**					**5**
33106	Applications of Photonics Detectors	V, L		4		5
33804	**Advanced Image Processing**					**5**
33107	Advanced Image Processing	V, L		4		5
33805	**Advanced Laser Technology**					**5**
33108	Advanced Laser Technology	V, L		4		5
33806	**Current Topics in Photonics 1**					**5**
33109	Current Topics in Photonics 1	V, L		4		5
33807	**Optical Systems Workshop**					**5**
33110	Optical Systems Workshop	V, L		4		5
33808	**Elective subject from the Master's program at Aalen University (after approval by the examination board)**					**5**
33111	Elective subject from the Master's program at Aalen University			X		5
	Total SWS		**24 (8 PB + 16 WB)**	**14 + WB***		
	Total CP		**30 (10 PB* + 20 WB*)**	**30 (15 PB* + 15 WB*)**	30	
	Total exams		**6 (2 PB* + 4 WB*)**	**6 (3 PB* + 3 WB*)**	MA*	

*MA=Master's thesis, WB=elective area, PB=compulsory area

4 The electives listed here are shown as examples.

Optional international semester

"International Photonics" (credits from the 2nd semester can be recognized according to the learning agreement and/or contract with a research institute abroad after approval by the examination board)

No.	Module / Course	Type	Semester 1 SWS	Sem. 2 SWS	Sem. 3 SWS	CP
International semester "International Photonics"						
33013	**International module - Photonics - IPH1**					**5**
33314	International course Photonics - IPH1	X		X		5
33014	**International Module - Photonics - IPH2**					**5**
33315	International course Photonics - IPH2	X		X		5
33015	**International module - Photonics - IPH3**					**5**
33316	International course Photonics - IPH3	X		X		5
33016	**International module - Photonics - IPH4**					**5**
33317	International course Photonics - IPH4	X		X		5
33017	**International module - Photonics - IPH5**					**5**
33318	International Course Photonics - IPH5	X		X		5
33018	**International module - Photonics - IPH6**					**5**
33319	International course Photonics - IPH6	X		X		5

§ 3 Entry into force / Expiry

(1) These statutes enter into force on the day after their announcement.

(2) With the entry into force of these bylaws, the bylaws MA-TB-APH-33 dated November 10, 2023 expire.

Aalen, February 05, 2025

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Prof. Dr. Harald Riegel

Rector