

## English Translation

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**Academic Regulations and Procedures for Students  
of the Robotics and Autonomous Systems Master Degree Program  
at the University of Lübeck  
awarding the Degree “Master of Science”**

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### § 1

#### Area of application

These academic regulations and procedures, together with the examination rules and regulations (PVO) of the University of Lübeck for students in the bachelor and master degree programs at the University of Lübeck, regulate the Robotics and Autonomous Systems master degree program at the University of Lübeck.

### § 2

#### Program Objective

(1) The master degree program prepares its graduates for activities in research, teaching, development and application-oriented occupational fields in Robotics and Autonomous Systems.

(2) The objective of the Robotics and Autonomous Systems master degree program is, by teaching knowledge of scientific methods and models as well as practice in mathematics, computer science and technology, to provide students with skills which will enable them to design, develop and research (partially) autonomous systems, especially from the field of robotics as well as automation and medicine. In contrast to the bachelor degree program, the emphasis is on the acquisition of skills for further scientific work. The course of studies with its both broadly-based and in-depth, fundamentally-oriented training is intended to provide the necessary prerequisites for lifelong learning in the field of autonomous and semi-autonomous systems, in particular robotics, as well as for further academic qualification, such as a doctorate. In addition, the students should be able to take on leadership roles in industry and commerce due to their acquired competences.

(3) The Robotics and Autonomous Systems master degree program is research-oriented and consecutive to the Robotics and Autonomous Systems bachelor degree program at the University of Lübeck. The students are expected to have already developed extensive, in-depth knowledge, proficiencies

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and competences in the field of robotics and autonomous systems as taught in the undergraduate degree program.

### § 3

#### Admission Requirements

(1) The master degree program is consecutive to (a continuation of) the Robotics and Autonomous Systems bachelor degree program at the University of Lübeck.

(2) Prerequisite for admission to the Robotics and Autonomous Systems master degree program, the applicant must provide the following documentation:

1. A bachelor degree in Robotics and Autonomous Systems or a related subject, for which the applicant must provide documentation,
  - a) that he or she has earned a bachelor degree or an equivalent degree in Robotics and Autonomous Systems or in a closely-related program of study at a German university or a university which belongs to one of the Bologna signatory states or
  - b) that he or she has earned an equivalent degree in a closely-related program of study at a foreign university.

The equivalence of a foreign qualification will be determined in accordance with the assessment recommendations (aka Statement of Comparability) of The Standing Conference of the Ministers of Education and Cultural Affairs of the Länder (States) in the Federal Republic of Germany (<https://www.kmk.org/kmk/information-in-english.html>). The marks on the foreign proof of qualification are to be converted to the German marking system.

2. Proof of the special qualification,
  - a) in that the undergraduate degree was completed with a grade of 2.7 or better or
  - b) for applicants who have an average grade below 2.7, if the Examination Board is able to determine the special qualifications by individually examining the submitted performance certificates, the bachelor thesis or other proof of research-oriented practical experience.
  - c) if the applicant is able describe the fundamental, mathematical concepts of analysis (calculus) and linear algebra and can apply the corresponding methods, as evidenced by having at least 32 credits proportionally in mathematics in the bachelor degree.
  - d) if the applicant is able to create programs using the usual software development methods, develop simple digital hardware circuits and machine-oriented software programs using computer engineering methods and present and use the fundamentals of electrical engineering and mechanics, as evidenced by at least 28 credits proportionally in technology and informatics in the bachelor degree.

3. Proof of sufficient knowledge of English in accordance with CEFT B2 (proven by submission of a German Abitur certificate showing courses in the language were taken for at least seven years, or through appropriate language tests ( e.g. TOEFL, IELTS)).

(3) The existence of the necessary documentation and fulfillment of the admission requirements referred to in paragraph 2 will be determined by the Examination Board.

(4) At the time of application, if the qualifying degree program has not yet been completed, however the bachelor thesis has already been begun, submitted proof of examinations totaling at least 135 credits with an average grade of at least 2.7 will be sufficient to qualify for conditional admission. In this case, proof of the successful completion of the degree must be provided within three months after beginning the master degree program. Failure to do so will void the admission.

(5) Admission will be denied if the candidate has irrevocably failed an examination deemed necessary by the Examination Regulations of a Robotics and Autonomous Systems degree program at a university of applied sciences in Germany or if the applicant is involved in a review process in said degree program.

(6) Students cannot be concurrently enrolled in the Robotics and Autonomous Systems master degree program and one or more of the other computer science and engineering degree programs at the University of Lübeck.

(7) Admission to the degree program can take place in both the summer and the winter semesters.

#### **§ 4**

#### **Master Agreement**

In the case of applicants for whom the Examination Board deems that the competencies acquired in the bachelor degree program do not exactly fulfill prerequisites and the relevant competencies could be acquired through attending and/or repeating a course or courses in the bachelor degree program, a so-called master agreement may be drawn up between the applicant and the Examination Board Chairperson. This would identify which modules from the bachelor degree program should be successfully completed and the deadline for completion. No more than three modules may be agreed upon. In the event of failure to complete the agreed modules by the time specified, the chairperson of the Examination Board will issue an invitation for student advising in accordance with § 6 PVO.

#### **§ 5**

#### **Curriculum**

The degree program is divided into the following sub-areas:

1. The acquisition of in-depth theoretical knowledge of robotics and autonomous systems
2. In-depth subject-specific courses through choice of further teaching modules

3. The acquisition and consolidation of application-oriented and research-centered knowledge and skills
4. The acquisition of interdisciplinary knowledge and skills, especially in the presentation of scientific results

## **§ 6**

### **Structure and Scope of the Degree Program**

(1) The degree program courses comprise a total of 120 credit points (KP) according to ECTS standards, with a prescribed period of study of two years. Credit points earned per teaching module:

- in the Robotics and Autonomous Systems compulsory section 58 KP (includes project internships with a performance equivalent of 24 KP and the Student Conference with 6 KP)
- in the consolidation section 12 KP
- in the subject-specific optional/elective section 16 KP
- in the interdisciplinary section 4 KP

The master thesis is worth 30 KP, with a final colloquium.

(2) The degree program also includes two internships for a total of 24 weeks, whereby one of the internships must have a duration of at least three months and should ideally be completed abroad. The internships serve as practical training and should be preparation for future professional activities. For this purpose, work in university or non-university research facilities is just as appropriate as that in commercial enterprises, provided that the activities performed there are carried out concerning themes of ongoing research and development of the respective department and satisfies the requirements of a graduate of the Robotics and Autonomous Systems master degree program. The decision in this case is the responsibility of the Examination Board.

(3) Participation in further training modules offered by the university, which are beyond those specified in paragraph 1 of the module handbook, is possible and recommended. The results of such examinations can, upon request, be listed in the Diploma Supplement, provided they are specified in the module handbook.

(4) The teaching modules of the individual sections and the optional/elective courses are listed in the appendix and described in detail in the module handbook. Mandatory as well as elective modules which are part of a prior bachelor degree program and have already been successfully completed cannot be chosen within the master degree program.

(5) The instruction and examination language is English. Within the subject-specific optional/elective courses, sessions may also be conducted in German, however an English-language alternative will always be offered. German-language optional/elective modules are marked as such in Supplement I.

## **§ 7**

### **Master Examination and Examination Prerequisites**

(1) The master examination consists of course-related subject examinations for the individual teaching modules and the master thesis with a final colloquium. Examination in accordance with § 12 paragraph 1 in conjunction with §§ 13 ff. PVO lead to category A and B performance certificates.

(2) The application for permission to do the master thesis is, in accordance with § 11 paragraph 5 PVO, to be made separately in writing to the chairperson of the Examination Board.

(3) In principle, admission to the course-related subject examinations occurs, in accordance with § 11 PVO, with the enrolment in the Robotics and Autonomous Systems master degree program. For admission to a subject examination, according to § 11 paragraph 2 PVO, there could be specific prerequisites defined in the module handbook which should be scheduled before beginning that module. Prerequisites must be completed and proof submitted before the time of the examination; they are not included in the module grade.

## **§ 8**

### **Prerequisites for the Master Thesis**

The authorization to commence work on the master thesis can only take place when the requirements according to § 11 PVO have been fulfilled, a student is at least in the third semester and has submitted proof of completion of at least 70 credit points in accordance with § 6 paragraph 1.

**Supplement 1 to the Academic Regulations and Procedures for the  
Robotics and Autonomous Systems Master Degree Program  
of the University of Lübeck**

*The Module Catalog*

**1. Preliminary remarks**

In the following tables, the teaching modules (LM) are listed for which performance certificates (LZF) must be earned in order to pass the master examination, divided into the various fields of study. For each teaching module the amount of average contact hours per week (SWS), the type – lecture (V), laboratory (Ü), internship (P) or seminar (S) – the number of credit points (KP) according to the European Credit Transfer System, and the type of performance certificate – category A or B – are indicated. Further details, such as learning objectives and content, the required coursework or the type of examination are described in the module handbook (MHB).

**2. General instructions and rules for the selection of teaching modules**

Taking into account the examination rules and regulations guidelines, students have freedom of choice concerning optional/elective modules. Thereby, the following rules must be observed:

- Teaching modules cannot be counted more than once.
- Teaching modules, which have already been specified in the examination certificate or Diploma Supplement of the qualifying bachelor degree program, cannot be selected.
- Other teaching modules or module combinations may be accepted by the Examination Board if the request has been properly justified.
- Of the optional/elective courses, only a limited number of teaching modules and only with sufficient demand can be offered in each academic year.

### 3. Compulsory teaching modules

Module number	Robotics and Autonomous Systems compulsory teaching modules	SWS	KP	Type LZF
RO4100-KP08	Robot Learning	4V + 2Ü	8	A
RO4000-KP12	Autonomous Systems	4V + 4Ü	12	A
RO4300-KP08	Machine Learning and Computer Vision	4V + 2Ü	8	A
RO5000-KP12	Internship Robotics and Autonomous Systems 1	12P	12	B
RO5001-KP12	Internship Robotics and Autonomous Systems 2	12P	12	B
PS5000-KP06	Student Conference	4S	6	B
	<b>Total</b>		<b>58</b>	

Module number	Consolidation modules from the following catalog comprising 12 KP	SWS	KP	Type LZF
RO5100-KP12	Medical Robotics	4V + 2Ü + 2S	12	A
RO5200-KP12	Bio-inspired Robotics	4V + 2Ü + 2S	12	A
RO5500-KP12	Autonomous Vehicles	4V + 2Ü + 2S	12	A
	consisting of - RO5500-L1 partial examination Dynamics and Control (graded exam, 4 KP) - RO5500-L2 partial examination Perception for Autonomous Vehicles (graded exam, 4 KP) - RO5500-L3 partial examination Technology of Autonomous Vehicles (ungraded seminar, 4 KP)			
RO4500-KP12	Advanced Control and Estimation	4V + 2Ü + 2S	12	A
RO5800-KP12	Advanced Topics in Robotics	4V + 2Ü + 2S	12	A
CS4503-KP12	Ambient Computing	3V + 2S + 3P	12	A
CS4504-KP12	Cyber Physical Systems	4V + 2Ü + 2S	12	A
	<b>Total</b>		<b>12</b>	

### 4. Subject-specific optional / elective courses

Module number	Subject-specific optional / elective courses from the following catalog comprising a total of 16 KP	SWS	KP	Type LZF
CS4290-KP04	Current Issues Robotics and Automation	2V + 1Ü	4	A
CS4130-KP06	Information Systems*	2V + 2Ü	6	A

CS4150-KP06	Distributed Systems*	2V + 2Ü	<b>6</b>	<b>A</b>
CS4170-KP06	Parallel Computer Systems	2V + 2Ü	<b>6</b>	<b>A</b>
CS5170-KP04	Hardware/Software Co-Design	2V + 1Ü	<b>4</b>	<b>A</b>
CS4405-KP04	Neuroinformatics*	2V + 1Ü	<b>4</b>	<b>A</b>
CS4220-KP04	Pattern Recognition*	2V + 1Ü	<b>4</b>	<b>A</b>
RO5100-KP08	Medical Robotics	4V + 1Ü	<b>8</b>	<b>A</b>
RO5500-KP08	Autonomous Vehicles	4V + 2Ü	<b>8</b>	<b>A</b>
	consisting of - RO5500-L1 partial examination Vehicle Dynamics and Control (graded exam, 4 KP) - RO5500-L2 partial examination Perception for Autonomous Vehicles (graded exam, 4 KP)			
RO5200-KP08	Bio-inspired Robotics	4V + 2Ü	<b>8</b>	<b>A</b>
RO4500-KP08	Advanced Control and Estimation	4V + 2Ü	<b>8</b>	<b>A</b>
RO5800-KP08	Advanced Topics in Robotics	4V + 2Ü	<b>8</b>	<b>A</b>
CS5204-KP04	Artificial Intelligence 2	2V + 1Ü	<b>4</b>	<b>A</b>
CS4374-KP06	Medical Deep Learning	2V + 2Ü	<b>6</b>	<b>A</b>
RO5801-KP04	Advanced Topics in Robotics	2V + 1Ü	<b>4</b>	<b>A</b>
	<b>Zu erreichende Summe</b>		<b>16</b>	

\* taught only in the German language

In addition to the modules in the above catalog, the Examination Board may identify further modules which can be selected for the subject-specific optional/elective courses, as long as there are spaces available in these training sessions.

### 5. Interdisciplinary optional / elective teaching modules

A total of 4 KP must come from modules which are interdisciplinary in character. The list of modules can be found on the degree program website and the website on university law. In addition, the following module can be used: EC5010-KP04 Entrepreneurship in the Digital Economy

### 6. Master Project

<b>Robotics and Autonomous Systems Master Project</b>	<b>KP</b>
RO5990-KP30 Master Thesis Robotics and Autonomous Systems	<b>30</b>



**Supplement 2 to the Academic Regulations and Procedures for the  
Robotics and Autonomous Systems Master Degree Program  
at the University of Lübeck**

The following table describes the recommended course of studies.

1. Semester (30 KP)	2. Semester (30 KP)	3. Semester (30 KP)	4. Semester (30 KP)
RO4100-KP08 Robot Learning 8 KP (4V + 2Ü)	RO4000-KP12 Autonomous Systems 12 KP (4V + 4Ü)	RO5000-KP12 Internship Robotics and Autonomous Systems 1 12 KP (12P)	RO5990-KP30 Master Thesis Robotics and Autonomous Systems 30 KP
RO4300-KP08 Machine Learning and Computer Vision 8 KP (4V + 2Ü)			
Specialization Course 12 KP		RO5001-KP12 Internship Robotics and Autonomous Systems 2 12 KP (12P)	
Elective Courses 16 KP	PS5000-KP06 Student Conference 6 KP (4S)		
Interdisciplinary Field 4 KP			
<b>10 Examinations*</b>		<b>3 Examinations</b>	
Contact hours: V: Lecture / Ü: Laboratory / P: Internship / S: Seminar		KP: Credit points / ECTS credits	
<b>Compulsory module</b> Robotics und Autonomous Systems	<b>Specialization</b>	<b>Elective</b> (subject-specific)	<b>Elective</b> (interdisciplinary)