

**Special Provisions of the Examination Regulations
for the Master of Computer Science Degree Program at the Faculty of Computer
Science, Electrical Engineering and Mathematics at Paderborn University**

Paderborn University has issued the following regulations based on § 2 (4) and § 64 (1) of the “Gesetz über die Hochschulen des Landes Nordrhein-Westfalen (Hochschulgesetz - HG)” of September 16, 2014 (GV.NRW. p. 547), last amended by Article 1 of the Act of November 25, 2021 (GV. NRW. p. 1210a):

¹ This is a translation of the “*Besondere Bestimmungen der Prüfungsordnung für den Masterstudiengang Computer Science der Fakultät für Elektrotechnik, Informatik und Mathematik an der Universität Paderborn*”. Only the German original version of these special provisions shall be legally binding, the English translation serves convenience purposes only.

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§ 31

General and special provisions

These special provisions apply in conjunction with the general provisions for the master's degree programs of the Faculty of Computer Science, Electrical Engineering and Mathematics at Paderborn University in the currently valid version (general provisions). A degree plan outlining the program's structure can be found in the appendix. Details on the modules, which are part of these special provisions, can be found in the module descriptions in the appendix.

§ 32

Acquiring competencies and language regulation

- (1) The master's degree program in Computer Science deepens the knowledge and skills acquired in a bachelor's degree program in Computer Science or a comparable degree program and provides a scientifically sound education in computer science. It qualifies students for doctoral studies and for a career in the development, evaluation and operation of computer science systems.
- (2) Graduates acquire, in particular, the following competencies during their studies:

Professional competencies:

In this degree program, graduates acquire an in-depth understanding of concepts and methods in fundamental areas of computer science and their areas of specialization. In addition, graduates are able to work independently with scientific literature in computer science and, on this basis, recognize and raise new problems and derive and implement suitable solutions and methods.

Instrumental competencies:

Graduates can apply the theoretical, methodological and technical knowledge of computer science they have acquired during the degree program to more complex problems from operational practice and to independently develop, substantiate, evaluate and improve suitable solutions to problems. In addition, graduates can apply the scientific methods they have learned in computer science to identify and solve new types of problems in both business and scientific practice.

Systemic competencies:

Graduates can collect, evaluate and interpret relevant problem-specific information and data on scientific topics in computer science. They can derive scientifically sound judgments on these issues and thus act responsibly based on social and ethical knowledge with regard to the effects of technological change. In addition, graduates can independently design advanced learning processes and systematically develop new areas of knowledge.

Communicative competencies:

Graduates can formulate scientific problems from computer science and essential approaches to their solutions and present these orally and in writing in English to professional representatives, including those from the scientific community. Furthermore, they can defend their solutions and arguments persuasively. Graduates can also exchange information at a scientific level and introduce and discuss new ideas, problems and possible solutions. The communicative competencies, as well as the professional, instrumental and systemic competencies acquired during the degree program, enable graduates not only to work effectively and in a goal-oriented manner in a team but also to take leading roles with corresponding responsibilities.

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- (3) The master's degree program and master's examination are predominantly in English. Modules in German are indicated in the module descriptions.

§ 33 Start of studies

The degree program can be started in the winter or summer semester.

§ 34 Admission requirements

- (1) In implementation of § 5 paragraph 1 no. 2b) of the general provisions, the following degree requirements apply:
- a. The degree must include
 - at least 20 credit points (CP) in the field of Software Engineering,
 - at least 20 CP in the field of Theoretical Computer Science,
 - at least 15 CP in the field of Computer Engineering,
 - at least 15 CP in the field of mathematical foundations of computer science.
 - b. The degree must have been achieved with a final grade of at least 3.0 in the German grading system (range: 1.0 – 5.0; best grade: 1.0; minimum passing grade: 4.0).
 - c. International applicants who do not have the same legal status as Germans by or based on international treaties must prove their eligibility to study in one of the following ways:
 - i. a very good final grade of the degree according to §5 paragraph 1 no. 1a) of the general provisions or
 - ii. the results of a GRE Revised General Test with, as a general rule, at least 157 points in the "Quantitative Reasoning" part and at least 4.0 points in the "Analytical Writing" part of the GRE Revised General Test or
 - iii. the result of a Test-AS Mastertest Computer Science dMAT with at least 50% of the achievable points.
- Applicants with a German higher education entrance qualification are not required to provide proof of eligibility to study.
- (2) Contrary to § 5 paragraph 1 no. 3 of the general provisions, no proof of German language skills is required for admission to the Master of Computer Science program.
- (3) Students are enrolled in the Master of Computer Science program if they have English language skills as proven by certificates or other documents relating to
- a. successful completion of at least five years of school education in English from grade 5 onwards or
 - b. a bachelor's degree in an English-speaking country (i.e., a country in which English is the official language and the medium of instruction of the corresponding degree program is considered English-speaking within the framework of these regulations) or in a domestic degree program accredited as English-speaking or
 - c. a language test at least at TOEFL 550 (paper and pencil) or TOEFL 80 (internet-based) level or
 - d. Cambridge Test Certificate in Advanced English (CAE) with at least a B grade or
 - e. IELTS with a minimum score of 6.5 or
 - f. by tests equivalent in their level.

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§ 35

Structure, course content, and modules

- (1) The following modules must be completed in the Master of Computer Science degree program:
 - Nine elective modules of 6 CP each
 - Project Group (20 CP, Compulsory module)
 - Key Skills (6 CP, Compulsory module)
 - Master's Thesis (30 CP, Compulsory module)
 - General Studies (10 CP, Compulsory module)
- (2) Each elective module is assigned to at least one of the following Focus Areas:
 - Classical and Quantum Algorithm Design
 - Computer and Communication Systems
 - Data Science and Intelligent Systems
 - Security
 - Software Engineering
- (3) The General Studies module has a volume of 10 CP.
- (4) If a specialization is intended, a Focus Area must be selected as a Specialization Area. The elective modules must then be selected as follows:
 - at least three elective modules from the Specialization Area
 - one elective module from a Focus Area that is not the Specialization Area
 - the remaining elective modules can be chosen from any Focus Area.

In addition, the master's thesis must be written in the Specialization Area.

§ 36

Transfer of credits

The regulations of the general provisions apply.

§ 37

Examination committee and examiners

The group of examiners can be expanded within the scope of § 65 HG.

§ 38

Individual course requirements and admission

- (1) Enrollment requirements for a module in accordance with § 7(2) of the general provisions are regulated by the module descriptions.
- (2) Students of the bachelor's degree program in Computer Science who have acquired at least 151 credit points relevant to their degree can be admitted to all modules of the master's degree program in Computer Science for one semester—with the exception of the Project Group and Key Skills modules—to the extent of 30 CP.
- (3) Only students who have successfully completed modules with a total of 48 CP can be admitted to the master's thesis. If specialization is intended, the topic of the master's thesis must be chosen in

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the Specialization Area. The topic is assigned to a Focus Area by the first reviewer when the master's thesis is registered. In the case of enrollment with conditions in accordance with § 34, proof of passing the associated examinations must be provided before admission to the master's thesis.

- (4) Further requirements for participation in examinations in accordance with § 12(2) of the general provisions, such as any attendance regulations, are specified in the module descriptions.

§ 39

Module assessments

- (1) All assessments of the modules must be completed in accordance with the module descriptions.
- (2) Examination assessments are provided in accordance with § 15 of the general provisions. In addition to the forms of assessment listed in § 15 of the general provisions, the following forms of assessment may also be considered:
 - a. Software with documentation: The submission of such artifacts may be required, particularly as part of project groups, final theses or elective modules; a demonstration of the software may be required for successful submission. Students hereby demonstrate the acquisition of the competencies described in the corresponding module. The software and the documentation are graded by an examiner. The time required to develop the software and documentation can be found in the module descriptions.
 - b. Mini-tests: Two short tests during the semester, usually lasting no more than 15 minutes.
- (3) The examinations usually take place twice per academic year.
- (4) In addition to the forms listed in §15 of the general provisions, study achievements can also be completed by:

Progress reports: Progress reports or interim results of up to three pages DIN A4 must be submitted at predefined times. Students should use these to demonstrate their ongoing work with the content and methods of the subject.

§ 40

Master's thesis and final presentation

- (1) The volume of work for the master's thesis should correspond to five months of full-time work (30 CP). The thesis must be submitted five months after the topic has been assigned. As a general rule, it should not exceed 120 pages. If the thesis takes less than five months to complete, the supervisor must justify this in written form to the Examination Committee.
- (2) In the master's thesis module, qualified participation must be demonstrated in the form of (a) a description of the task and objective to be worked on, usually no longer than five (in exceptional cases up to ten) pages and (b) an inaugural presentation. This qualified participation should take place within one month of the topic being assigned. The inaugural presentation should present at least the planned work, the planned process, and the expected results and should last approximately 30 minutes. The inaugural presentation is followed by a discussion.
- (3) The topic of the master's thesis can be returned once and within two weeks from the start of the processing period. The completion period starts again when the new topic is assigned. By contrast to Section 17 (7) of the general provisions, the Examination Committee may, in exceptional cases, extend the completion time by up to six weeks upon justified request, which must be submitted to the

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Examination Committee at least one week before the submission deadline, if the reasons for this are related to the topic of the thesis and the responsible supervisor supports this.

- (4) The results of the master's thesis must be presented in a final presentation followed by a scientific discussion. The final presentation takes place (as a general rule) no later than four weeks after submission of the written thesis and should last approximately 30 minutes. The final presentation may include other elements (e.g. demonstration of software) in addition to the presentation and discussion. The final presentation is included in the final grade.

§ 41 Additional modules

Students can complete additional modules up to a total of 24 CP.

§ 42 Final grade

- (1) Contrary to § 21 (2) of the general provisions, the module grades are weighted as follows:
 - The Project Group module is weighted with 10 weight points.
 - The Master's Thesis module is weighted with 50 weight points.
 - The General Studies module is not graded. For all other modules, the weight points correspond to the credit points (factor 1).
- (2) The grade "passed with distinction" is awarded if the final grade determined in accordance with § 21(2) of the general provisions in conjunction with subsection 1 is at least 1.1.

§ 43 Repeating examinations and compensation

- (1) The number of examination attempts, in accordance with § 22 (1) of the general provisions, is limited to three.
- (2) Contrary to § 22 (2) of the general provisions, the substitute oral examination can only be graded "sufficient" (4.0) or "unsatisfactory" (5.0).
- (3) At the candidate's request, a passed examination that is recorded as additional work in accordance with § 41 can be exchanged for a passed examination or an examination that has not yet been passed or has been finally failed (compensation) if this can be recorded in its place in general terms.
- (4) Repeated examinations for which there is no possibility of compensation in the event of a final failure must be graded by at least two examiners.
- (5) The candidate may propose a different examiner for the repetition of the master's thesis; however, this does not constitute a legal claim.
- (6) It is possible to deregister from an elective module four times and choose another elective module in accordance with the requirements of § 35. This regulation also applies if the respective elective module has finally not been passed. It is not possible to deregister from elective modules that have already been passed. The deregistration must be requested in written form at the Central Examination Office.

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§ 44a **Certificate**

In addition to § 25 (1) of the general provisions, the chosen Specialization Area will be stated in the certificate upon request if the master's thesis is written in the Specialization Area. The application must be submitted in the Campus Management System to the Central Examination Office by the time the master's thesis is submitted at the latest.

§ 44 **Transitional provisions**

- (1) These special provisions apply to all students who are enrolled for the first time in the master's degree program in Computer Science at the Faculty of Computer Science, Electrical Engineering and Mathematics from the winter semester 2024/25 onwards.
- (2) Students who were already enrolled before the winter semester 2024/25 will take their master's examination, including repeat examinations, in accordance with the examination regulations in the version dated June 16, 2017 (AM.Uni.Pb. 44.17), last amended by the statutes dated May 10, 2022 (AM.Uni.Pb. 22.22). Students can apply to the Central Examination Office to be transferred to these special provisions. The application is irrevocable. Students who do not switch to these special provisions can take their Master's examination, including repeat examinations, for the last time in the winter semester 2026/27 in accordance with the examination regulations in the version dated June 16, 2017 (AM.Uni.Pb. 44.17), last amended by the statutes dated May 10, 2022 (AM.Uni.Pb. 22.22). The master's examination, including repeat examinations, is thereafter taken in accordance with these special provisions.

§ 45 **Enactment and publication**

- (1) These special provisions come into legal effect on October 01, 2024. At the same time, the examination regulations for the Master of Computer Science degree program at the Faculty of Computer Science, Electrical Engineering and Mathematics at Paderborn University, dated June 16, 2017 (AM.Uni.Pb. 44.17), last amended by the statutes dated May 10, 2022 (AM.Uni.Pb. 22.22), shall no longer apply. § 44 remains unaffected.
- (2) These special provisions are published in the Official Notices of Paderborn University (AM.Uni.Pb.).
- (3) According to § 12 (5) HG, a violation of procedural or formal regulations of the Higher Education Act or the university's regulatory or other autonomous law can no longer be asserted against these regulations after one year has passed since the publication of these regulations, unless,
 1. the regulations have not been announced in accordance with the regulations,
 2. the Presidium has previously objected to the decision of the body adopting the regulations,
 3. the formal or procedural defect has been notified to the university in advance, stating the violated legal provision and the fact that reveals the defect, or
 4. no reference was made to the legal consequences of the exclusion of complaints when the regulations were published.

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Issued on the basis of the resolution of the Faculty Council of the Faculty of Computer Science, Electrical Engineering and Mathematics of May 22, 2023, and after examination of legality by the Presidium of Paderborn University on July 12, 2023.

Paderborn, xx.xx.202x

The President
of Paderborn University,
Professor Dr. Birgitt Riegraf

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Appendix

Appendix I: Exemplary study plan

1	Elective Module I (6 CP)	Elective Module II (6 CP)	Elective Module III (6 CP)	Elective Module IV (6 CP)	Elective Module V (6 CP)
2	Project Group (20 CP)	Elective Module VI (6 CP)	Elective Module VII (6 CP)	Key Skills (6 CP)	General Studies (10 CP)
3		Elective Module VIII (6 CP)	Elective Module IX (6 CP)		
4	Master's Thesis (30 CP)				

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**Appendix II:
Modules and forms of examination**

As a result of the ongoing development of the research and teaching content of the Institutes of Computer Science and Electrical Engineering and Information Technology, a small number of modules from the following list may be omitted from the elective area or replaced or supplemented by a small number of modules that belong to the same subject area. The changes will be announced in the module handbook. The regulations on assessments, volume and enrollment requirements remain unaffected by this.

Focus Area Module	CP Module hours per week per semester	Forms of examination	Remarks
<i>Classical and Quantum Algorithm Design</i>	6	Exercises, written reports or progress reports as study achievements Written exam, oral exam or presentation as final module exam	Elective module The prerequisite for participation in the final module examination is passing the study achievements.
One of the modules <ul style="list-style-type: none"> • Advanced Algorithms • Advanced Distributed Algorithms and Data Structures • Algorithms for Complex Virtual Scenes • Efficiency in Games • Foundations of Cryptography • Game Theory • Introduction to Quantum Computation • Post-Quantum Cryptography • Quantum Algorithms • Quantum Complexity Theory • Quantum Information 	3+2 or 2+3		
<i>Computer and Communication Systems</i>	6	Exercises, written reports or progress reports as study achievements Written exam, oral exam or presentation as final module exam	Elective module The prerequisite for participation in the final module examination is passing the study achievements.
One of the modules <ul style="list-style-type: none"> • Advanced Computer Architecture 	3+2 or		

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Focus Area Module	CP Module hours per week per semester	Forms of examination	Remarks
<ul style="list-style-type: none"> Advanced Distributed Algorithms and Data Structures Networked Embedded Systems Reconfigurable Computing VLSI Testing 	2+3		
Data Science and Intelligent Systems	6	Exercises, written reports or progress reports as study achievements Written exam, oral exam or presentation as final module exam	Elective module The prerequisite for participation in the final module examination is passing the study achievements.
One of the modules <ul style="list-style-type: none"> Advanced Algorithms Advanced Distributed Algorithms and Data Structures Data Science for Dynamical Systems Data Science in Industrial Applications Explainable Artificial Intelligence Foundations of Knowledge Graphs Logic Programming for Artificial Intelligence Machine Learning 1 Machine Learning 2 Machine Learning for Biometrics 	3+2 or 2+3		
Security	6	Exercises, written reports or progress reports as study achievements Written exam, oral exam or presentation as final module exam	Elective module
One of the modules <ul style="list-style-type: none"> Advanced Distributed Algorithms and Data Structures Designing code analyses for large-scale software systems 1 Designing code analyses for large-scale software systems 2 Foundations of Cryptography Human Factors in Security and Privacy Introduction to Quantum Computation Machine Learning for Biometrics 	3+2 or 2+3	Written exam, oral exam or presentation as final module exam	The prerequisite for participation in the final module examination is passing the study achievements.

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Focus Area Module	CP Module hours per week per semester	Forms of examination	Remarks
<ul style="list-style-type: none"> • Post-Quantum Cryptography • Privacy and Technology • Quantum Complexity Theory • Real World Crypto Engineering • Usable Security and Privacy • Web Security 			
Software Engineering	6	Exercises, written reports or progress reports as study achievements Written exam, oral exam or presentation as final module exam	Elective module The prerequisite for participation in the final module examination is passing the study achievements.
One of the modules <ul style="list-style-type: none"> • Concepts of Computer Science • Data-Driven Innovation and Engineering • Data Science in Industrial Applications • Designing code analyses for large-scale software systems 1 • Designing code analyses for large-scale software systems 2 • Human Factors in Security and Privacy • Logic Programming for Artificial Intelligence • Model-Based Systems Engineering 	3+2 or 2+3		

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