Examination regulations
for the Master's degree course in Computer
Engineering of the Faculty for
Electrical Engineering, Computer Science and
Mathematics
at the University of Paderborn

of 31 May 2013
Faculty for
Electrical Engineering, Computer Science and Mathematics

Examination regulations
for the Master's degree course Computer Engineering
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Based on §2 section 4 and §64 section 1 of North-Rhine Westphalia’s Tertiary Institutions Act (Higher Education Act – HG) of 31.10.2006 (GV. NRW. 2006 p. 474), last amended by Article 1 of the Act for amending the Higher Education Act and the Art Colleges Act of 18th December 2012 (GV.NRW.2012 S. 672) the University of Paderborn issued the following examination regulations:
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## APPENDIX B MODULE IN MASTER'S DEGREE COURSE IN COMPUTER ENGINEERING

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I. General Issues

§1. Purpose of the examinations, goal and duration of the course

(1) The Master's examination provides the student with a second degree, bestowing professional qualification after studies in Computer Engineering.

(2) The Master's examination determines whether the students have broadened their professional skills gained during a preceding Bachelor course and have deepened their knowledge in selected areas in such a way that they are able to solve problems by applying suitable scientific methods of Computer Engineering, and are able to develop them further in their area of specialization (major). An adequate oral and written command of the English language in a professional context is also a requirement in regard to professional skills in Computer Engineering.

(3) Apart from the general course goals of § 58 HG, the Master's course provides the students with the ability to apply and extend the scientific methods of Computer Engineering in their work and to act responsibly with regard to the effects of technological change.

§2. Start of studies, admission requirements and academic degree

(1) The courses start in the Winter semester or Summer semester.

(2) Prerequisites for the Master's degree course in Computer Engineering are

1. the University Entry Certificate (University Entry general or respective subject-related University Entry), or a certificate recognized as equivalent by law or by a competent public institution, or a qualification through respective vocational training,

2. a first degree bestowing professional qualifications, either from the Bachelors course in Computer Engineering at the University of Paderborn, or from an equivalent or comparable degree course at a university governed by the Basic Law with a standard period of study of at least 6 semesters or at a foreign university with an equivalent degree. The equivalence agreements endorsed by the Education Ministers' Conference (Kultusministerkonferenz) and the Heads of the German Rectors' Conference (Hochschulrektorenkonferenz) or appropriate legal regulations should be taken into account for deciding on the equivalence of foreign qualifications. If there are any doubts about the equivalence, the Central Office for Foreign Education Systems (Zentralstelle für ausländisches Bildungswesen) should be consulted. If a decision concerning the equivalence of foreign qualifications is based on the knowledge and skills certified on completion of course of studies, equivalence must be determined unless a fundamental difference exists regarding this. The examination committee decides on the equivalence or comparability of the course of studies and the equivalence of the foreign educational attainment.

3. adequate language abilities as stipulated in sections 3 and 4.

4. proof of a foreign university applicant's ability to study (who is not on the same
footing as Germans by virtue of international agreements) based on the results of a GRE Revised General Test. At least 157 points in the part "Quantitative Reasoning" and at least 4.5 points in the part "Analytical Writing" of the GRE Revised General Test are normally required. If the final grade of the degree is very good in accordance with No. 2, the examination committee can, depending on the degree, allow a lower number of points to be sufficient. University applicants who hold a German university entrance qualification are exempted from proof of their ability to study.

(3) A further prerequisite for the Master's degree course in Computer Engineering is knowledge of the English language substantiated by attestations or other documentation such as the

1. successful completion of a minimum of 5 years of English at least from the 5th grade at a German institution or

2. language examination at a minimum proficiency level comparable with B2 of the Common European Framework of Reference, attained, for example, by TOEFL iBT 79 points, TOEFL paper & pencil 550 points, Cambridge First Certificate in English (FCE) or British Council IELTS, Minimum Band 6.0.

In accordance with §49 section 13 HG, university applicants must also prove that they have sufficient command of German according to the regulations of the German language proficiency test for university admission at the University of Paderborn in the currently valid version.

(4) As an alternative to section 3, for those who do not have the required knowledge of German but do possess a well-founded knowledge of English that can be substantiated by attestations or other documentation such as

1. a Bachelors degree from an English-speaking country\(^1\) or acquired during a course of study at an English-speaking domestic accredited institution or

2. a language examination at a minimum proficiency level comparable with C1 of the Common European Framework of Reference, attained, for example, by TOEFL iBT 100 points, TOEFL paper & pencil 600 points, Cambridge Certificate of Advanced English (CAE) or British Council IELTS, Minimum Band 7.0.

(5) Enrolment is refused if

1. the prerequisites specified in section 2-4 are not fulfilled, or

2. the candidate has ultimately failed an examination in a Computer Engineering Master's degree course or in a related or comparable degree course at a tertiary scientific institution governed by the German Basic Law, whereby the failure of the enrolment in the related or comparable degree courses is limited to the case that an examination has not been passed that is mandatory in the Computer Engineering Master's degree course and is deemed equivalent. The enrolment

\(^1\) Within the framework of these regulations these are Australia, Great Britain, Ireland, Canada, New Zealand and the United States of America.
regulation of the University of Paderborn in its respective current version applies regarding additional grounds for refusal.

(6) Upon successfully passing the Master's examination, the Faculty for Electrical Engineering, Computer Science and Mathematics bestows the academic degree "Master of Science," abbreviated as "M.Sc.". A certificate is issued regarding this. If the performance in the examination has been sufficiently tested in accordance with § 17 sec. 8 in the English language, then the academic degree will appear as “English Computer Engineering” on the respective certificate issued.

§3. **Regular course duration and extent of the course**

(1) The regular course duration for the Master's degree including the Master's examination is four semesters. A total workload of around 3600 hours equivalent to 120 credit points (CP) is assumed for the students.

(2) The degree course consists of modules with a total of 120 credit points, including mandatory modules with a volume of 24 credit points, mandatory elective modules with a volume of 42 credit points, an academic work module with a volume of 6 credit points, a project module of two semesters with a volume of 18 credit points and the Master's thesis module with a volume of 30 credit points.

(3) Credit points are awarded according to the European Credit Transfer System (ECTS). One credit point is equivalent to a workload totalling an average of 30 hours.

(4) Based on these examination regulations, the Faculty for Electrical Engineering, Computer Science and Mathematics has issued an example curriculum and a module catalogue. These documents describe in detail the aims and contents of the individual modules, the assigned courses and the recommended previous knowledge. The example curriculum and the list of modules are attached to these examination regulations as Appendix A and B. The module handbook is updated regularly and published on the Internet websites of the Faculty for Electrical Engineering, Computer Science and Mathematics. The module descriptions in the module handbook also highlight in particular, in which form and to what extent key qualifications such as team management and project management etc. can be acquired.

(5) The course contents described in the module handbook are selected and limited in such a way that the degree course can be completed within the regular course duration.

(6) If the Master course Computer Engineering is to be completed entirely in English, a slight limitation in the choice of courses must be expected. The same applies when the courses required in §17 section 7 are only chosen in English.

§4. **Modularisation**

(1) The Master's degree course in Computer Engineering is offered in modules that are individual, self-contained, examinable qualification units. They are integrated with respect to their content and duration and have credit points attached. Modules are completed by successfully passing a module examination for which grades and credit points are awarded.
(2) Apart from the project group module (18 CP) and thesis module (30 CP), the Master's degree course (24 CP), mandatory elective modules (42 CP) and an academic work module (6 CP) are subdivided into mandatory modules. In the mandatory elective area there are six areas of specialisation, for which corresponding module catalogues are listed in the module handbook; the examination committee is responsible for further developing these areas of specialisation. Mandatory elective modules with a total of 22-26 credit points from one of the six areas of specialisation (specialisation in degree course) must be selected; additional mandatory elective modules with a total of 16-20 credit points can optionally be selected from the six areas of specialisation so that a total of 42 credit points can be attained. The academic work module includes a seminar with a total of 4 CP as well as an optional, ungraded course with a total of 2 CP; Appendix B and the module description regulate details. All modules have to be completed successfully in the course of study.

(3) If a module includes mandatory elective classes, these can be chosen from the module catalogue, which is part of the module description.

(4) The credit points allocated to a module are only awarded when the module has been completed according to §9 Section 4.

§5. Examinations and examination deadlines

(1) A module examination normally consists of a final examination module, but in some cases can consist of course-related partial examinations, which are generally referred to as "examination" here. The examinations are normally conducted in the form of written examinations or oral examinations. In addition, the examinations are also possible in alternative forms such as homework, project work, presentations or similar. In all cases, the individual candidate's contribution, which is part of the examination performance, must be clearly distinguishable and assessable. More detailed regulations on the form and/or duration/scope of examinations can be found in §§ 6, 7 and 8 as well as in the module list in Appendix B. Provided that framework requirements are included, the examination committee in coordination with the examiners will define within the first three weeks of the lecture period, how the examination performances are to be achieved specifically. The announcement is normally made in the Campus Management System or by notices.

(2) Should a candidate credibly prove (doctor's certificate) that he/she is not in a position to sit or partially sit the exam in the intended form because of continued illness or physical handicaps, then the chairman of the examination committee must provide the candidate with an alternative examination possibility as equal as possible to the original.

(3) All examinations are taken during the course of studies. The examinations normally take place twice per academic year.

(4) The assessment of examinations must be disclosed to the students in the Campus Management System after six weeks at the latest.

§6. Written examinations

(1) In the written examinations, the candidate must prove that he/she can discern the problems of the subject and solve them with common methods using the tools
permitted by the examiner within a predefined time. A list of the permitted tools must be announced on the Internet pages of the examiner at the beginning of the semester.

(2) Each written examination is assessed by at least one of the examiners according to §12 section 1. In the case of the last repeat examination, two examiners make the assessment.

(3) The duration of a written examination is based upon the workload allocated to the underlying course or courses. It is 60 to 120 minutes for a workload of up to 150 hours and 120 to 240 minutes for a workload of more than 150 hours.

§7. Oral examination

(1) In the oral examinations, the candidate should show that he/she recognizes the context of the subject, is able to put specific examination questions into this context and find the solutions within the predefined time.

(2) Oral examinations are directed by two examiners (cooperative examination) or by a single examiner in the presence of an assessor compliant (§ 12 section 1 paragraph 5) held as group or individual exams. Before the grade is determined according to §15 section 1, the examiners consult with each other, or the examiner consults with the assessor in the absence of the candidate. In the case of the last repeat examination, two examiners make the assessment.

(3) The duration of an oral examination per candidate (even an examination according to §9) is based upon the sum of the workload of the underlying courses. It is 20 to 30 minutes for a workload of up to 150 hours and 30 to 45 minutes for a workload of more than 150 hours.

(4) The significant topics and results of the examination must be recorded in the minutes. The result of the examination must be disclosed to the candidate immediately after the oral examination.

(5) Unless a candidate disagrees, students who intend to sit the same oral examination at a later date are admitted as listeners subject to space availability. The admission does not include the discussion and disclosure of the examination result.

§8. Other forms of performance

(1) A presentation is a lecture of about 30 minutes in length based on a written draft. When doing so, the students should prove that they are able to scientifically elaborate on a topic and present the results.

(2) Within the context of written homework covering approximately 10 DIN A4 pages, an assignment within the subject area of a course is worked on and solved correctly with the aid of relevant literature, if necessary. The performance can also be achieved as group performance provided that it is possible to individually assess the contribution of each group member.

(3) In the colloquium, the students should demonstrate in a discussion of 20 to 30 minutes with examiners and other participants of the colloquium that they can discern technical correlations and classify special issues in this context.
In a *project work*, the students work on a topic predefined by the organizer either alone or in a group. A project work normally involves designing and creating hardware and software prototypes as well as a subsequent experimental assessment. Additional components of a project work are normally the technical documentation and presentation of the work and its results.

§9. **Passing modules, compensation and repetition of examinations**

(1) Each examination can be repeated twice. In the case of a written examination, the second repetition is replaced by an oral examination across the entire range of grades.

(2) Students cannot repeat an examination that they have passed.

(3) A successfully passed examination in the mandatory elective area according to § 22 can, at a candidate’s request, be exchanged (compensation) for a successfully passed examination or for an examination that has not yet been passed (final pass) according to clause 2. A compensation is possible between courses within the same module, in the selected area of specialisation for two modules within the area of specialisation and in the remaining mandatory elective area for any two modules.

(4) A module has been successfully completed if the final grade was assessed as at least "sufficient". If a module examination consists of course-related partial examinations, each course-related partial examination must have been assessed as "sufficient".

(5) A module has been failed when the final module examination or course-related mandatory partial examination was definitively failed and cannot be compensated according to section 3 either.

(6) Examinations or partial examinations, in the event of whose failure the corresponding module according to section 5 was ultimately completed without success, are assessed by at least two examiners according to §12. One of the examiners is appointed based on a proposal by the candidate.

§10. **Registration, deregistration and examination deadlines**

(1) Each module requires registration in the Campus Management System.

(2) Each examination according to § 5 section 1 requires separate registration in the Campus Management System. The registration must be made within the deadlines announced in the Campus Management System. Only students who have verified the admission prerequisites according to §16 will be admitted to the examinations.

(3) Deregistration from examinations can take place at the central examination registrar’s up to one week before the respective examination date, no reasons need to be given. Deregistration from examinations within an examination block can only take place up to one week before the start of this examination block. In the case of examination forms without an examination date, the deregistration deadlines will be fixed and announced by the examination committee in consultation with the examiners.
§11. Examination committee

(1) The Faculty for Electrical Engineering, Computer Science and Mathematics forms an examination committee for the Master's degree course in Computer Engineering. This committee

1. organizes the examinations and supervises their implementation,

2. ensures that the examination regulations are followed and observes the agreed upon procedural rules for implementing the examinations,

3. decides the appeals against decisions made during the examination procedure,

4. prepares an annual report to the Faculty Council on the development of the examinations and the duration of studies,

5. performs any other tasks explicitly assigned in these regulations.

(2) In addition, the examination committee suggests when examination regulation reform is needed and publicises grade distribution. The examination committee may authorise its chairman or deputy chairman to handle matters for its various institutes that have no significant importance; this does not apply to decisions about appeals and reports to the Faculty Council. The chairman or deputy chairman reports to the examination committee about the decisions made on its behalf.

(3) The examination committee is composed of representatives of the Institute for Electrical Engineering and Information Technology and the Institute for Computer Science. It consists of four university professors, one academic colleague and two students. Each member has a deputy. The members and their deputies are elected by their respective representatives in the Faculty Council. Participation of the institutes, chairmanship and tenures are regulated as follows:

1. The group of university professors is composed of two members and their representatives from the institutes involved.

2. The chairmanship rotates between the institutes involved. The deputy chairmanship is taken up by the other respective institute. The chairman and deputy chairman are elected accordingly by the examination committee from the group of university professors at the start of each term of office.

3. The academic staff comes from the institute that does not hold the chairmanship.

4. The term of office of the members from the group of university professors and from the group of academic staff is two years and runs from 1 October of the election year of the examination committee until 30 September of the second following year. The term of office of the students is one year and runs from 1 October of the election year of the examination committee until 30 September of the following year. Re-election is permitted.

(4) The examination committee holds legislative authority on administrative procedures and administrative court proceedings.
(5) A quorum for the examination committee consists of the chairman or the deputy chairman, two further professors, and at least one further member with voting rights. The examination committee reaches its decisions with a simple majority vote with the chairman holding the casting vote. The student members of the examination committee have only an advisory role in educational or scientific decisions. This limitation applies in particular to assessing, recognizing, or crediting study and examination performances, specifying examination questions and appointing examiners and assessors.

(6) The chairman summons the examination committee as needed. However, the chairman must summon it upon the request of at least three members.

(7) The meetings of the examination committee are not public. The members of the examination committee, their deputies and the examiners and assessors are subject to official confidentiality. If they are not public employees, they must assure the chairman that they will abide by the confidentiality requirements.

(8) The members of the examination committee have the right to be present while an examination is being conducted.

§12. Examiners and assessors

(1) The examination committee appoints the examiners. The committee can assign the power of appointment to its chairman. Only professors and other persons who have been authorised according to German national law can be appointed as examiners. Academic staff can be appointed as examiners if they have practiced a freelance teaching activity in the subject corresponding to the study section in the examination. A person may only be appointed as an assessor if he or she has successfully completed this course of studies or a related course of studies at a tertiary scientific institution governed by the German Basic Law or has a comparable final degree.

(2) The examiners are independent in their examination work.

(3) The candidate may suggest examiners for the Master's thesis and - if several possible examiners are available - also for oral examinations. If possible, the suggestions of the candidate should be taken into account. However, this privilege does not constitute an entitlement. In the case of an examination according to §9 section 6, one of the examiners is appointed according to the suggestion of the candidate.

(4) The examination committee ensures that the names of the examiners are announced in due time in the Campus Management System. This generally means four weeks, or at least two weeks in any case before the date of the respective examination.

§13. Crediting course durations, study and examination performances, admission to higher stage semesters

(1) Course durations, study and examination performances achieved in the same courses of study at other universities governed by the German Basic Law are credited by right of office without the need for verification of equivalence.

(2) Course durations, study and examination performances achieved in other courses of study or at other universities as well as at state or state recognised vocational academies governed by the German Basic Law are to be credited if they are
This also applies upon application for course durations as well as for study and examination performances achieved at universities outside the scope governed by the German Basic Law. Equivalence as defined in sentences 1 and 2 must be determined if no significant difference of course durations, study and examination performances in terms of knowledge and skills to be acquired exists in relation to that of the corresponding studies at the University of Paderborn. This accreditation need not be based on a schematic comparison, but on comprehensive observation and evaluation. Determining the equivalence of course durations, study and examination performances at tertiary institutions abroad follows the equivalence agreements endorsed by the Education Ministers' Conference (Kultusministerkonferenz) and the Heads of the German Rectors' Conference (Hochschulrektorenkonferenz). This accreditation also applies to agreements that are part of partnership agreements between tertiary institutions. If there are doubts about the equivalence, the Central Office for Foreign Education Systems (Zentralstelle für ausländisches Bildungswesen) may be consulted.

(3) Section 2 applies accordingly to the awarding of credits for course durations, study and examination performances from state-approved extramural studies or extramural study units developed by the state of North-Rhine Westphalia in co-operation with other states and the federal government.

(4) Unsuccessful attempts in equivalent module examinations in the same course of studies at other universities or in related or comparable courses of studies of these or other universities governed by the German Basic Law will be credited by right of office.

(5) Course applicants who are entitled to take up their studies in a semester based on an entry assessment examination according to § 49 subsection 12 HG are awarded credits toward their examination performances for the knowledge and abilities demonstrated in the entry assessment examination. The assessments in the certificate reporting on the placement test are binding for the examination committee.

(6) Upon application, other skills and qualifications may be credited on the basis of the documents submitted.

(7) The examination committee is responsible for awarding credits according to sections 1 to 4 and 6. Before equivalence is assessed, the examination committee consults competent representatives from the subject area. If the awarding of credits fails, this must then be substantiated.

(8) If the examination committee awards credits for examination performances - possibly after conversion - the grades must be incorporated into the calculation of the overall grade. The award of credits is indicated on the certificate.

(9) An examination performance can only be credited once. The students must submit the necessary documents for the awarding of credits (particularly regarding the knowledge and skills to be acquired by examination performances and examination conditions as well as the number of examination attempts and examination results).

§14. Missed examinations, withdrawal, cheating, violation of regulations

(1) Examination performance is assessed as "unsatisfactory“ (5.0) if the candidate fails to appear at an examination without proper cause. This assessment also applies if he or
she withdraws from the examination without proper reason after the start of the examination or within the week prior to the respective examination date. The same applies if the candidate fails to deliver a written examination performance within the specified timeframe.

(2) Reasons claimed for missing the examination, for withdrawing during the week before the respective examination date or examination block, or for withdrawing after the start of the examination must be presented in writing to the examination committee without delay or five working days after the date of examination and substantiated. In the case of illness, the candidate must submit a medical certificate dated no later than the day of the examination containing an assessment concerning the candidate's ability to take an examination so that the examination committee can determine this. A confirmation from the medical officer can be requested by the examination committee. If the examination committee does not accept the reasons, it informs the candidate about this in writing. In the case of acceptance, course-related partial examination results that have already been achieved are credited.

(3) If a candidate attempts to influence or influences the result of his or her examination performance by cheating, the examination committee will assess the respective examination performance as "unsatisfactory (5.0)" and therefore as "failed". If a candidate carries aids into the examination that are not permitted, the examination committee will assess the respective examination performance as "unsatisfactory (5.0)" and therefore as "failed". The incidents will be recorded on file by the respective supervisor. The assessment according to sentence 1 or the decision according to sentence 2 will be made by the respective examiner.

(4) A candidate who disrupts the orderly conduct of the examination may be excluded by the respective examiner or supervisor from the remainder of the examination. This action is usually preceded by a reprimand. In such cases, the examination performance is assessed as "unsatisfactory (5.0)" and therefore as "failed". The reasons for the disqualification must be recorded on file.

(5) The candidate can demand within 14 days that decisions made according to §14 section 3 sentence 1 or sentence 2 or §14 section 4 be reviewed by the examination committee. Instructions on the right to appeal against incriminating decisions must be provided.

(6) In serious cases, the examination committee can exclude the candidate from further examination credits. According to HG §63 section 5, acts of deception can additionally result in a fine of up to €50,000 and exmatriculation.

(7) Upon a female candidate's application, the examination committee must take into account the maternity protection periods as they are specified in the Working Mothers Protection Act (Gesetz zum Schutze der erwerbstätigen Mutter, MSchG) effective at the time of application. The application must be accompanied by the required supporting documentation. The maternity protection periods interrupt any time limit set by these examination regulations. The duration of the maternity protection is not included in any deadlines.

(8) The examination committee must likewise take into account the time limits of the current law on granting parental allowance and parental leave upon application as
specified in the correspondingly applicable Child Education Benefit and Parental Leave Award Act - Gesetz über die Gewährung von Elterngeld und Elternzeit (BEEG). The candidate must notify the examination committee in writing about the time period of parental leave he or she intends to take. The examination committee must receive this notification not less than four weeks before the intended start of the parental leave and it must include the required supporting documentation. The examination committee must establish whether the legal prerequisites have been met that would entitle an employee to parental leave under the BEEG. The examination committee promptly informs the candidate about the outcome and, where applicable, about the new examination deadlines. Deadlines of a Master's thesis cannot be interrupted by parental leave. The assigned task is withdrawn and regarded as not assigned. After the end of parental leave, the candidate is given a new topic.

(9) Furthermore, the examination committee regulates the disadvantage compensation for disabled students and takes into account lost periods due to the care of the spouse, registered partner or a relative related in direct line or in first degree by marriage.

**§15. Examination performance assessment and grading**

(1) Graded examination performances are to be assessed with one of the following grades:

1 = very good: an excellent performance  
2 = good: a performance significantly above the average requirements  
3 = satisfactory: a performance that meets the average requirements  
4 = sufficient: a performance that meets the requirements in spite of its deficiencies  
5 = unsatisfactory: a performance that no longer meets the requirements because of significant deficiencies

(2) The following range of grades is provided for a differentiated assessment of the examinations: 1.0 and 1.3 for differentiation of the grade "very good", 1.7; 2.0 and 2.3 for differentiation of the grade "good", 2.7; 3.0 and 3.3 differentiation of the grade "satisfactory", 3.7 and 4.0 differentiation of the grade "sufficient" and 5.0 for the grade "unsatisfactory".

(3) The grade of a module examination consisting of partial examinations is determined from the weighted average of the grades of the course-related partial examinations based on workload. Only the first decimal digit is taken into account for the calculation. All subsequent digits are dropped without rounding.

(4) Ungraded examination performances are assessed as "passed" or "failed".
II. Master examination

§16. Admission to the Master's examination

(1) Only students who are enrolled at the University of Paderborn in the Master's degree course Computer Engineering, or who have been admitted as guest students (Zweithörer) according to §52 HG may be admitted to examinations in the Master's degree course Computer Engineering. These requirements must also exist during the examinations.

(2) The Master's thesis module can only be started if module examinations were passed successfully with a total of 45 credit points.

(3) Candidates must apply in writing to the chairman of the examination committee for admission to the second Master's thesis at the Central Examination Registrar. The application must include the following:
   1. evidence showing that the candidate has met the admission requirements described in section 2
   2. a declaration stating whether the candidate is in a pending examination procedure,
   3. a declaration stating whether ultimately failed examinations exist.

(4) Admission is refused, if
   1. the prerequisites specified in §16 section 1 to section 3 are not fulfilled, or
   2. the documents are incomplete, or
   3. the candidate has ultimately failed the Master's examination in a degree course in Computer Engineering or in a comparable or related degree course at a tertiary scientific institution governed by the Basic Law, whereby refusal of admission in the related or comparable courses or study is limited to cases that an examination has been failed which is mandatory in the Computer Engineering Master's degree course and should be considered equivalent, or
   4. the candidate is already attending another university in a comparable examination in the same, in a related or comparable course of studies.

(5) Students who have changed a tertiary institution or degree course and have failed the examination in a course of studies at a university governed by the Basic Law according to §2 section 2 No. 2 in a subject of a degree course, which according to §17 must be passed for the Master's degree course Computer Engineering and should be considered equivalent, may only be admitted to the respective repeat examination.

§17. Goal, extent and format of the Master's examination

(1) Through the Master's examination, the candidate should demonstrate that he or she has acquired the necessary basic level in Computer Engineering, a range of methodological instruments, the systematic orientation, and on this basis, a broad range of general scientific knowledge in engineering and computer science.

(2) The Master's examination consists of
1. course-related module examinations on contents of courses covering a volume of 66 credit points,
2. the project group module (18 CP),
3. the academic work module (6 CP) and
4. the Master's thesis module (30 CP).

(3) Course-related module examinations covering the content of the following mandatory modules must be passed with the specified credit points:

1. Compulsory module Computer Science (12 CP)
2. Compulsory module Electrical Engineering (12 CP)

(4) The mandatory elective area is subdivided into 6 areas of specialisation:

1. Embedded Systems
2. Nano/Microelectronics
3. Computer Systems
4. Communication and Networks
5. Signal, Image and Speech Processing
6. Control and Automation

(5) Mandatory elective modules with a total of 22-26 credit points must be selected from an area of specialisation. Furthermore, additional mandatory elective modules with a total of 16-20 credit points must completed, in which any modules from all areas of specialisation can be selected. A total of 42 credit points must be achieved in the mandatory elective area.

(6) The catalogue of the courses of the mandatory elective modules as well as more detailed regulations concerning the examination forms of the compulsory and mandatory elective modules can be found in the module list in Appendix B.

(7) All students must attend modules and pass the respective examinations in their major course of study in English with a volume of at least 24 credit points. In the framework of this regulation this means that lectures must be conducted in English, materials must be available in English and examinations held in English.

(8) The certificate described in § 2 section 6 concerning the graduation title “English Master of Computer Engineering” is granted if

1. the examination according to section 2, No. 4 (Master's thesis module) has been completely passed in the English language and
2. work described in section 2 No. 1 to 3, with the exception of modules and examinations with a total of 18 credit points at most and with the exception of non-English language courses in the academic work module, have been passed in the form described according to section 7.
§18. Thesis module

(1) The thesis module consists of the work planning phase (workload 150 hours, not graded) and the Master's thesis including an interim presentation, final presentation and a disputation (workload 750 hours).

(2) The Master's thesis is an examination work that concludes the scientific education. In it the candidate should show that he or she has the ability to process a problem in Computer Engineering according to scientific methods, within a certain deadline. The task for the thesis module is to be designed so that it corresponds to a workload of 900 hours (30 credit points). The thesis should normally not exceed 120 DIN A4 pages.

(3) The thesis is prepared in the selected area of specialisation according to §17 section 4. The candidate must be given the opportunity to suggest a topic for the Master's thesis. These suggestions do not constitute an entitlement.

(4) Upon application, the chairman of the examination committee ensures that a candidate is given a topic for the Master's thesis on time.

(5) The Master's thesis may also be approved in the form of group work, provided that the individual candidate's contribution is clearly distinguishable in terms of individual sections, number of pages or other objective criteria that permit unambiguous discrimination and assessment and it fulfils the requirements according to section 2.

(6) The student can first be admitted to the Master's thesis when module examinations amounting to 45 credit points have been passed successfully. The chairman of the examination committee issues the topic of the Master's thesis immediately after the work plan has been accepted. The date of issue must be recorded and placed on file. The processing time for the Master's thesis is 6 months.

(7) The topic and the task of the Master's thesis are sent to the candidate in writing. They must be formulated such that the envisaged workload is sufficient. The topic may be returned only once and only within the first month after it has been issued. The work period starts anew on a new topic. In individual cases and upon justified application, the examination committee can grant a work period extension of no more than six weeks.

(8) Neither the Master thesis nor any part thereof may be used for another examination in this or any other course of study. The rules for credit points shall remain unaffected by this.

(9) Upon submission of the Master's thesis, the candidate must declare in writing, that the work - or in the case of group work, the relevant section of the work - has been written independently and no other sources other than those specified have been used as support, and that citations have been marked as such.

(10) No later than four weeks after announcement of the topic, the candidate presents the procedure and time schedule for the thesis in an interim presentation. The final presentation of the thesis topic and its results, including a disputation, takes place no later than four weeks after submission of the thesis. This final presentation including the disputation lasts about 45 to 60 minutes.
§19. Acceptance and assessment of the Master's thesis module

(1) The Master's thesis module consisting of the work planning (not graded) and the Master's thesis including an interim presentation, a final presentation and a disputation, is assessed according to §15. After acceptance by the first examiner according to §18 section 6, the work planning is deemed as passed. The assessment of the Master's thesis includes the final presentation and the disputation. The grade of the Master's thesis is also the grade of the Master's thesis module.

(2) The Master's thesis must be delivered in duplicate to the central examination registrar within the deadline. A third copy of the Master's thesis must be kept by the candidate for 5 years and shown upon request. The date and time of submission must be recorded and placed on file by the central examination registrar. If the work is submitted by mail, the delivery date at the post office (postmark) is determined as the submission date. According to §14 section 1, the Master's thesis is deemed and assessed as "unsatisfactory" (5.0) if it is not submitted within the deadline.

(3) According to § 12, two examiners must assess the Master's thesis. The final presentation and disputation are included in the assessment. The grade is calculated as the arithmetic average of the two examiners' assessments if they do not differ by less than 2.0. If the assessment of the first and second examiner differs by the value 2 or by a higher value, the chairman of the examination committee must then appoint a third examiner to assess the Master's thesis (without final presentation and disputation). The grade of the Master's thesis is then derived from the arithmetic average of the three assessments. The Master's thesis can only then be assessed as "sufficient" or better, however, if at least two grades are "sufficient" or better.

(4) The candidate has passed the Master's thesis if the grade is at least "sufficient". The student must be informed about the assessment of the Master's thesis no later than six weeks after submitting the work.

§20. Repetition of the thesis module

(1) If the Master's thesis has been assessed as "unsatisfactory (5.0)"), the thesis module can be repeated once. A second repeat is not permitted. Returning a Master's thesis topic within the deadline specified in § 18, section 7, sentence 3 is only permitted if the candidate did not use this option while writing his or her first Master's thesis.

(2) The candidate may suggest a different examiner for the repeat of the thesis module.

§21. Completion of studies, overall grade, final failure

(1) The candidate has passed the Master's examination if all examinations including the Master's thesis module according to §17 have been assessed with a grade of at least "sufficient".

(2) The overall grade is calculated as the weighted average of the credit points from the module grades. For the purpose of calculating the overall grade for the candidate, the credit points specified in § 17, section 2 should be modified as follows: the project group module is weighted with the factor 1/2 and the final examination module is weighted with the factor 5/3. In the mandatory elective area, the completed modules of the selected area of specialisation within the scope of 22-26 credit points are weighted with 24 credit points, the remaining modules within the scope of 16-20 credit points are
weighted with 18 credit points. All other modules are weighted with their credit points. The module grade of the scientific work module is equivalent to the grade of the seminar. According to §22, extra achievements are not included in the overall grade.

(3) The overall assessment "passed with distinction" is awarded if the grade of the thesis module is 1.0, the average of the module grades weighted according to credit points is at least 1.3 and none of the module grades is below "good".

(4) The candidate has ultimately failed the Master's examination if he or she fails a module and compensation at the module level according to § 9 section 3 is no longer possible, or if the Master's thesis has been assessed for the second time with the grade "unsatisfactory".

(5) The candidate is notified in writing by the examination committee about an ultimately failed Master's examination. The notification must be accompanied by instructions on the right to appeal.

(6) If the candidate has ultimately failed the Master's examination, he or she, upon submitting an application can be issued a written certificate, stating the examination performances with credit points and their achieved grades, and indicating that the Master's examination has ultimately not been passed.

(7) Upon submission of an application, a certificate containing the examination performances achieved, as well as the number of examination attempts made in the case of failed examination performances, must be issued to students within one year after the exmatriculation.

§22. Extra achievements

(1) Beyond the achievements required in § 17, students can take examinations in subjects or modules of up to 16 credit points. This upper limit also includes examinations that were failed. The successfully completed exams are then listed in the "Transcript of Records".

(2) It is possible to transfer credit points (in compliance with the maximum number allowed in sentence 1) for the purpose of compensation as mentioned in § 9 section 3. These maximum credit points also include examinations that were failed.

§23. Certificate, Transcript of Records and Diploma Supplement

(1) If the candidate has completed the course of studies successfully, he or she receives a certificate of the result. This certificate contains the name of the degree course, the regular course duration and the overall grade. The certificate shows the date when the last examination performance was achieved. In addition to this, it bears the date of issue. The certificate must be signed by the chairman of the examination committee.

(2) In addition, the candidate receives a Transcript of Records listing the entire performances achieved and the length of study. The Transcript of Records contains details about the credit points (ECTS-Credits) and the grades achieved for the completed modules and Master's thesis. It also contains the topic of the Master's thesis and the overall grade achieved of the master examination.

(3) The graduate is also issued a Diploma Supplement with the leaving certificate.
(4) The Diploma Supplement is in English and German with standardised information about the German university degrees, which explain the German educational system and classify the degree. The Diploma Supplement provides information about the completed course of studies and the academic and professional qualifications acquired with the degree.

§24. Master's certificate

(1) Together with the certificate of the successfully Master's examination, the candidate receives a certificate certifying the award of the Master's grade according to § 2.

(2) The Master's certificate is signed by the dean of the Faculty Electrical Engineering, Computer Science and Mathematics and the chairman of the examination committee. The University's seal is affixed to the document.

III. Final regulations

§25. Invalidity of the Master's examination

(1) If the candidate cheated during an examination and this fact only becomes known after a certificate has been handed out, the examination committee may retroactively correct the grades where cheating took place and can declare the examination as fully or partially failed.

(2) If the prerequisites for admission to an examination were not met, with no intention on the part of the candidate, and this fact becomes known after the certificate has been issued, the passing of the examination compensates for this deficiency. If the candidate has gained admission by intentional deceit, the examination committee will decide over legal consequences, taking into account the Administrative Procedures Act (Verwaltungsverfahrensgesetz) of the state of North-Rhine Westphalia.

(3) Before arriving at such a decision, the person in question must be given the opportunity to be heard.

(4) The incorrect examination certificate must be surrendered and where applicable, a new one must be issued. A decision according to section 1 and 2, sentence 2 is not allowed after a period of five years after the issue date on the examination certificate.

(5) If the examination is declared as an overall fail, the Master's degree must be revoked and the respective certificate must be surrendered.

§26. Revocation of the Master's degree

(1) A Master's degree is revoked if in hindsight proof is brought forth that it was achieved by cheating, or if significant prerequisites for the award were wrongly deemed to have been fulfilled. The Faculty Council decides over the revocation by a two-thirds majority of its members.

§27. Inspection of the examination files

(1) After each examination and conclusion of their examination procedures, a candidate can apply to have access to his or her written examination work, to the examiner's reports relating to it, and to the minutes of the examination.
(2) This application must be made to the chairman of the examination committee within one year after the result has been released or the examination certificate has been handed over to the candidate. The chairman of the examination committee determines the place and time of inspection.

§28. Date of effectiveness and publication

(1) These examination regulations come into effect as of 01.10.2013. The admission requirements in accordance with § 2 already come into effect as of 01.06.2013.

(2) These examination regulations are published in the Official Communications of the University of Paderborn (AM Uni. Pb.).

These examination regulations are issued as a result of the decision of the Faculty Council of the Faculty for Electrical Engineering, Computer Science and Mathematics dated the 27.05.2013 and the legal review through the Rector's Office, dated the 29.05.2013.

Paderborn, date 31 May 2013

The Rector
University of Paderborn
Professor Dr. Nikolaus Risch
Appendix A Curriculum Master Computer Engineering

The following diagram shows an example curriculum of the Computer Engineering Master's degree course with its modules and credit points (CP) per module. The courses are listed for each module together with details of the semester periods per week (time of attendance) and the workload. The total weekly time of attendance and achievable credit points are specified per semester.

Vertiefungsgebiete
- Embedded Systems
- Nano/Microelectronics
- Computer Systems
- Communication and Networks
- Signal, Image and Speech Processing
- Control and Automation
Appendix B Module in Master's degree course in Computer Engineering

As a result of the further development of the research and teaching contents of the Institute for Computer Science, Electrical Engineering and Information Technology, courses of the mandatory elective area in the list below may be slightly less or may be replaced or supplemented by courses belonging to the same subject area. The changes are announced in the module handbook. The regulations concerning the number and form of examinations remain unaffected by this.

<table>
<thead>
<tr>
<th>Module Course (LV)</th>
<th>CP Module SWS LV</th>
<th>Number and form of examinations</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compulsory module Computer Science</strong></td>
<td>12</td>
<td>1 oral examination or written examination as final module examination</td>
<td>Compulsory module</td>
</tr>
<tr>
<td>Operating Systems</td>
<td>2+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hardware-Software Codesign</td>
<td>2+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced Computer Architecture</td>
<td>2+1</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Compulsory module Electrical Engineering</strong></td>
<td>12</td>
<td>1 oral examination or written examination as final module examination</td>
<td>Compulsory module; Statistical Signal Processing can be replaced by: Processing of statistical signals (2+2)</td>
</tr>
<tr>
<td>Statistical Signal-Processing</td>
<td>2+2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circuit and System Design</td>
<td>2+2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Academic Work</strong></td>
<td>6</td>
<td>1 presentation in the seminar</td>
<td>Compulsory module; The course Languages, Writing and Presentation Techniques is not graded</td>
</tr>
<tr>
<td>Seminar</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Languages, Writing and Presentation Techniques</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mandatory elective modules from the area of specialisation</strong></td>
<td>22-26</td>
<td>1 oral examination or written examination per module as final module examination</td>
<td></td>
</tr>
<tr>
<td>Selection from the Module Catalogue of one of the six areas of specialisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Additional mandatory elective modules</strong></td>
<td>16-20</td>
<td>1 oral examination or written examination per module as final module examination</td>
<td></td>
</tr>
<tr>
<td>Random selection from all Module Catalogues of the six areas of specialisation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Project group</strong></td>
<td>18</td>
<td>Project work</td>
<td></td>
</tr>
<tr>
<td><strong>Master's thesis</strong></td>
<td>30</td>
<td>see §18, §19</td>
<td>The work plan is not graded; Admittance to the Master's thesis module is not possible until module examinations amounting to 45 credit points have been passed successfully</td>
</tr>
<tr>
<td>Work plan</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Master's thesis</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Courses in "Languages, writing and presentation technology"

A subject can be selected from the range of courses at the University of Paderborn in the subject areas Foreign Languages, Writing Scientific Texts and Presentation Technology. The range of courses is shown in the lecture timetable of the University of Paderborn. The aim of these optional subjects is to ensure enhancement and specialisation of interdisciplinary qualifications.

List of areas of specialization with associated modules

The following areas of specialization and modules within the areas of specialization are listed in alphabetical order.

Area of specialisation "Communication and Networks"
- Clouds, Grids, and HPC
- Mobile Networks
- Networking Techniques
- Networking Theory
- Optical Communication A
- Optical Communication B
- Optical Communication C
- Optimal and Adaptive Filter
- Security
- Wireless Communications

Area of specialisation "Computer Systems"
- Clouds, Grids, and HPC
- Computer Architecture
- Hardware Fault Tolerance
- Large-scale IT systems
- Security

Area of specialisation "Control and Automation"
- Advanced Control
- Advanced Topics in Robotics
- Biomedical Measurement Technology
- Digital Controls
- Flatness Based Controls
- Controlled AC Drives
- Optical Measuring Processes
- Control Technology B
- Control theory - Non-linear Regulators
- Robotics
- System theory - Non-linear Systems
- Ultrasonic Measuring Technology
- Environmental Measuring Technology

Area of specialisation "Embedded Systems"
- Algorithms and Tools for Test and Diagnosis of Systems on Chip
• Computer Architecture
• Fast Integrated Circuits for Digital Communications Technology
• Real-time/Embedded Systems
• SW-Engineering for Embedded Systems
• Testing Highly Integrated Circuits

Area of specialisation "Nano/Microelectronics"
• Algorithms and Tools for Test and Diagnosis of Systems on Chip
• Introduction to High-frequency Engineering I
• Fast Integrated Circuits for Digital Communications Technology
• Semi-conductor Process Technology
• High Frequency Engineering
• Technology of Highly Integrated Circuits
• Testing Highly Integrated Circuits

Area of specialisation "Signal, Image, and Speech Processing"
• Advanced System Theory
• Algorithms of Speech Recognition
• Cognitive Systems in Virtual Reality
• Digital Image Processing I
• Digital Image Processing II
• Digital Speech Signal Processing
• Cognitive Sensor Systems
• Measurement Probability
• Modelling, Identification and Simulation
• Optimal Systems
• Optimal and Adaptive Filters
• Statistical Learning Methods and Pattern Recognition
• System theory - Non-linear Systems
• Topics in Pattern Recognition and Machine Learning
• Topics in Signal Processing
• Processing of Statistical Signals
• Video Technology
• Wireless Communications

List of mandatory modules with associated courses

Module Clouds, Grids, and HPC
• Analytic Performance Evaluation
• Cloud Computing
• Empiric Performance Evaluation
• Advanced distributed Algorithms and Data Structures
• HPC architectures
• Reconfigurable Computing
• Routing and Data Management in Networks

Module Mobile Networks
• Ad Hoc and Sensor Networks
• Analytic Performance Evaluation
• Empiric Performance Evaluation
• Mobile Communications

Module Networking Techniques
  • Analytic Performance Evaluation
  • Empiric Performance Evaluation
  • Future Internet

Module Networking Theory
  • Advanced distributed Algorithms and Data Structures
  • Routing and Data Management in Networks

Module Optical Communication A
  • Optical Communication A

Module Optical Communication B
  • Optical Communication B

Module Optical Communication C
  • Optical Communication C

Module Optimal and adaptive Filters
  • Optimal and adaptive Filters

Module Security
  • Cryptographic Protocols
  • Cryptography - Provable Security
  • Protection of Data Privacy
  • Introduction to Cryptography
  • IT Security

Module Wireless Communications
  • Wireless Communications

Module Computer Architecture
  • HPC architectures
  • Massively Parallel Architectures
  • Reconfigurable Computing

Module Hardware Fault Tolerance
  • Hardware Fault Tolerance

Module Large-scale IT systems
  • Analytic Performance Evaluation
  • Cloud Computing
  • Databases and Information Systems
  • Empiric Performance Evaluation
  • Processing, Indexing, and Compression of Structured Data

Module Advanced Control
  • Advanced Control

Module Advanced Topics in Robotics
• Advanced Topics in Robotics

Module Biomedical Measurement Technology
  • Biomedical Measurement Technology

Module Digital Controls
  • Digital Controls

Module Flatness Based Controls
  • Flatness Based Controls

Module Controlled AC Drives
  • Controlled AC Drives

Module Optical Measuring Processes
  • Optical Measuring Processes

Module Control Technology B
  • Control Technology B

Module Control theory - Non-linear Regulators
  • Control theory - Non-linear Regulators

Module Robotics
  • Robotics

Module System theory - Non-linear Systems
  • System theory - Non-linear Systems

Module Ultrasonic Measuring Technology
  • Ultrasonic Measuring Technology

Module Environmental Measuring Technology
  • Environmental Measuring Technology

Module Algorithms and Tools for Test and Diagnosis of Systems on Chip
  • Algorithms and Tools for Test and Diagnosis of Systems on Chip

Module Fast Integrated Circuits for Digital Communications Technology
  • Fast Integrated Circuits for Digital Communications Technology

Module Real-time/Embedded Systems
  • Advanced Embedded Systems
  • Intelligence in Embedded systems
  • Real-Time Systems
  • Reconfigurable Computing

Module SW-Engineering for Embedded Systems
  • Model-Driven Software Development
  • Quantitative Evaluation of Software Designs
  • Software Quality Assurance

Module Testing Highly Integrated Circuits
• Testing Highly Integrated Circuits

Module Introduction to High-frequency Engineering
  • Introduction to High-frequency Engineering

Module Semi-conductor Process Technology
  • Semi-conductor Process Technology

Module High Frequency Engineering
  • High Frequency Engineering

Module Technology of Highly Integrated Circuits
  • Technology of Highly Integrated Circuits

Module Advanced System Theory
  • Advanced System Theory

Module Algorithms of Speech Recognition
  • Algorithms of Speech Recognition

Module Cognitive Systems in Virtual Reality
  • Cognitive Systems in Virtual Reality

Module Digital Image Processing I
  • Digital Image Processing I

Module Digital Image Processing II
  • Digital Image Processing II

Module Digital Speech Signal Processing
  • Digital Speech Signal Processing

Module Cognitive Sensor Systems
  • Cognitive Sensor Systems

Module Measurement Probability
  • Measurement Probability

Module Modelling, Identification and Simulation
  • Modelling, Identification and Simulation

Module Optimal Systems
  • Optimal Systems

Module Optimal and Adaptive Filters
  • Optimal and Adaptive Filters

Module Statistical Learning Methods and Pattern Recognition
  • Statistical Learning Methods and Pattern Recognition

Module Topics in Pattern Recognition and Machine Learning
  • Topics in Pattern Recognition and Machine Learning

Module Topics in Signal Processing
• Topics in Signal Processing

Module Processing of Statistical Signals
  • Processing of Statistical Signals

Module Video technology
  • Video technology