Preamble to the Module Handbook

Master's Program
Computer Engineering v3
(CEMA v3)
Master-Version v3 (2017)
(Study period: 4 Semester)

Faculty of Electrical Engineering, Computer Science and Mathematics University of Paderborn

Paderborn, 21. March 2022

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2 Description of Program Master Computer Engineering

This module handbook describes the modules and courses of the master program Computer Engineering with their goals, contents and relationships. For students, the module handbook shall provide useful and binding information to support them in planning their studies. For teachers and the interested reader the handbook provides an in-depth view into the structure and organization of the study program.

The following paragraphs present a list of abbreviations, the curriculum of the Master program Computer Engineering and an exemplary schedule of courses, comment on the training of soft skills and show the schemes for describing modules and courses used in this handbook. Details and regulations regarding examination modalities and grading rules are provided in the document "Prüfungsordnung für den Master-Studiengang Computer Engineering".

3 Structure an references of the module handbook

3.1 List of Abbreviations

LP	Leistungspunkt (nach ECTS)	CP	Credit Point (in ECTS)
SWS	Semesterwochenstunden	SWS	Semester load (weekly hours)
WS	Wintersemester	WS	Winter semester / Winter term
SS	Sommersemester	SS	Summer semester / Summer term
2V	Vorlesung mit 2 SWS	2L	Lecture with 2 SWS
2Ü	Übung mit 2 SWS	2Ex	Exercise with 2 SWS
2P	Projekt mit 2 SWS oder Praktikum mit 2 SWS	2P	Project with 2 SWS or Practical Laboratory Course with 2 SWS
2S	Seminar mit 2 SWS	2S	Seminar with 2 SWS
2PS	Projektseminar mit 2SWS	2PS	Project seminar with 2 SWS
P	Pflicht	C	Compulsory
WP	Wahlpflicht	CE	Compulsory elective

Table 1: List of Abbreviations

3.2 Schema of Module Description

The module descriptions are consistently structured according to the following scheme:

Module name			
Module number M.xxx.xxx	**Workload (h)**	**Credits**	**Regular cycle**

	Semester number	Duration (in sem.)	Teaching Language
1 Module structure			
Course number Course name: Type with SWS (Time of attendance (h) / Self-study (h) / Status / Group size)			
2 Options within the module			
3 Admission requirements			
4 Contents			
Short Description Contents			
5 Learning outcomes and competences			
6 Assessments			
7 Study achievement			
8 Prerequisites for participation in examinations			
9 Prerequisites for assigning credits			
10 Weighing for overall grade			
11 Reuse in degree Modules			
12 Module coordinator			
13 Other notes			
Module Homepage Implementation Teaching Material, Literature Comments			

Table 2: Schema of Module Description

4 Remarks and legal references for the program

4.1 Degree plan for the master program Computer Engineering

Figure 1 shows the curriculum and an exemplary schedule of courses for the master program Computer Engineering. The master program comprises four mandatory modules (6 LP each), elective modules (42 LP), a seminar module (6 LP), the module project group (18 LP) and the master theses (30 LP). For the elective modules, the program defines six focus areas for which this handbook lists corresponding module catalogs. Each student selects one out of these focus areas and completes modules totaling

24 LP in this focus area. Another set of modules totaling 18 LP can be selected from any of the focus areas. The seminar module contains a seminar with 4 LP and an elective, ungraded course with 2 LP.

1st Semester 20 SWS / 30 Credits	2nd Semester - SWS / 30 Credits	3rd Semester - SWS / 30 Credits	4th Semester - SWS / 30 Credits
Focus Area 24 Credits (4 modules out of 1 of 6 focus areas)			Master's Project 30 Credits
Module 1 e.g. 2+2 SWS / 180 h	Module 2 e.g. 2+2 SWS / 180 h	Module 4 e.g. 2+2 SWS / 180 h	Work Plan - / 150 h
	Module 3 e.g. 2+2 SWS / 180 h		Master's Thesis - / 750 h
Mandatory Module ET I 6 Credits	Further Electives 18 Credits (3 modules out of arbitrary focus area)		
Statistical Signal Processing* 2+2 SWS / 180 h	Module 1 e.g. 2+2 SWS / 180 h	Module 2 e.g. 2+2 SWS / 180 h	
Mandatory Module ET II 6 Credits		Module 3 e.g. 2+2 SWS / 180 h	
Circuit and System Design 2+2 SWS / 180 h	Project Group 18 Credits		
Mandatory Module CS I 6 Credits	Project Group Computer Engineering - / 540 h		
Networked Embedded Systems 3+2 SWS / 180 h	Scientific Work Style 6 Credits		
Mandatory Module CS II 6 Credits	Seminar - / 120 h		
Advanced Computer Architecture 3+2 SWS / 180 h	Languages, Writing and Presentation Techniques - / 60 h		

*can be replaced by "Verarbeitung statistischer Signale" (taught in German)

Figure 1: Degree plan for the master program Computer Engineering v3

Focus Areas:

- Embedded Systems
- Nano/Microelectronics
- Computer Systems
- Communication and Networks
- Signal, Image and Speech Processing
- Control and Automation

Further Electives:

Modules can be arbitrarily selected out of all focus areas.

Master's Project:

The topic of the master's thesis must be within the selected focus of study.

4.2 List of organization forms

The following organization forms are used in this program:

- **Final thesis**
- **Lecture with exercises and practical work**
  Combination of a lecture with exercises and a phase of practical work.
- **Lecture with practical assignments**
  A combination consisting of a lecture and exercises. Usually practical problems are solved during the exercises. There may also be homework assignments.
- **Project**
- **Seminar and elective courses**

4.3 List of examination forms [1]

The following examination forms are used in this program:

Written Exam

In written examinations the candidate has to demonstrate that she or he is capable of recognizing problems of the subject with the help of the tools allowed by the examiner and solve them with the common methods within the given time frame. A list of the allowed aids has to be announced together with the date of the examination.
Every written examination is graded by one examiner. In case of the last repetition, the assessment is conducted by two examiners.
The duration of a sit-down examination depends on the sum of the credit points in a module. It takes 90 to 120 minutes in case of up to 5 credit points and 120 to 180 minutes in case of more than 5 credit points.

Oral Exam

In oral examinations the candidate has to demonstrate that she or he recognizes the interrela- tions within the examined area, is able to put specific questions into context and find solutions within the time given.
Oral examinations are performed in front of two examiners or one examiner in presence of one competent observer as group examinations or as single examinations. In any case it must be possible to differentiate and grade the contribution counted as an examination performance of each candidate separately. Before setting a grade the examiner consults the observer in absence of the candidate. In case of the last repetition, two examiners do the grading.
The duration of an oral examination per candidate depends on the sum of the credit points of the underlying courses. It takes 20 to 30 minutes in case of up to 5 credit points and 30 to 45 minutes in case of more than 5 credit points. For group examinations the total duration of the examination extends accordingly. The essential content and results of the examination have to be recorded in the minutes of the examination. The result of the examination has to be announced to the candidate subsequent to the oral examination by the examiner.
Students who want to take the same examination at a later examination date will be admitted as listeners according to the spatial conditions, as long as no candidate disagrees. Admission does not extend to the consultation and announcement of the examination result.

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[1] The latest examination regulations and explanations can be found at http://digital.ub.uni-paderborn.de/nav/classification/1201976.

Presentation

A presentation is a performance of about 30 minutes on the basis of a written composition. Thereby students have to prove that they are able to elaborate a topic scientifically and can present results.

Written Term Paper

Within the framework of a written term paper with a scope of ten DIN-A4 pages a task is dealt with and solved properly within a thematic area of a course with the help of relevant literature, if necessary. The performance can also be made as a group performance, as long as an individual assessment and evaluation of each group member is possible.

Colloquium

In a colloquium students have to prove that they can recognize technical interrelations and are able to put specific questions into a context in a conversation of 20 to 30 minutes with the examiner and other participants of the colloquium.

Project

In a project the students work on a topic given by the lecturer by themselves or in a group. Projects usually include a draft and structure of hardware and software prototypes, as well as an ensuing experimental evaluation. Other parts of a project are usually the technical documentation and the presentation of the work and its results.

Qualified Participation

A qualified participation is given, if the achieved performances indicate that the subjects underlying a given problem have been dealt with more than just superficially. The evidence of a qualified participation can be requested in a module, if this is necessary for ensuring the acquisition of competences in the module besides the module examination. The evidence of a qualified participation in a module can be a requirement for the allocation of credit points or a requirement for the participation in examinations. The evidence of a qualified participation is provided especially by one or more short written examinations, an expert discussion, the preparation of a protocol, exercises prepared during the course or as homework, short tests ("Testate"), a presentation. Details are provided in the module description. If the module description only sets the framework, then the exact rules must be published by the lecturer in the campus management system or in another suitable way no later than three weeks after the beginning of semester.

Course Work

As a course work exercises can be requested which usually are put as homework and / or presence tasks on a weekly basis. Further forms of course work can be a written paper or report of 5 - 10 pages, a presentation of 10 - 20 minutes duration or a short written examination of at most 30 minutes duration. Details are provided in the module description. If the module description only sets the framework, then the exact rules must be published by the lecturer in the campus management system or in another suitable way no later than three weeks after the beginning of semester.

Bonus System

Voluntary bonus work is possible in addition to examinations. Bonus work can be delivered in the form of exercises or homework, short tests ("Testate") or projects. The goal of bonus work is to prepare students for examinations step by step. Bonus work can be graded and improve the final grade of the module according to predefined rules. The module exam must be passed independent of the bonus work. The final grade can be improved by the bonus system by at most 0.7.

4.4 Training of Soft Skills

The master program Computer Engineering includes a number of courses in which training of soft skills is an integral component:

- project group Computer Engineering (module Project Group)
- seminar (module Seminar)
- an elective course in languages or scientific writing (module Seminar)
- master thesis including the presentation of the theses and the work schedule (module Master Thesis)

Besides providing training in a joined-up scientific-technical way of thinking, these courses greatly strengthen communication, presentation, moderation and self-reflection skills. The amount of credit points devoted to soft skills training totals to 54 LP. Actually, the number of courses including soft skills training is much higher, since exercise sessions often require and train communication skills, the ability to work in a team and competences in using modern information technology. This also applies to many of the lectures when using novel forms of teaching.

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