

**Examination Regulations
for the Master Course Embedded Systems for Mechatronics
of the Faculty of Computer Science
of Dortmund University of Applied Sciences and Arts
(Fachhochschule Dortmund)**

As of 16th May, 2017

(As amended on 4th May 2018;

Issued based on the resolutions of the faculty transfer of the Faculty of Information Engineering as of 25th October 2017, of the Faculty of Computer Science as of 20th December 2017 and the Rectorate as of 9th January 2018, as well as an update of the Expert Committee Admission Procedure according to Attachment 3)

Whilst every effort has been made to ensure the above information is an accurate translation of the Examination Regulations for the master course Embedded Systems for Mechatronics of the Faculty of Computer Science of Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund) - Official Announcements – Public Journal, yearly issue 38, volume 20, 23rd May 2017, Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund) accepts no legal liability for its contents and reserves the right to make alterations and amendments if and when required.

**Programme Examination Regulations (PER)
for the Master Course Programme Embedded Systems for Mechatronics
of the Faculty of Computer Science
of Dortmund University of Applied Sciences and Arts
(Fachhochschule Dortmund)**

As of 16th May, 2017

In accordance with § 2 subsection 4 clause 1 and § 64 subsection 1 in conjunction with § 22 subsection 1 no. 3 of the “Gesetz über die Hochschulen des Landes Nordrhein-Westfalen” (North-Rhine Westphalian University Act, abbreviated: HG) of 16th September 2014 (Law and Ordinance Gazette NRW. p. 547) most recently amended by law on 15th December 2016 (GV. NRW. S. 1154), Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund), has issued the following Programme Examination Regulations:

Table of Contents

I. Preamble	3
II. General Regulations.....	4
§ 1 Scope of Application of the Course Programme Examination Regulations, General Examination Regulations	4
§ 2 Objective of the Course Programme, Master’s Degree.....	4
§ 3 Modular Structure and Credit Point System	5
§ 4 Entry requirements.....	5
§ 5 Student Advisory Services.....	6
§ 6 Start of Study, Normal Course Duration	6
§ 7 Examination Board	7
§ 8 Examiners, Observers.....	7
§ 9 Transfer of Credits and Recognition of Examination Results.....	7
§ 10 Assessment of Examinations	7
§ 11 Retaking Examinations, Compensation.....	7
§ 12 Absence, Withdrawal, Fraudulent Behaviour, Breach of Regulations	8
§ 13 Invalidity of Examinations	8
§ 14 Inspection of Examination Papers.....	8
§ 15 Appeal Procedure.....	8
§ 16 Retention Periods for Examination Documents	8
III. Mentoring, Student Monitoring, Modules Requiring Intensive Support.....	8
IV. Special Programme Contents	8
§ 17 Key Qualifications.....	8
§ 18 Semesters Abroad, Work Placement in Germany and Abroad, Practical Semesters.....	8

V. Examination Elements of the Module Examinations	9
§ 19 Objective and Form.....	9
§ 20 Admission to the Module Examinations	9
§ 21 Conduct of Examinations	10
§ 22 Written Examinations	10
§ 23 Project-related Work	10
§ 24 Oral Examinations	10
§ 25 Assignment Papers and Seminar Presentations.....	10
§ 26 Bonus Points for Work during the Course of a Semester	10
VI. Thesis and Colloquium	10
§ 27 Thesis	10
§ 28 Admission to the Thesis	11
§ 29 Issue of and Work on the Thesis	11
§ 30 Submission of the Thesis	12
§ 31 Colloquium.....	12
§ 32 Assessment of the Thesis and the Colloquium	12
VII. Master Examination, Certificates, Records	12
§ 33 Results of the Master Examination	12
§ 34 Certificate, Overall Grade, Diploma Supplement, Transcript of Records.....	13
§ 35 Additional Modules	13
§ 36 Master's Certificate.....	13
VIII. Final Provisions	13
§ 37 Entry into Force and Publication	13
Attachment 1: Modules	15
Attachment 2: Catalogue of Compulsory Elective Modules.....	16
Attachment 3: Expert Committee Admission Procedure	17

I. Preamble

The master study course Embedded Systems for Mechatronics leads to a degree which qualifies individuals both in the field of scientific research as well as in areas of professional practice. They are being prepared for technical careers but also for senior management assignments in technical projects. Furthermore, a subsequent career in academic research is also an option. The programme is intended to provide students with the required technical knowledge, skills and methods. In order to meet the requirements and changes in the professional world, the contents of the individual modules are taught in an application-oriented manner, based on research findings. Students are thus enabled to analyse processes and problems met in practice and to work out professional solutions while recognizing the wider implications of their actions. Furthermore, students are enabled to participate in the academic debate within their area of expertise. Apart from acquiring technical and methodical competence, students are encouraged to develop their personal and social skills. Students acquire professional skills and are able to act responsibly. International competences are promoted by studies abroad, in particular at the partner universities during the optional third semester abroad.

The master programme Embedded Systems for Mechatronics enables students to develop their distinctive profile within the scope of their main focus areas while simultaneously completing the compulsory courses of the first and second semester. In particular through the subject range offered by the Ruhr Master School (RMS), the compulsory elective modules are integrated in a cross-university network. The RMS aims at creating a joint master programme offered by universities in the Ruhr Area in the technical disciplines to provide a special offer of master programmes with a comprehensive research curriculum. This offer is completed by international, project-oriented components and summer schools as well as symposia. The RMS also allows students of the participating universities a simplified transition from the bachelor programmes to the joint master programmes. The RMS strives to facilitate the positioning of the master programmes by transferring the latest research findings into practical applications and ensuring the universities' contribution to the transition of the Ruhr Area to a high-tech location.

The language of instruction is English.

The master course programme Embedded Systems for Mechatronics was developed and organised by the Faculties of Information Technology and Electrical Engineering (now: the Faculty of Electrical Engineering and the Faculty of Information Engineering), and The Faculty of Computer Science. The Faculty of Computer Science assumes the responsibility for the organization and delivery of the course programme.

Gender equality is observed in the design and structure of the course programme and its contents.

II. General Regulations

§ 1

Scope of Application of the Course Programme Examination Regulations, General Examination Regulations

- (1) The following Programme Examination Regulations (PER) apply to the master course programme Embedded Systems for Mechatronics of the Faculty of Computer Science of Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund). They govern the master's examination in these course programmes according to § 64 sub 2 of the North-Rhine Westphalian University Act (HG NRW) in conjunction with the General Examination Regulations of Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund) of 20th August 2013 (Official Announcements – Public Journal – of Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund), volume 34, no. 78 of 23-08-2013) of the relevant issue.
- (2) These PER specify the General Examination Regulations – hereafter referred to as GER – for the master course programme Embedded Systems for Mechatronics. They specify complementary as well as alternative regulations which do not contradict the General Examination Regulations.

§ 2

Objective of the Course Programme, Master's Degree

[with reference to § 2 of the General Examination Regulations - GER (RahmenPO)]

- (1) The course of studies leading to the master's examination, taking into consideration the general aims of study courses (§ 58 HG), includes in particular the application-related contents of the curriculum on the basis of scientific findings, and is designed to enable students to independently analyse problems using scientific methods and to apply these according to engineering methods while observing aspects relevant to society in general. The course of studies is designed to develop the inventive and creative skills of the students and to prepare them for the master's examination.
- (2) Students complete their course of studies with the master's examination. The master's examination serves to determine whether the students have acquired the advanced professional expertise as well as the methodological and key skills required in order to work independently in their profession, and whether they are able to work independently in an entrepreneurial context on the basis of scientific findings and methods.
- (3) If the master's Examination has been passed, Dortmund University of Applied Sciences and Arts, Fachhochschule Dortmund, awards the degree Master of Engineering (M.Eng.).
- (4) For the rest, § 2 of the General Examination Regulations applies.

§ 3

Modular Structure and Credit Point System

[with reference to § 3 GER (RahmenPO)]

- (1) The workload for the course of studies amounts to a total of 3,600 hours (900 hours per semester), including time for the master's thesis. Accordingly, 30 hours of study equal one credit point. From the total, 48 weekly hours per semester (Semesterwochenstunden, SWS, 1 SWS = 45 mins.) are allotted to attendance at lecture sessions. Based on these examination regulations, the course of studies is organized in such a way that it allows for completion within the standard course duration (Regelstudienzeit, RSZ).
- (2) To successfully complete the course of studies, a total of 120 credit points according to the European Credit Transfer and Accumulation System (ECTS) must be obtained.
- (3) The modules of the master course programme Embedded Systems for Mechatronics, including its number of hours per week and their distribution over the semesters, are specified in detail in **Attachments 1 and 2**. The descriptions of the modules and lectures are listed in the current version of the module handbook of the master course programme Embedded Systems for Mechatronics.
- (4) Provided they meet the entry requirements and within the scope of the defined intake capacity limits, students in RMS master course programmes can complete compulsory elective modules as cross-registered students at the participating universities by sitting an examination. The number of corresponding credit points obtained in the compulsory elective modules, outside the primary course programme, may amount to up to 12 credit points. The participating universities define the cross-university offer of the compulsory elective modules for each course programme in a catalogue which is published on the RMS website.
- (5) No claims can be asserted with regard to the realization of the complete spectrum of the planned compulsory elective modules. Nor is there any guarantee that these lectures will be held if the number of participants is insufficient. The catalogues of lectures offered will be published before the start of the lecture period of each semester.
- (6) For the rest, § 3 of the General Examination Regulations applies.

§ 4

Entry requirements

[with reference to § 4 GER (RahmenPO)]

- (1) Requirements before commencing the course of studies are
 1. the completion of a "Diplom" or bachelor course of study of Information Technology, Electrical Engineering or (Technical) Computer Science at a university of applied sciences (Fachhochschule) or a university, or the completion of a corresponding accredited bachelor qualification programme at a university of cooperative education (Berufsakademie) with an overall grade of at least "good" (2.5). The qualifying degree course of study must have included instruction in the relevant competences in the areas of Embedded Systems and Software Engineering equalling the required

amount at the required level (cf. Attachment 3).

and

2. evidence of sufficient English skills provided by a TOEFL-ITP test with at least 550 points or a TOEFL-iBT test amounting to a minimum of 90 points passed within the two years before the application was submitted. The evidence may also be provided by other test methods equivalent to the TOEFL test in accordance with the European Framework of Reference (e.g. IELTS with at least 6.5 points). In exceptional cases the evidence can be submitted by means of an equivalent certificate or test results demonstrating the relevant minimum requirements (equivalent to C1 of the Common European Framework of Reference for Languages (CEFR)). The Expert Committee decides whether equivalence is demonstrated. Course programmes completed at foreign universities as defined under 1 must also include a final thesis comparable to theses from course programmes at German universities with regard to the minimum quality requirements.

In addition, the courses of study as defined in 1 must amount to a minimum of 180 credit points of the European Credit Transfer and Accumulation System (ECTS). Degrees obtained outside the ECTS-System must be converted into the ECTS system.

- (2) The Examination Board of the master course Embedded Systems for Mechatronics elects a joint Expert Committee to verify whether a course of studies can be defined as relevant according to § 4 subsection 1 no. 1. If there is doubt regarding the comparability of the final thesis in terms of sub. 1 no. 2, the Expert Committee decides. It can request further documents for a review.
- (3) The Expert Committee consists of the professors and academic staff of the Examination Board as elected under § 7.
- (4) The Expert Committee discusses and decides in closed meetings. It has a quorum if at least three members are present.
- (5) For the rest, § 4 of the General Examination Regulations applies.

§ 5

Student Advisory Services

§ 5 of the General Examination Regulations applies.

§ 6

Start of Study, Normal Course Duration

[with reference to § 1 subsection 2 clause 2 no. 2 GER (RahmenPO)]

- (1) Students start the master course Embedded Systems for Mechatronics in the winter semester.
- (2) The normal course duration, including all examinations, is four semesters.

§ 7**Examination Board**

[with reference to § 6 GER (RahmenPO)]

- (1) The Examination Board for the master course Embedded Systems for Mechatronics of the Faculty of Computer Science is responsible for the organization of the examinations and any further tasks following from these Examination Regulations or from the General Examination Regulations.

The examination board comprises

1. A professor acting as the chair;
 2. A professor acting as deputy;
 3. Two further persons from the circle of professors;
 4. A member of the academic staff (§ 11 sub. 1 No. 2 HG);
 5. One student.
- (2) For the rest, § 6 of the General Examination Regulations applies.

§ 8**Examiners, Observers**

§ 7 of the General Examination Regulations applies.

§ 9**Transfer of Credits and Recognition of Examination Results**

§ 8 of the General Examination Regulations applies.

§ 10**Assessment of Examinations**

§ 9 of the General Examination Regulations applies.

§ 11**Retaking Examinations, Compensation**

[with reference to § 10 GER (RahmenPO)]

- (1) If a module examination in the compulsory elective modules is finally graded “inadequate”, this may be compensated by passing another module examination from the catalogue of compulsory elective modules. This compensation is only possible once.
- (2) For the rest, § 10 of the General Examination Regulations applies.

§ 12**Absence, Withdrawal, Fraudulent Behaviour, Breach of Regulations**

§ 11 of the General Examination Regulations applies.

§ 13**Invalidity of Examinations**

§ 12 of the General Examination Regulations applies.

§ 14**Inspection of Examination Papers**

§ 13 of the General Examination Regulations applies.

§ 15**Appeal Procedure**

§ 14 of the General Examination Regulations applies.

§ 16**Retention Periods for Examination Documents**

§ 15 of the General Examination Regulations applies.

III. Mentoring, Student Monitoring, Modules Requiring Intensive Support

Section II General Examination Regulations (§§ 16 and 17) does not apply.

IV. Special Programme Contents**§ 17****Key Qualifications**

[with reference to § 18 GER (RahmenPO)]

§ 18 of the General Examination Regulations does not apply.

§ 18**Semesters Abroad, Work Placement in Germany and Abroad, Practical Semesters**

§ 19 of the General Examination Regulations does not apply.

V. Examination Elements of the Module Examinations

§ 19

Objective and Form

[with reference to § 20 GER (RahmenPO)]

- (1) Module examinations are held in the modules as laid down in **Attachments 1 and 2**.
- (2) Admissible forms of examination are written examinations (§ 23) lasting no more than four clock hours, oral examinations (§ 25) lasting no more than 45 minutes per candidate, assignment papers and seminar presentations (§26), or project related work with documentation and presentation with an oral examination lasting approximately 20 minutes. (§ 24). The project related work must be submitted before the oral examination.
- (3) The module MP13 Research Project (Thesis) must be executed in the form of a research and development project, either individually or as a team effort. The project must be carried out at a university or research institution or as a company project. Alternative project forms must be approved by the examination board. The research project comprises a project thesis and a final presentation.
- (4) For the rest, § 20 of the General Examination Regulations applies.

§ 20

Admission to the Module Examinations

[with reference to § 21 GER (RahmenPO)]

- (1) Admission to a module examination is only granted to persons who
 1. are enrolled in the master course programme Embedded Systems for Mechatronics at Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund), or who are admitted as cross-registered students and who are not on leave. Regarding students on leave, § 21 sub. 1 clause 1 no. 1 GER applies;
 2. have made fewer than three valid attempts at an examination in the same or a comparable module or partial module in a master course programme Embedded Systems for Mechatronics, or in a course programme closely related to the master course programme Embedded Systems for Mechatronics.
- (2) Admission must be denied if
 - a) the prerequisites stated in subsection 1 are not met or
 - b) the candidate has failed the same or a comparable examination in Germany in the master course programme Embedded Systems for Mechatronics or in a course programme closely related to the master course programme Embedded Systems for Mechatronics or has definitively failed the master's Examination in a master course programme Embedded Systems for Mechatronics.
- (3) Via the "Online Services for Students (ODS) – Registration for Examinations and Withdrawals", the student can withdraw from module or partial module examinations until

one week before the examination date at the latest without this examination then counting towards the possible attempts at the examination.

§ 21

Conduct of Examinations

§ 22 of the General Examination Regulations applies.

§ 22

Written Examinations

§ 23 of the General Examination Regulations applies.

§ 23

Project-related Work

§ 24 of the General Examination Regulations applies.

§ 24

Oral Examinations

§ 25 of the General Examination Regulations applies.

§ 25

Assignment Papers and Seminar Presentations

§ 26 of the General Examination Regulations applies.

§ 26

Bonus Points for Work during the Course of a Semester

§ 27 of the General Examination Regulations does not apply.

VI. Thesis and Colloquium

§ 27

Thesis

[with reference to § 28 GER (RahmenPO)]

- (1) The thesis is a written work of scientific research in the field of Embedded Systems. It serves to document that the candidate is capable of independently applying scientific and practical techniques to the processing of challenging tasks taken from his area of

specialization, including their specialized technical details as well as their wider implications.

- (2) As a rule, the application for admission to the thesis should take place before the end of the third semester.
- (3) For the rest, § 28 of the General Examination Regulations applies.

§ 28

Admission to the Thesis

[with reference to § 29 GER (RahmenPO)]

- (1) Candidates are admitted to the thesis provided they
 1. meet the requirements of the module examinations according to § 20 sub. 1;
 2. have passed all module examinations according to **Attachment 1** but for one compulsory module and one compulsory elective module respectively.
- (2) The application must include the following documents unless these have already been provided:
 1. documents confirming the admission requirements according to subsection 1;
 2. a declaration whether the candidate has previously not passed, or has definitively not passed, a final thesis or the master examination in a master course programme Embedded Systems for Mechatronics.
- (3) Admission must be denied if
 - a) the requirements according to subsection 1 are not met, or
 - b) the documents according to subsection 2 are incomplete, or
 - c) in a master course programme Embedded Systems for Mechatronics in Germany a corresponding final thesis of the candidate, taking into account the possibility to retake the examination, has been graded “inadequate” (5.0), or the candidate has definitively not passed the master examination.
- (4) For the rest, § 29 of the General Examination Regulations applies.

§ 29

Issue of and Work on the Thesis

[with reference to § 30 GER (RahmenPO)]

- (1) The time allocated to the writing of the thesis is a single, full time period of five months.
- (2) For the rest, § 30 of the General Examination Regulations applies.

§ 30**Submission of the Thesis**

[with reference to § 31 GER (RahmenPO)]

- (1) Three copies of the final thesis must be submitted to the Examination Board within the time limit. The full texts of the online sources used in the thesis as well as the text of the thesis itself must be submitted stored on a standard storage device together with the printed version of the thesis. The electronic transfer is inadmissible for the submission of the thesis within the time limit.
- (2) In order to further the students' competence to reflect on their work, an abstract of the key contents and results of the thesis must be provided. If possible, the abstract should not exceed one DIN A4 page and present the approach and the result in abstract form. It must be submitted in English, together with the thesis.
- (3) For the rest, § 31 of the General Examination Regulations applies.

§ 31**Colloquium**

[with reference to § 32 GER (RahmenPO)]

- (1) The colloquium supplements the thesis and both are assessed as a single examination.
- (2) The colloquium lasts approximately 60 minutes and consists of a 30-minute presentation followed by an oral examination of 30 minutes.
- (3) For the rest, § 32 of the General Examination Regulations applies.

§ 32**Assessment of the Thesis and the Colloquium**

[with reference to § 33 GER (RahmenPO)]

- (1) The thesis and the colloquium are related examinations and must be assigned an overall grade by two examiners. One examiner must supervise the final thesis. The proportionate weighting is 90 % for the thesis and 10 % for the colloquium.
- (2) For the rest, § 33 of the General Examination Regulations applies.

VII. Master Examination, Certificates, Records**§ 33****Results of the Master Examination**

[with reference to § 34 GER (RahmenPO)]

- (1) A candidate has passed the master's examination when all prescribed module examinations and the thesis including the colloquium have been awarded a grade equal to or better than "pass" (4.0).

- (2) For the rest, § 34 of the General Examination Regulations applies.

§ 34

Certificate, Overall Grade, Diploma Supplement, Transcript of Records

[with reference to § 35 GER (RahmenPO)]

- (1) Candidates who have passed the master's examination, receive the results as a certificate, usually within four weeks of the last examination. The certificate contains information about the course, names of the modules and module grades, the topic of the thesis and the combined grades of the thesis and oral defence, as well as the final grade.
- (2) The final grade for the master's examination is calculated from the weighted arithmetic mean of the individual grades of the module examinations and the thesis including colloquium according to § 9 General Examination Regulations. The following weighting of the grades is applied:

Thesis and Colloquium25 %

Arithmetic mean of the grades achieved in the module examinations75 %

The weighting of the grades for the individual module examinations is in proportion with the ECTS-points allocated to the individual modules.

- (3) For the rest, § 35 of the General Examination Regulations applies.

§ 35

Additional Modules

§ 36 of the General Examination Regulations applies.

§ 36

Master's Certificate

[with reference to § 37 GER (RahmenPO)]

- (1) Candidates who have passed the master's examination receive a Master's Degree Certificate. It certifies that the master's degree (Master of Engineering, abbreviated M.Eng.) according to § 2 subsection 3 has been awarded.
- (2) For the rest, § 37 of the General Examination Regulations applies.

VIII. Final Provisions

§ 37

Entry into Force and Publication

- (1) These Examination Regulations enter into force on 1st April 2017. At the same time the Examination Regulations (PER/StgPO) for the Master Course Embedded Systems for

Mechatronics of the Faculties of Information Technology and Electrical Engineering of Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund) of 17th July 2014 (Official Announcements – Public Journal, of Fachhochschule Dortmund, 35th year's issue, no. 40, of 21st July 2014) and of 1st March 2016 (Official Announcements – Public Journal, of Fachhochschule Dortmund, 37th year's issue, no. 18 of 2nd March 2016), expire.

- (2) These Examination Regulations apply to all students entering their master course programme Embedded Systems for Mechatronics at Dortmund University of Applied Sciences (Fachhochschule Dortmund) from the winter semester 2017/2018 onward.
- (3) They also apply to students who have entered their studies in the master course programme Embedded Systems for Mechatronics at Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund) in accordance with §48 HG or as cross-registered students according to § 52 subsection 1 and 2 HG before the winter semester 2017/2018.
- (4) The modules “Control Theory and Systems (ME 1)” and “Signal Processing (ME 9)” are recognised automatically.
- (5) These examination regulations are published in the Official Announcements – Public Journal -- Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund).

Issued based on the resolutions of the Founding Dean of the Faculty of Information Engineering of 4th May 2017 in accordance with the North-Rhine Westphalian University Act (HG) § 26 subsection 1 and § 27, acting as Faculty Council and the Rectorate of Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund) of 16th May 2017.

Dortmund, 16th May, 2017

The Rector of Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund)

The Founding Dean of the Faculty of Information Engineering of Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund)

Prof. Dr. Schwick

Prof. Dr. Wißing

Attachment 1: Modules

Modules, module examinations and periods; student workload; credit points according to the European Credit Transfer and Accumulation System (ECTS)

1 st semester (winter semester)						
	module examination	mod-nr/ exam-nr	student workload			ECTS points
			contact hours		self-study (hrs)	
			SWS ¹	hours		
Mathematics for Signals & Controls	MOD1-01	10110/11	4	60	120	6
Distributed and Parallel Systems	MOD1-02	10120/21	4	60	120	6
Embedded Software Engineering	MOD1-03	10130/31	4	60	120	6
Requirements Engineering	MOD1-04	10140/41	4	60	120	6
Introduction to Embedded Systems Design	MOD1-05	10150/51	4	60	120	6
Total	5		20	300	600	30

2 nd semester (summer semester)						
	module examination	mod-nr/ exam-nr	student workload			ECTS points
			contact hours		self-study (hrs)	
			SWS ¹	hours		
Mechatronic Systems Engineering	MOD2-01	10210/11	4	60	120	6
Microelectronics & HW/SW Co-Design	MOD2-02	10220/21	4	60	120	6
R&D Project Management	MOD2-03	10230/31	4	60	120	6
Signals and Control Systems 1	MOD2-04	10240/41	4	60	120	6
Elective 1 *	MOD2-05	10250	4	60	120	6
Total	5		20	300	600	30

3 rd semester (winter semester)						
	module examination	mod-nr/ exam-nr	student workload			ECTS points
			contact hours		self-study (hrs)	
			SWS ¹	hours		
Elective 2 *	MOD3-01	10310	4	60	120	6
Elective 3 *	MOD3-02	10320	4	60	120	6
Research Project (Thesis)	MOD3-03	10330/31	0	0	540	18
Total	3		8	120	780	30

4 th semester (summer semester)						
	module examination	mod-nr/ exam-nr	student workload			ECTS points
			contact hours		self-study (hrs)	
			SWS ¹	hours		
Master Thesis and Colloquium	P	103	0	0	900	30
Total	5		20	300	600	30

¹ SWS= weekly hours per semester

*cf. Attachment 2

Attachment 2: Catalogue of Compulsory Elective Modules

Catalogue of Compulsory Module (Electives 1, 2 and 3)*						
Module	module examination	mod-nr/ exam-nr	student workload			ECTS-Punkte
			contact hours		self-study (hrs)	
			SWS ¹	hours		
Applied Embedded Systems	MOD-E01	10401	4	60	120	6
Biomedical Systems	MOD-E02	10402	4	60	120	6
SW Architectures for Embedded and Mechatronic Systems	MOD-E03	10403	4	60	120	6
Signals and Systems for Automated Driving ***	MOD-E04	10404	4	60	120	6
Internet of Things	MOD-E05	10405	4	60	120	6
Computer Vision ***	MOD-E06	10406	4	60	120	6
Signals & Control Systems 2 ***	MOD-E07	10407	4	60	120	6
Formal Methods in Mechatronics	MOD-E08	10408	4	60	120	6
System on Chip Design	MOD-E09	10409	4	60	120	6
Automotive Systems	MOD-E10	10410	4	60	120	6
Research Seminar	S	10411			180	6
Module(s) from cooperating institutions		10421				
Module(s) from study courses of the home institution**		10431				

* From the Catalogue of Compulsory Electives a minimum of 3 modules must be completed with an examination (MOD2-05, MOD3-01 and MOD3-02). More than 18 credit points may be obtained which will be marked as additional module examinations in the certificate.

** If compulsory elective modules of the Ruhr Master School (RMS) are part of the course programmes of Dortmund University of Applied Sciences and Arts (Fachhochschule Dortmund), students must complete the examinations within their own course programme.

Upon application, modules of the course programmes participating in the RMS may be elected.

*** At least 1 of the following Modules must be taken as an Elective: MOD-E04, MOD-E06, or MOD-E07.

Attachment 3: Expert Committee Admission Procedure

The Competence-Profile is regularly evaluated and adapted by the Expert Committee (Fachausschuss) prior to the beginning of the application period. With regard to the application for the respective winter semester, the following fields of competence are relevant:

- Software Engineering (such as Modelling Techniques, Modern Programming Languages, Software Architectures)
- Control Systems (such as Control Theory, Modelling, Higher Mathematics, not relevant are: SPS-Programming, Automation)
- Signal Processing (such as Model-driven Development, Filters, Integral Transformation)
- Systems Engineering (processes such as INCOSE, Modelling, Requirements Engineering)

The competences are classified in 5 levels:

Stufe	Software Engineering	Control Engineering	Signal Processing	Systems Engineering
	A	B	C	D
1	uC-Programming, Structured programming languages (C, VB), Scripting languages, (min. 18 ECTS)	Controller design (PID etc.), PLC programming (not relevant), (min. 18 ECTS)	Signal Analysis (Time Domain, Frequency Domains), (min. 18 ECTS)	R&D Project Management, Domain knowledge, (min. 18 ECTS)
2	OOP (e.g. C++, Java), operating systems, RTOS, (min. 30 ECTS)	Mathematics for Control Systems (Laplace, Differential Equations), Linear Systems, (min. 30 ECTS)	Mathematics for Signal Processing, Filters (e.g. simple first order filters), (min. 30 ECTS)	Processes for Mechatronics Design, HW/SW Codesign, (min. 30 ECTS)
3	Modelling (UML), SW architectures, SW platforms (e.g. Java platform), (min. 30 ECTS)	Systems Modelling, Model-Based Controller Design, Matlab/Simulink, (min. 30 ECTS)	Digital Filters, Model Based Design, Matlab/Simulink, (min. 30 ECTS)	Systems Modelling, e.g. sysML, System Verilog, (min. 30 ECTS)
4	SW engineering, DSLs, model driven design, (min. 48 ECTS)	Control Theory, Non-Linear Systems, Digital Control, (min. 48 ECTS)	Signal Theory, Higher Order Filters, Digital Signal Processing, (min. 48 ECTS)	Model Based Systems Engineering (MBSE), Requirements Engineering (RE), (min. 36 ECTS)
5	SW engineering for large SW systems, SW quality & test, distributed systems, (min. 48 ECTS)	State Space, Stochastic/Fuzzy Control, Advanced Robotics, MPC, (min. 48 ECTS)	Wave Digital Filters, Image Processing, (min. 48 ECTS)	Modelling Frameworks, Traceability, (min. 36 ECTS)

Explanation:

The levels build on one another. It is assumed that once a levels' content has been processed, the competences of the lower level have been acquired. Level 5 is informational.

Decision Matrix - minimum requirements:

For the qualifying bachelor degrees' relevance the following combination of minimum requirements is necessary:

A3 and C2 and B4 and D4

A2 and C3 and B4 and D4

A4 and C2 and B4

A4 and C2 and D4

A2 and C4 and B4

A2 and C4 and D4

A4 and C3 and B3

A4 and C3 and D3

A3 and C4 and B3

A3 and C4 and D3

A3 and C3 and B4

A3 and C3 and D4