These degree programme and examination regulations have been worded carefully to be up to date; however, errors cannot be completely excluded. The official German text available at the Examinations Office is the version that is legally binding.

Note: Students who started their studies before the latest amendment came into effect are requested to also comply with previous amendments and the respective transitory provisions.

Degree Programme and Examination Regulations for Bachelor's and Master's Degree Programmes in Medical Engineering at Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU)
– FPOMT –
Dated 15 September 2009

amended by statutes of
30 October 2009
4 March 2010
09 March 2011
05 August 2011
24 February 2012
31 July 2012
18 February 2013
18 February 2014
28 August 2018
10 July 2019

Based on Section 13 (1)(2), Section 43 (5)(2), Section 58 (1) and Section 61 (2)(1) of the Bavarian Higher Education Act (Bayerisches Hochschulgesetz, BayHSchG), FAU enacts the following Degree Programme and Examination Regulations:

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Part I: General Provisions

Section 35 Scope

[1]These degree programme and examination regulations govern studies and examinations for the Bachelor's and consecutive Master's degree programmes in Medical Engineering leading to a Bachelor of Science or Master of Science degree. [2]They complement the current version of the General Examination Regulations for the Bachelor's and Master's Degree Programmes of the Faculty of Engineering at FAU (**ABMPO/TechFak**).

Section 36 Bachelor's Degree Programme, Teaching and Examination Language

(1) [1]The degree programme consists of compulsory modules from module groups B1 to B4, core modules from module group B5 or B6 depending on the specialisation chosen by the student, specialisation modules from module group B8, key qualifications from module group B7, and the Bachelor's thesis module (B9). [2]It includes ten weeks' vocational practice (up to four of which may be spent in a healthcare institution) to be carried out in the course of the degree programme according to internship guidelines. [3]Students choose a specialisation made up from core and specialisation modules from module groups B5 and B8 or B6 and B8 which complement each other with regard to content. [4]The modules and recommended programme structure can be found in **Appendix 1**. [5]The fifth or sixth semester is the most suitable for spending a semester abroad.

(2) [1]One of the following specialisations must be chosen when studying the Bachelor's degree programme in Medical Engineering:

1. Medical electronics and medical image and data processing (electrical engineering/information technology/computer science)
2. Medical device engineering, production technology and prosthetics (mechanical engineering/materials science and engineering/chemical and biological engineering).

[2]The specialisation shall be chosen by registering for the first examination in a module for that specific specialisation from module groups B5, B6 or B8. [3]Once the specialisation is chosen, the core modules of module group B5 have to be taken for the 'Medical electronics and medical image and data processing' specialisation and the core modules of module group B6 for the 'Medical device engineering, production technology and prosthetics' specialisation, in accordance with the prescribed compulsory elective

options. [4]A change of specialisation shall only be permitted in justified, exceptional cases if a written request is submitted to and approved by the Examinations Committee. [5]The module catalogue for the specialisations (core modules specific to the specialisation B5 or B6 worth 40 ECTS credits and corresponding elective specialisation modules B8 worth 17.5 ECTS credits) may be added to by the Examinations Committee; the catalogue and any changes shall be published on the degree programme website.

Section 37 Master's Degree Programme, Standard Duration of Studies, Teaching and Examination Language

(1) [1]The Master's degree programme in Medical Engineering consists of medical specialisation modules from module group M1, core modules specific to the chosen specialisation from module groups M2 and M3, the 'Advanced seminar: Medical engineering' module (M4), specialisation modules specific to the chosen specialisation from module group M5, practical medical engineering modules from module group M6, elective modules from module groups M7 and M8 and the Master's thesis module (M9). [2]Module group M6 includes an academic laboratory course and a research laboratory course. [3]Students shall choose a specialisation made up of modules from the module groups M2, M3 and M5. [4]The specialisation shall be chosen by registering for the first examination in a module for that specific specialisation from module groups M2, M3 or M5. [5]A change of specialisation shall only be permitted in justified, exceptional cases if a written request is submitted to the Examinations Committee. [6]The module catalogue for specialisations (M2, M3, M5) and the common module catalogue (M1, M4, M6, M7) can be added to by the Examinations Committee. Any changes shall be published on the degree programme's website.

(2) [1]The Master's degree programme in Medical Engineering may be started in the winter semester or in the summer semester. [2]Sentence 1 notwithstanding, the specialisation 'Health & medical data analytics and entrepreneurship (hereinafter 'HMDA') can only be chosen if students start to study in the winter semester pursuant to Section 43 (1)(2)(4).

(3) [1]Notwithstanding Section 4 (5) **ABMPO/TechFak**, the teaching and examination language in the Master's degree programme in Medical Engineering is English if students choose the specialisation 'Medical image and data processing' (see Section 43 (1)(2)(1)). Individual classes and examinations in the free electives or compulsory electives may be in German. [2]Notwithstanding Section 4 (5) **ABMPO/TechFak**, the teaching and examination language throughout the course is English if students choose the specialisation 'HDMA' (see Section 43 (1)(2)(4)). [3]In the cases stated in sentences 1 and 2, the Master's thesis shall as a rule be written in English. [4]Exceptions shall require the Examination Committee's approval.

Part II: Special Provisions

1. Bachelor's Degree Programme

Section 38 Scope of the Grundlagen- und Orientierungsprüfung

The preliminary examination (Grundlagen- und Orientierungsprüfung, GOP) pursuant to Section 3 (1)(1) and Section 25 **ABMPO/TechFak** shall have been passed if at least one module from each of the module groups B2 to B4 has been passed in the first year

of study (first and second semesters) and modules worth a total of 30 ECTS credits have been passed.

Section 39 Scope and Structure of the Bachelor's Examination

(1) [1]The Bachelor's examination comprises the examinations in the modules from module groups B1 to B9 listed in **Appendix 1**, whereby module group B5 only has to be taken by students who have chosen the specialisation 'Medical electronics and medical image and data processing' and module group B6 only has to be taken by students who have chosen the specialisation 'Medical device technology, production technology and prosthetics'. [2]The ECTS credits allocated to each module and the type and scope of the examinations are stipulated in **Appendix 1**.

(2) The Bachelor's examination shall have been passed if all modules specified in paragraph 1 have been passed.

Section 39a Compulsory Elective Modules in the Bachelor's Degree Programme

(1) [1]Firstly, the specialisation modules in module group B8 are intended to allow students to explore one or several areas in more depth ('fundamentals relevant to both specialisations' or relating to the chosen specialisation 'specialisation modules for medical electronics and medical image and data processing' or 'specialisation modules for medical device technology, production technology and prosthetics'). [2]Secondly, these modules also have theoretical and application-oriented learning outcomes, training students to take an interdisciplinary approach and deepen their knowledge of their subject. [3]Thirdly, the element of choice gives students the opportunity to create their own particular profile in view of their future career.

(2) [1]The type and scope of examinations in specialisation module B8 depend on the skills taught in the respective module accounting for 5 and 7.5 ECTS credits respectively, or, if so chosen by the student, 2.5 ECTS credits pursuant to paragraph 1 and the module handbook. [2]Possible examination achievements are: written examination (60, 90 or 120 mins) or oral examination (30 mins). [3]The module handbook is published before the beginning of the semester in accordance with local practice.

(3) [1]Compulsory elective modules amounting to 5 ECTS credits usually consist of a lecture (2 semester hours (SWS)) and a tutorial (2 SWS) or a lecture (3 SWS) and a tutorial (1 SWS). [2]Any exceptions are detailed in the module handbook.

Section 40 Bachelor's Thesis

(1) [1]The Bachelor's thesis is intended to enable students to learn to solve problems relating to medical engineering independently. [2]Requirements for the thesis shall be such that it can completed with a workload of approximately 300 hours. [3]10 ECTS credits shall be awarded for the Bachelor's thesis. A further 2.5 ECTS credits are awarded for an accompanying advanced seminar.

(2) [1]The topic of the Bachelor's thesis is issued by a member of the Faculty of Engineering involved in the compulsory, core or specialisation modules (with the exception of module B7.2, module groups M6 and M7 and module M8) of the Bachelor's or Master's degree programme in Medical Engineering (university lecturer responsible). [2]Any exceptions to this rule are only possible by submitting a prior written request in each

instance to the chairperson of the Degree Programme Committee. [3]The university lecturer responsible and/or a research assistant employed at the same Chair shall provide supervision together with at least one member of Universitätsklinikum Erlangen or a comparable institution.

(3) [1]The Bachelor's thesis shall be written in German or English. [2]The thesis shall deal with a scientific subject from the field of medical engineering. [3]The results of the Bachelor's thesis shall be introduced in a presentation followed by a discussion; this part of the examination shall not be graded. [4]The date of the presentation shall be determined by the university lecturer responsible either after the student has submitted their Bachelor's thesis or during the final stage of thesis work. [5]The date shall usually be within four weeks of the date on which the thesis was submitted; students shall be notified of the date at least two weeks in advance.

Section 41 Determining Interim Grades for Module Groups, Overall Grade

[1]An interim grade shall be calculated for each of the module groups B5 or B6, and B8; the individual module grades shall be weighted with a factor corresponding to their ECTS credits. [2]The interim grade of the module group B5 or B6 shall be weighted with 40 ECTS credits and the interim grade of the specialisation modules (module group B8) shall be weighted with 17.5 ECTS credits in the calculation of the overall grade.

2. Master's Degree Programme

Section 42 Qualification for a Master's Degree, Certificates and Admission Requirements

(1) [1]A subject-specific degree within the meaning of Section 29 (1)(1) **ABMPO/TechFak** shall be a Bachelor's degree in medical engineering that is equivalent to studies according to these examination regulations. [2]In accordance with paragraph 5 (4) of the **Appendix to ABMPO/TechFak,** applicants with a subject-related degree or an equivalent degree within the meaning of Section 29 (1)(1) **ABMPO/TechFak** (in particular in an engineering subject such as (bio)medical engineering, electrical engineering, mechanical engineering and computer science) shall only be admitted to the Master's degree programme after passing an oral admission examination pursuant to paragraph 4.

(2) [1]Applicants shall be required to submit a listing of their qualifications obtained to date in the areas of mathematics, electrical engineering and computer science. This is classed as an additional document within the meaning of **Appendix 1 (2)(4) ABMPO/TechFak** and is required for the purpose of checking their documents. [2]In addition, proof of English language skills equivalent to at least Level B2 of the Common European Framework of Reference (CEFR) shall be provided by submitting either relevant school reports or certificates issued by a language school or university. [3]Proof of language skills can in particular be provided by submitting a school leaving certificate or a certificate issued by the school providing evidence that English lessons up to a level equivalent to B2 CEFR have been taken at school or evidence of having successfully completed the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) at level B2 or above (please refer to the table of equivalence published by the FAU Language Centre). [4]Proof of language proficiency does not need to be submitted if the applicant acquired their university entrance qualification or relevant undergraduate degree in English.

(3) An applicant shall be considered qualified for the Master's degree programme in Medical Engineering according to **Appendix 1**, Section 5(2)(2) **ABMPO/TechFak** if at least four of the modules from module groups B5 or B6 of the Bachelor's degree programme pursuant to these examination regulations or equivalent modules from other universities with their average grade for all modules weighted according to their ECTS credits have been passed with a minimum grade of 3.0 or better.

(4) In the oral admission examination according to **Appendix 1** Section 5(3) et seq. **ABMPO/TechFak**, applicants shall be evaluated with regard to the following criteria and according to the following weighting:

1. Solid knowledge of the foundations of the subject (mathematics, physics, algorithms) (30 percent)
2. Good knowledge of a field of specialisation in medical image and data processing, medical electronics or medical device engineering, production technology and prosthetics corresponding to an eligible specialisation in the Master's degree programme; the applicant shall choose the specialisation to be discussed during the interview (25 %)
3. Description of a relevant subject-related project, knowledge of the relevant literature (25 %)
4. A positive prognosis demonstrated by the applicant's academic progress in fundamental engineering-related subjects to date (in particular mathematics, electrical engineering and computer science); discussion based on graduation documents relating to the applicant's previous degree (in particular the transcript of records) (20 %).

Section 43 Scope and Structure of the Master's Examination

(1) [1]Master's students shall choose a specialisation in order to establish a subject-specific profile. [2]The following specialisations are possible:

1. Medical image and data processing (IDP) or the German version Medizinische Bild- und Datenverabeitung (BDV):
   This specialisation prepares students for a career in improving and developing imaging processes for medical diagnosis and treatment as well as data processing within a medical context.
2. Medical electronics (MEL):
   This specialisation prepares students for a career in
   medical applications of sensor technology, communication electronics and photonics.
3. Medical device engineering, production technology and prosthetics (GPP):
   This specialisation gives students the necessary knowledge for developing and using innovative materials, for example for use in implants and prostheses, as well as developing surgical robots and assistance systems.
4. Health & medical data analytics and entrepreneurship (HMDA):
   The specialisation combines the study of medical image and data processing with comprehensive training in entrepreneurship.

(2) [1]The Master's degree programme contains the module groups listed in **Appendix 2**. [2]More details on compulsory elective modules and elective options in general are stipulated in the following paragraphs and Section 44a.

(3) [1]The module group M6 'Practical medical engineering modules' consists of an academic laboratory course ('Hochschulpraktikum') and a research laboratory course

('Forschungspraktikum'). [2]For the academic laboratory course, students must select one or more practical units worth a total of 5 ECTS credits from those offered by the Faculty of Engineering. [3]The research laboratory course must be completed at a chair of the Faculty of Engineering and shall account for 5 ECTS credits. [4]The academic laboratory course and the research laboratory course may be completed at other faculties provided a request is filed with and approved by the chairperson of the Degree Programme Committee. [5]The Degree Programme Committee's chairperson may upon application agree to other ungraded elective modules from the course catalogue of the Faculty of Engineering worth 5 ECTS credits being submitted in place of the research laboratory course.

(4) Furthermore, within the framework of the module group M7, students shall complete elective modules amounting to 10 ECTS credits from the modules offered by the Faculty of Engineering or from the joint catalogue of (compulsory) elective modules for all specialisations ('basic curriculum'). The (compulsory) elective modules for all specialisations ('basic curriculum') are published on the degree programme website.

(5) [1]Within the context of module M8, one elective module worth 5 ECTS credits has to be chosen from the range of modules offered across the University. [2]Alternatively, two modules worth 2.5 ECTS credits each can be chosen. [3]In this case, both modules will be weighted equally when determining the module grade.

Section 44 Master's Degree Examinations

[1]Type and scope of the course and examination achievements are set out in **Appendix 2**. [2]For individual modules that may be chosen from other degree programmes as part of the flexible budget applicable in the Faculty of Engineering and as part of the 'Free Choice Uni' for module group M7 and module M8, the type, length and scope of the examinations can be found in the applicable **degree programme and examination regulations.**

Section 44a Learning Outcomes and Examinations in Compulsory Elective Modules

(1) [1]The learning outcome of compulsory elective module group M1 (medical specialisation) is to allow students to acquire a fundamental knowledge of medicine and specialise further in the area of medical applications. [2]For specialisation HMDA, in addition to sentence 1, fundamental knowledge of medicine shall be taught at all times in combination with training in entrepreneurship.

(2) The learning outcome of compulsory elective module M2 (engineering core modules) is to allow students to acquire advanced core engineering skills according to the specialisation they have chosen and to create a particular engineering profile suited to their future career thanks to the various options open to them.

(3) The learning outcome of compulsory elective module group M3 (medical engineering core modules) is to allow students to acquire advanced core skills in medical engineering according to the specialisation they have chosen and to create a particular engineering profile suited to their future career thanks to the various options open to them.

(4) [1]The learning outcome of the advanced seminar in medical engineering M4 is to allow students to gain more advanced knowledge in an individual specialised medical

engineering topic. [2]In addition, modules also have theoretical and application-oriented learning outcomes, training students to take an interdisciplinary approach and deepen their knowledge of their subject.

(5) The learning outcome of compulsory elective module group M5 (medical engineering specialisation modules) is to allow students to gain more specialist knowledge in one specific area of medical engineering according to the specialisation they have chosen. The element of choice gives students the opportunity to create their own specialisation profile in view of their future career in medical engineering.

(6) The module group M6 (practical medical engineering modules) pursues practical and research-based learning outcomes allowing students to extend their practical skills in engineering disciplines within the framework of two modules (academic laboratory course and research laboratory course).

(7) [1]The type and scope of examinations depend on the skills taught in the respective module accounting for 5, 7.5 and 10 ECTS credits respectively, or, if so chosen by the student, 2.5 ECTS credits pursuant to paragraphs 1 to 6 and the module handbook. [2]Possible examination achievements for the compulsory elective module groups M1, M2, M3 and M5 are: written examination (60, 90 or 120 mins) and oral examination (30 mins). [3]For module M4, the examination takes the form of a seminar achievement pursuant to Section 6 (3) **ABMPO/TechFak**. [4]Course achievements have to be submitted for module group M6. [5]In the case of the academic laboratory course ('Hochschulpraktikum'), these take the form of a practical achievement pursuant to Section 6 (3) **ABMPO/TechFak** and for the research laboratory course ('Forschungspraktikum') a written report of four to six pages in length. [6]The module handbook is published before the beginning of the semester in accordance with local practice.

(8) [1]Compulsory elective modules amounting to 5 ECTS credits usually consist of a lecture (2 SWS) and a tutorial (2 SWS) or a lecture (3 SWS) and a tutorial (1 SWS). [2]Any exceptions are detailed in the module handbook.

Section 45 Master's Thesis, Requirements for Subject Allocation

(1) [1]The Master's thesis is intended to demonstrate the students' ability to solve medical engineering problems independently. [2]The thesis shall have a workload of approximately 825 hours to be completed within six months. [3]27.5 ECTS credits shall be awarded for the Master's thesis. A further 2.5 ECTS credits are awarded for an accompanying advanced seminar.

(2) [1]The topic of the Master's thesis is issued by a member of the Faculty of Engineering involved in the compulsory, core or specialisation modules (with the exception of module B7.2, module groups M6 and M7 and module M8) of the Bachelor's or Master's degree programmes in Medical Engineering (university lecturer responsible). [2]Any exceptions to this rule are only possible by submitting a prior written request in each instance to the chairperson of the Degree Programme Committee. [3]The university lecturer responsible and/or a research assistant employed at the same Chair shall provide supervision together with at least one member of Universitätsklinikum Erlangen or a comparable institution.

(3) [1]The Master's thesis shall be written in German or English. [2]Sentence one notwithstanding, students who have chosen to study their Master's degree in English must

write the Master's thesis in English. [3]The thesis shall deal with a scientific subject from the field of medical engineering. [4]For students taking the specialisation HMDA, the Master's thesis shall include additional components covered in the entrepreneurship modules. [5]An industrial partner should preferably be involved when deciding on a specific topic for the thesis; Section 32 (3)(3) **ABMPO/TechFak**. [6]The results of the Master's thesis shall be introduced in a presentation followed by a discussion; this part of the examination shall not be graded. [7]The date of the presentation shall be determined by the responsible university lecturer either after the student has submitted their thesis or during the final stage of Master's thesis work. [8]The date shall usually be within four weeks of the date on which the thesis was submitted; students shall be notified of the date at least two weeks in advance.

(4) The requirements for admission to the Master's thesis shall be as follows:
1. achievement of 75 ECTS credits in the Master's degree programme
2. submission of relevant certificates if admission to the Master's degree programme was granted with conditions according to Section 29 (2)(2) **ABMPO/TechFak**
3. Evidence for the Examinations Office that the compulsory elective modules marked as obligatory in **Appendix 3** have been completed successfully.

(5) In justified, exceptional cases, the Examinations Committee shall be entitled to grant early admission to the Master's thesis.

Section 45a Determining Interim Grades for Module Groups, Overall Grade

[1]An interim grade shall be calculated for each of the module groups M1, M2, M3, M5 and M7 as well as modules M4 and M8; the individual module grades shall be weighted with a factor corresponding to their ECTS credits. [2]The interim grades of the module groups M1, M5 and M7 are weighted with 10 ECTS credits each, the interim grades of module groups M2 and M3 are weighted with 20 ECTS credits each and the interim grade of modules M4 and M8 are weighted with 5 ECTS credits each when calculating the overall grade.

Part III: Transitory and Final Provisions

Section 46 Legal Validity

(1) [1]These degree programme and examination regulations shall come into effect on the day after their publication. [2]They shall apply to all students who enter a Medical Engineering degree programme in the winter semester 2009/2010 or later.

(2) [1]The ninth amendment statute shall come into effect on the day after its publication. [2]It shall apply to all students starting a degree programme from the winter semester 2018/2019 onwards. [3]Notwithstanding sentence 2, the amendments in Section 42 shall apply to all students starting a degree programme from the summer semester 2019 onwards.

(3) [1]The tenth amendment statute shall come into effect on the day after its publication. [2]It shall apply to all students starting a degree programme from the winter semester 2019/2020 onwards.

Appendix 1: Study plan and examinations for the Bachelor's degree programme in Medical Engineering

Modules			Courses/lectures					Distribution of workload per semester in ECTS credits						Type and scope of course and examination achievements
No.	Name	ECTS credits	Name	SWS (semester hours)				1	2	3	4	5	6	
				L	P/ tut	P	S							
B1	**Foundations of medicine**	**10**							2.5	2.5		2.5	2.5	
B 1.1	Anatomy and physiology for non-medical students	5	Foundations of anatomy and physiology for medical engineers, part I	2					2.5					EA: written examination, 60 mins
			Foundations of anatomy and physiology for medical engineers, part II	2						2.5				
B 1.2	Biomedicine and advanced seminar in medical engineering	5	Foundations of biochemistry and molecular medicine + advanced seminar in disease mechanisms	1			1					2.5		EA (written examination, 60 mins) + EA (SA)
			Advanced seminar in medical engineering according to seminar catalogue for all specialisations				2						2.5	
B2	**Medical Engineering**	**10**						5	5					
B 2.1	Medical engineering I (biomaterials) (GOP)	5		2	2			5						EA: written examination, 90 mins
B 2.2	Medical engineering II (imaging techniques) (GOP)	5		4	4				5					EA: Project with implementation on PC (approx. 5-7 pages)
B3	**Mathematics and algorithms**	**45**						17.5	10	5	12.5			
B 3.1	Mathematics for medical engineers 1 (GOP)[1)]	7.5		4	2			7.5						EA (written examination, 90 mins) + CA (TA)
B 3.2	Mathematics for medical engineers 2 (GOP)[1)]	10		6	2				10					EA (written examination, 120 mins) + CA (TA)
B 3.3	Mathematics for medical engineers 3[1)]	5		2	2					5				EA (written examination, 60 mins) + CA (TA)
B 3.4	Mathematics for medical engineers 4[1)]	5		2	2						5			EA (written examination, 60 mins) + CA (TA)
B 3.5	Algorithms and data structures for medical engineers													
B 3.5.1	Lecture: Algorithms and data structures for medical engineers (GOP)	5		4				5						EA: written examination, 120 mins
B 3.5.2	Tutorial: Algorithms and data structures	5			4			5						CA: (TA)

Modules			Courses/lectures					Distribution of workload per semester in ECTS credits						Type and scope of course and examination achievements
No.	Name	ECTS credits	Name	SWS (semester hours)				1	2	3	4	5	6	
				L	P/ tut	P	S							
	for medical engineers (GOP, only available in conjunction with B 3.5.1)													
B 3.6	Algorithms for continuous systems	7.5		4	4						7.5			EA (written examination, 90 mins) + CA (TA)
B4	**Foundations of physics and engineering**	**30**						7.5	12.5	5	5			
B 4.1	Foundations of electrical engineering I for medical engineers (GOP)	7.5		4	2			7.5						EA: written examination, 120 mins
B 4.2	Foundations of electrical engineering II (GOP)	5		2	2				5					EA: written examination, 90 mins
B 4.3	Statics and mechanics of materials (GOP)	7.5		3	4				7.5					EA: written examination, 90 mins
B 4.4	Experimental physics I	5		3	1					5				EA: written examination, 90 mins
B 4.5	Experimental physics II	5		3	1						5			EA: written examination, 90 mins
B5	**Core specialisation modules[3)] Medical electronics and medical image and data processing**	**40**								15	12.5	12.5		
B 5.1	Signals and systems I	5		see FPOEEI						5				EA: see FPOEEI
B 5.2	Health care information systems	5		4						5				EA: written examination, 60 mins
B 5.3	Foundations of electrical engineering III	5		see FPOEEI						5				EA: see FPOEEI
B 5.4	*Choose 2 of 4:	10									10			
B 5.4.1	Signals and systems II*	(5)		see FPOEEI							(5)			EA: see FPOEEI
B 5.4.2	Passive components and their RF properties*	(5)		see FPOEEI							(5)			EA: see FPOEEI
B 5.4.3	Circuit technology*	(5)		see FPOEEI							(5)			EA: see FPOEEI
B 5.4.4	Foundations of system programming*	(5)		see FPOINF							(5)			EA: see FPO INF
B 5.5	Electromagnetic fields I	2.5		see FPOEEI							2.5			EA: see FPOEEI
B 5.6	**Choose 1 of 2:	5										5		
B 5.6.1	Sensors**	(5)		see FPOEEI								(5)		EA: see FPOEEI
B 5.6.2	Advanced programming techniques for engineers**	(5)		4								(5)		EA: written examination, 60 mins
B 5.7	Foundations of computer engineering	7.5		see FPOINF								7.5		EA + CA:

Modules			Courses/lectures					Distribution of workload per semester in ECTS credits						Type and scope of course and examination achievements
No.	Name	ECTS credits	Name	SWS (semester hours) L	P/ tut	P	S	1	2	3	4	5	6	
														see FPO INF
B6	**Core specialisation modules[3)] Medical device technology, production technology and prosthetics**	**40**								15	2.5	12.5		
B 6.1	Production technology I + II	5	Production technology I	see FPOMB						2.5				EA: see FPOMB
			Production technology II								2.5			
B 6.2	Materials and their structure	5		see FPOET						5				EA: see FPOET
B 6.3	Foundations of metrology	5		see FPOMB						5				EA: see FPOMB
B 6.4	Engineering drawing I	2.5				4				2.5				CA: PA
B 6.5	Biomechanics	2.5		2							2.5			EA: written examination, 60 mins
B 6.6	*Choose 1 of 2	5									5			
B 6.6.1	Technical thermodynamics for medical engineers*	(5)		4	2						(5)			EA: written examination, 120 mins
B 6.6.2	Finite element method*	(5)		see FPOMB							(5)			EA: see FPOMB
B 6.7	Surfaces of biomaterials	2.5		2							2.5			EA: written examination, 60 mins
B 6.8	**Choice of a total of 12.5 ECTS credits	12.5										12.5		
B 6.8.1	Light in medical engineering**	(5)		2	2							(5)		EA: written examination, 90 mins
B 6.8.2	Fluid mechanics for medical engineers**	(5)	Biothermal fluid dynamics for medical engineers	2								(5)		EA: written examination, 120 mins
			Biothermal fluid dynamics for medical engineers - tutorial		2									
B 6.8.3	Quality management in medical engineering	(2.5)		2								(2.5)		EA: written examination, 60 mins
B 6.8.4	Dynamics of rigid bodies**	(7.5)		see FPOMB								(7.5)		EA: see FPOMB
B7	**Practical and additional qualifications**	**15**								2.5			12.5	
B 7.1	Laboratory course Basic laboratory for medical engineers	2.5				8				2.5				CA: PA
B 7.2	Free choice Uni	2.5		(2)									2.5	EA: according to applicable degree programme and examination regulations Module handbook
B 7.3	Practical internship	10											10	CA:

Modules			Courses/lectures					Distribution of workload per semester in ECTS credits						Type and scope of course and examination achievements
No.	Name	ECTS credits	Name	SWS (semester hours) L	P/ tut	P	S	1	2	3	4	5	6	
														Report pursuant to guidelines for internships in medical engineering
B8	**Specialisation modules pursuant to catalogue of optional specialisations for B8 (Section 39a)**	**17.5**	see Section 39a (3)									15	2.5	[4]
B9	**Bachelor's thesis**	**12.5**	Bachelor's thesis			8							10	EA (written assignment) + CA (presentation)
			Advanced seminar Bachelor's thesis				2						2.5	
Total ECTS credits		**180**	**Total semester hours (at least)**	**58**	**32**	**16**	**5**	**30**	**30**	**30**	**30**	**30**	**30**	
				111										

EA: examination achievement (graded achievement)
CA: course achievement (ungraded achievement)
W: written examination 60, 90 or 120 mins
SA: seminar achievement pursuant to Section 6 (3) **ABMPO/TechFak** (generally a presentation and written assignment)
TA: tutorial achievement pursuant to Section 6 (3) **ABMPO/TechFak** (generally a weekly assignment solving practical exercises)
PA: practical achievement pursuant to Section 6 (3) **ABMPO/TechFak** (generally involving practice of practical tasks, written experiment protocols and written or oral tests).

[1] The equivalence of the mathematics modules in the degree programmes of the Faculty of Engineering shall be announced according to local practice.
[2] Modules marked with 'GOP' may make up part of the preliminary examination (GOP) according to Section 38. At least one module from each of the module groups B2 to B4 must have been passed.
[3] The choice of modules offered in module groups B5 and B6 can be extended if a resolution is passed on this by the Examinations Committee.
[4] cf. Section 39a. The type and scope of the examination depend on the specific manner in which the chosen module is taught. The catalogues of compulsory elective modules with detailed examination requirements for each module shall be published on the Medical Engineering website before the start of the semester according to local practice.

Appendix 2: Master's study plan template Medical Engineering

Module group			Modules					Distribution of workload per semester in ECTS credits[1]				Type and scope of the course and examination achievement[2) 3)]
No.	Name	ECTS credits		SWS (3)				1	2	3	4	
				L	P/tut	P	S					
M1	Medical specialisation modules pursuant to Section 44a (1)	10	pursuant to catalogue of compulsory elective modules for all specialisations	(6)	(2)			5	5			EA: Written examination 60/90/120 mins or oral, 30 mins
M2	Engineering core modules pursuant to Section 44a (2)	20	pursuant to catalogue of compulsory elective modules for respective specialisation	(12)	(4)			10	10			EA: Written examination 60/90/120 mins or oral, 30 mins
M3	Engineering core modules pursuant to Section 44a (3)	20	pursuant to catalogue of compulsory elective modules for respective specialisation[4]	(12)	(4)			10	10			EA: Written examination 60/90/120 mins or oral, 30 mins
M4	Advanced seminar medical engineering pursuant to Section 44a (4)	5	pursuant to seminar catalogue for all specialisations				2			5		EA: SA (written assignment and presentation according to specifications of chair)
M5	Medical engineering specialisation modules pursuant to Section 44a (5)	10	pursuant to catalogue of compulsory elective modules for respective specialisation[5]	(6)	(2)				5	5		EA: Written examination 60/90/120 mins or oral, 30 mins
M6	Medical engineering practical modules pursuant to Section 44a (6)	10	pursuant to catalogue of compulsory elective modules for all specialisations			(8)				10		CA (written assignment) + CA (PA)
M7	Flexible budget Faculty of Engineering and School of Business, Economics and Society pursuant to Section 43 (4)	10		(6)	(2)					10		EA: according to applicable degree programme and examination regulations
M8	Free choice Uni	5		(4)				5				EA: according to applicable degree programme and examination regulations

Module group			Modules					Distribution of workload per semester in ECTS credits[1]				Type and scope of the course and examination achievement[2) 3)]
No.	Name	ECTS credits		SWS [(3)]				1	2	3	4	
				L	P/tut	P	S					
M9	Master's thesis	30	Master's thesis								27.5	EA (written assignment) + CA (presentation)
			Advanced seminar Master's thesis				2				2.5	
Total ECTS credits		**120**	**Total semester hours (at least)**	**46**	**14**	8	4	30	30	30	30	
				72								

EA: examination achievement (graded achievement)
CA: course achievement (ungraded achievement)
W: written examination 60, 90 or 120 mins
Oral: oral examination, 30 mins
SA: seminar achievement pursuant to Section 6 (3) **ABMPO/TechFak** (generally a presentation and written assignment)
PA: practical achievement pursuant to Section 6 (3) **ABMPO/TechFak** (generally involving practice of practical tasks, written experiment protocols and written or oral tests).

[1)] The third and fourth semesters are designed as mobility windows during which students can realise stays abroad.
[2)] One examination per module. Due to the specific subject competencies that must be acquired as part of the learning outcome of the Master's degree programme, students are expected to prove that they will acquire additional skills in the Master's degree programme in Medical Engineering compared to the skills acquired in their previous Bachelor's degree programme when choosing modules from the catalogue of modules available for the respective specialisation.
[3)] see Section 44a. The type and scope of the teaching units and the examination depend on the specific manner in which the chosen module is taught. The catalogues of compulsory elective modules with detailed examination requirements for each module shall be published on the Medical Engineering website before the start of the semester according to local practice.
[4)] In the module group M3, modules of up to 5 ECTS credits can be transferred from the module groups M2 and M5 of the chosen specialisation or from module groups M2, M3 and M5 from other specialisations in the degree programme.
[5)] In the module group M5, modules of up to 5 ECTS credits can be transferred from the module groups M2 and M3 of the chosen specialisation or from module groups M2, M3 and M5 from other specialisations in the degree programme.
[6)] The type and scope of teaching units and examinations depend on the specific manner in which the respective module is taught and are regulated by the applicable **(degree programme and) examination regulations** and/or the module handbook.
[7)] The type and scope of teaching units and examinations depend on the specific manner in which the respective module is taught and are regulated by the applicable **(degree programme and) examination regulations** and/or the module handbook.

Appendix 3: Compulsory elective modules which must be completed before registering for a Master's thesis in Medical Engineering (see Section 45 (4)(3))

Appendix 3a: Obligatory compulsory elective modules for all specialisations

Module group		Obligatory modules						Distribution of workload per semester in ECTS credits				Type and scope of the course/examination achievement
No.	Name	ECTS credits	Name	SWS (semester hours) L	P/ tut	P	S	1	2	3	4	
M1 BDV/ IDP/ MEL/ GPP/ HMDA	Medical specialisation modules pursuant to Section 44a (1)	5	Foundations of anatomy and physiology for non-medical students	see Section 44a (8)				2.5	2.5			EA: see Section 44a (7)

Appendix 3b: Obligatory compulsory elective modules for the specialisation 'Medical image and data processing'

Module group		Obligatory modules						Distribution of workload per semester in ECTS credits				Type and scope of the course/examination achievement
No.	Name	ECTS credits	Name	SWS (semester hours) L	P/ tut	P	S	1	2	3	4	
M2 BDV/ IDP	Engineering core modules pursuant to Section 44a (2)	5	Pattern recognition	see Section 44a (8)				5				EA: see Section 44a (7)
		5	Pattern analysis						5			EA: see Section 44a (7)

Appendix 3c: Obligatory compulsory elective modules for the specialisation ‘Health & medical data analytics and entrepreneurship.’

Module group		Obligatory modules						Distribution of workload per semester in ECTS credits				Type and scope of the course/examination achievement
No.	Name	ECTS credits	Name	SWS (semester hours)				1	2	3	4	
				L	P/ tut	P	S					
M2 HMDA	Engineering core modules pursuant to Section 44a (2)	5	Pattern recognition	see Section 44a (8)				5				EA: see Section 44a (7)
		5	Pattern analysis						5			EA: see Section 44a (7)

Appendix 3d: Obligatory compulsory elective modules for the specialisation ‘Medical electronics’

Module group		Obligatory modules						Distribution of workload per semester in ECTS credits				Type and scope of the course/examination achievement
No.	Name	ECTS credits	Name	SWS (semester hours)				1	2	3	4	
				L	P/ tut	P	S					
M2 MEL	Engineering core modules pursuant to Section 44a (2)	5	Signals and systems II	see Section 44a (8)					5			EA: see Section 44a (7)
M2 MEL	Engineering core modules pursuant to Section 44a (2)	5	Passive components and their RF properties	see Section 44a (8)					5			EA: see Section 44a (7)
M2 MEL	Engineering core modules pursuant to Section 44a (2)	5	Circuit technology	see Section 44a (8)					5			EA: see Section 44a (7)
M2 MEL	Engineering core modules pursuant to Section 44a (2)	5	Automatic control A (foundations)	see Section 44a (8)				5				EA: see Section 44a (7)
M3 MEL	Medical engineering core modules pursuant to Section 44a (3)	5	Medical electronics	see Section 44a (8)					5			EA: see Section 44a (7)

Appendix 3e: Obligatory compulsory elective modules for the specialisation ‘Medical engineering, production technology and prosthetics’

Module group		Obligatory modules						Distribution of work-load per semester in ECTS credits				Type and scope of the course and examination achievement
No.	Name	ECTS credits	Name	SWS (semester hours)				1	2	3	4	
				L	P/ tut	P	S					
M3 GPP	Medical engineering core modules pursuant to Section 44a (3)	5	Medical engineering I (biomaterials)	see Section 44a (8)				5				EA: see Section 44a (7)
M3 GPP	Medical engineering core modules pursuant to Section 44a (3)	2.5	Material surfaces in medicine	see Section 44a (8)					2.5			EA: see Section 44a (7)