These degree program and examination regulations have been worded carefully to be up to date; however, errors cannot be completely excluded. The official German text available from L1 – Legal Affairs and Academic Quality Management 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 Program and Examination Regulations for the Bachelor's and Master's Degree Programs in Medical Engineering at Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU)
– FPOMT –
dated September 15, 2009

amended by statutes of
October 30, 2009
March 4, 2010
March 9, 2011
August 5, 2011
February 24, 2012
July 31, 2012
February 18, 2013
February 18, 2014
August 28, 2018
July 10, 2019
April 13, 2022

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 General Degree Program and Examination Regulations:

Contents:

Part I: General Provisions

Section 35 Scope

[1]These **degree program and examination regulations** govern studies and examinations for the Bachelor's and consecutive Master's degree programs 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 Programs of the Faculty of Engineering at FAU (**ABMPO/TechFak**).

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

(1) [1]The degree program consists of compulsory modules from module groups B1 to B4, core modules from module groups B5 or B6 depending on the specialization chosen by the student, key qualifications from module group B7, specialization modules from module group B8 and the Bachelor's thesis module (B9). [2]It includes ten weeks' vocational practice (up to four of which may be spent in a health care institution) to be carried out in the course of the degree program according to internship guidelines. [3]Students choose a specialization made up from core and specialization modules from module groups B5 and B8 or B6 and B8 which complement each other with regard to content. [4]The modules and recommended program 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 specializations must be chosen when studying the Bachelor's degree program 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 specialization shall be chosen by registering for the first examination in a module for that specific specialization from module groups B5, B6 or B8. [3]Once the specialization is chosen, the core modules of module group B5 have to be taken for the "Medical

electronics and medical image and data processing" specialization and the core modules of module group B6 for the "Medical device engineering, production technology and prosthetics" specialization, in accordance with the obligatory compulsory elective options. [4]A change of specialization shall only be permitted in justified, exceptional cases if a written request is submitted to and approved by the chair of the Degree Program Committee. [5]The module catalog for the specializations (core modules specific to the specialization B5 or B6 worth 40 ECTS credits each and corresponding elective specialization modules B8 worth 17.5 ECTS credits) may be added to by the Degree Program Committee; the catalog and any changes shall be published on the degree program website.

(3) [1]The Bachelor's degree program in Medical Engineering may be started in the winter semester or in the summer semester. The degree program may only be started in the summer semester if students have achieved sufficient credits that allow them to enter into at least the second subject semester. [3]In cases covered by sentence 2, students to which the provision applies shall draw up an individual degree program structure together with a study advisor in order to be able to provide proof of having completed the modules listed in **Appendix 1** by the time of completion of the Bachelor's degree program.

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

(1) [1]The Master's degree program in Medical Engineering consists of medical specialization modules from module group M1, core modules specific to the chosen specialization from module groups M2 and M3, the "Advanced seminar: Medical engineering" module (M4), specialization modules specific to the chosen specialization 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 a laboratory course and practical research. [3]Students shall choose a specialization made up of modules from the module groups M2, M3 and M5. [4]The specialization shall be chosen by registering for the first examination in a module for that specific specialization from module groups M2, M3 or M5. [5]A change of specialization shall only be permitted in justified, exceptional cases if a written request is submitted to the chair of the Degree Program Committee. [6]The module catalog for specializations (M2, M3, M5) and the common module catalog (M1, M4, M6, M7) can be added to by the Degree Program Committee. Any changes shall be published on the degree program's website.

(2) [1]The Master's degree program in Medical Engineering may be started in the winter semester or in the summer semester. [2]Sentence 1 notwithstanding, the specialization '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 program in Medical Engineering is English if students choose the specialization "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

specialization "HDMA" (see Section 43 (1)(2)(4)). [2]Notwithstanding Section 4 (5) **ABMPO/TechFak**, the teaching and examination language throughout the course is English if students choose the specialization "Medical Robotics" (see Section 43 (1)(2)(5)). [4]In the cases stated in sentences 1 to 3, the Master's thesis shall as a rule be written in English. [5]Exceptions shall require the Examination Committee's approval. [6]This shall not affect the rest of Section 4 (5) **ABMPO/TechFak**.

Part II: Special Provisions

1. Bachelor's Degree Program

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 specialization "Medical electronics and medical image and data processing" and module group B6 only has to be taken by students who have chosen the specialization "Medical equipment 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 Program

(1) [1]Firstly, the specialization modules in module group B8 are intended to allow students to explore one or several areas in more depth ("fundamentals relevant to both specializations" or relating to the chosen specialization "specialization modules for medical electronics and medical image and data processing" or "specialization modules for medical equipment 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 specialization module B8 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 paragraph 1 and the module handbook. [2]Examinations shall take one of the following forms: written examination (60, 90 or 120 min), oral examination (20-30 min), tutorial achievement or practical achievement pursuant to Section 6 (3) **ABMPO/TechFak**. [3] Section 6 (2)(3) **ABMPO/TechFak** stipulates that in justified exceptional circumstances, combinations of the individual achievements stated in sentence 2 may also be possible. [4]Other examination forms are possible if so decided by the Degree Program Committee. [5]The

module handbook is published before the beginning of the seminar in accordance with local practice.

(3) [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 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 specialization modules (with the exception of module B7.2, module groups M6 and M7 and module M8) of the Bachelor's or Master's degree programs 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 Program 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 specialization modules (module group B8) shall be weighted with 17.5 ECTS credits in the calculation of the overall grade.

2. Master's Degree Program

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 program 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 as defined by **Appendix** (2)(4)(3) **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 Center). [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 program in Medical Engineering according to **Appendix 1**, Section 5(2)(2) **ABMPO/TechFak** if they have passed at least four of the modules from module groups B5 or B6 of the Bachelor's degree program pursuant to these examination regulations or equivalent modules from other universities with an average grade for all modules weighted according to their ECTS credits 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 specialization in medical image and data processing, medical electronics, medical device engineering, production technology and prosthetics, or medical robotics corresponding to an eligible specialization in the Master's degree program; the applicant shall choose the specialization 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 specialization in order to establish a subject-specific profile. [2]The following specializations are possible:

1. Medical image and data processing (IDP) or the German version Medizinische Bild und Datenverabeitung (BDV):

This specialization 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 specialization qualifies students for a career in medical applications of sensor technology, communication electronics and photonics.
3. Medical device engineering, production technology and prosthetics (GPP):
   This specialization 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 specialization combines the study of medical image and data processing with comprehensive training in entrepreneurship.
5. Medical robotics (MER):
   This specialization teaches students the skills necessary for analyzing and developing robotics systems for applications in medicine, rehabilitation and supporting users in a medical context.

(2) [1]The Master's degree program includes the module groups from **Appendix 2a** (full-time) or **Appendix 2b** (part-time). [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 shall choose one or several laboratory courses worth a total of 5 ECTS credits from the modules offered by the Faculty of Engineering or a chair from one of the other faculties at FAU that is involved in the curriculum of the Bachelor’s or Master's degree program (with the exception of module groups B7.2, M7 and M8). [3]Students shall complete the research laboratory course, worth 5 ECTS credits, at a chair belonging to the Faculty of Engineering or a chair at one of the other faculties at FAU involved in the curriculum of the Bachelor’s or Master's degree program (with the exception of module groups B7.2, M7 and M8). [4]Further academic laboratory courses and research laboratory courses may be completed at other chairs provided a request is filed with and approved by the chairperson of the Degree Program Committee. [5]The Degree Program Committee’s chairperson may upon application agree to other ungraded elective modules from the course catalog 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 compulsory elective modules at Master’s level – module group M7 – students shall complete elective modules amounting to 10 ECTS credits from the modules offered by the Faculty of Engineering. The Degree Program Committee can extend the catalog of (compulsory) elective modules for M7. Any changes shall be announced on the website for the degree program.

(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]The type and scope of the course and examination achievements shall be stipulated in **Appendix 2a** (full-time) and **2b** (part-time). [2]For individual modules that may be chosen from other degree programs 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 program 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 specialization) is to allow students to acquire a fundamental knowledge of medicine and specialize further in the area of medical applications. [2]For specialization 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 specialization 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 specialization 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 specialized 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 specialization module) is to allow students to gain more specialist knowledge in one specific area of medical engineering according to the specialization they have chosen. The element of choice gives students the opportunity to create their own specialization 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]Unless stipulated otherwise in **Appendix 2a** or **2b**, 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]Examinations for the compulsory elective module groups M1, M2, M3 and M5 shall take one of the following forms: written examination (60, 90 or 120 min), oral examination (20-30 min), tutorial achieve-

ment or practical achievement pursuant to Section 6 (3) **ABMPO/TechFak**. [3]For module M4, the examination shall take 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 laboratory 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] Section 6 (2)(3) **ABMPO/TechFak** stipulates that in justified exceptional circumstances, combinations of the individual achievements stated in sentence 2 may also be possible. [7]Other examination forms are possible if so decided by the Degree Program Committee. [8]The module handbook is published before the beginning of the seminar 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 specialization modules (with the exception of module B7.2, module groups M6 and M7 and module M8) of the Bachelor's or Master's degree programs 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 Program 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 pursuant to Section 37 (3) 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 specialization 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 be graded. [7]The date of the presentation shall be determined by the university lecturer responsible 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. Acquiring at least 75 ECTS credits in the Master's degree program
2. Submitting relevant certificates if admission to the Master's degree program was granted with conditions according to Section 29 (2)(2) **ABMPO/TechFak**

3. Providing the Examinations Office evidence 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 program 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 program in 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 program from winter semester 2018/2019 onwards. [3]Notwithstanding sentence 2, the amendments in Section 42 shall apply to all students starting a degree program from 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 program from winter semester 2019/2020 onwards.

(4) [1]The eleventh amendment statute shall come into effect on the day after its publication. [2]It shall apply to all students starting a degree program from winter semester 2022/2023 onwards. [3]Examinations in accordance with previous versions of the degree program and examination regulations will be offered for the last time in summer semester 2027 for the Bachelor's degree program and in winter semester 2025/2026 for the Master's degree program. [4]From the date stated in sentence 3, those students who are affected by the examination regulations becoming invalid shall take their examinations in accordance with the currently valid version of the degree program and examination regulations.

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

Module name	Teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits						Type and scope of the examination
		L	T	P	S		1st sem.	2nd sem.	3rd sem.	4th sem.	5th sem.	6th sem.	
B1: Foundations of medicine						**10**		**2.5**	**2.5**		**2.5**	**2.5**	
B1.1 Anatomy and physiology for non-medical students	Foundations of anatomy and physiology for medical engineering Part I	2				**5**		2.5					EA: written examination, 60 min
	Foundations of anatomy and physiology for medical engineering Part II	2							2.5				
B1.2 Biomedicine and advanced seminar in medical engineering	Basics of Biochemistry and molecular medicine + advanced seminar in disease mechanisms	1			1	**5**					2.5		EA: written examination, 60 min + EA: SA
	Advanced seminar in medical engineering according to seminar catalog for all specializations				2							2.5	
B2: Medical engineering						**10**	**5**	**5**					
B 2.1 Medical engineering I (Biomaterials) (GOP) [1)]		2	2			**5**	5						EA: written examination, 90 min
B 2.2 Medical engineering II (Imaging methods) (GOP) [1)]		4	4			**5**		5					PA: 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 engineering 1 (GOP) [1) 2)]		4	2			**7.5**	7.5						EA: written examination, 90 min + CA: TA
B 3.2 Mathematics for medical engineering 2 (GOP) [1) 2)]		6	2			**10**		10					EA: written examination, 120 min + CA: TA

Module name	Teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits						Type and scope of the examination
		L	T	P	S		1st sem.	2nd sem.	3rd sem.	4th sem.	5th sem.	6th sem.	
B 3.3 Mathematics for medical engineering 3 [2)]		2	2			**5**			5				EA: written examination, 60 min + CA: TA
B 3.4 Mathematics for medical engineering 4 [2)]		2	2			**5**				5			EA: written examination, 60 min
B 3.5 Algorithms and data structures for medical engineering													
B 3.5.1 Algorithms and data structures (for medical engineering) (AuD-MT-V) (GOP) [1]		4				**5**	5						EA: written examination, 60 min
B 3.5.2 Algorithms and data structures (for medical engineering) (AuD-MT-UE) (GOP, only available in conjunction with B 3.5.1) [1)]			4			**5**	5						CA: TA
B 3.6 Algorithms for continuous systems		see FPOINF				**7.5**				7.5			see FPOINF
B4: Fundamentals of physics and engineering						**30**	**7.5**	**12.5**	**5**	**5**			
B 4.1 Fundamentals of electrical engineering I for medical engineering and mechatronics (GOP) [1)]		4	2			**7.5**	7.5						EA: written examination, 120 min
B 4.2: Fundamental principles of electrical engineering II (GOP) [1)]		2	2			**5**		5					EA: written examination, 90 min
B 4.3 Statics and mechanics of materials (GOP) [1)]		3	4			**7.5**		7.5					EA: written examination, 90 min
B 4.4 Experimental physics for medical engineering	Experimental physics for EEI medical engineering	3	1			**5**			5				EA: written examination, 180 min [3)]
	Experimental physics II for EEI medical engineering	3	1			**5**				5			
B5 Core specialization modules [4)] **Medical electronics and medical image and data processing**						**40**			**15**	**12.5**	**12.5**		

Module name	Teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits						Type and scope of the examination
		L	T	P	S		1st sem.	2nd sem.	3rd sem.	4th sem.	5th sem.	6th sem.	
B 5.1 Signals and systems I		see FPOEEI				**5**			5				see FPOEEI
B 5.2 Information systems in health care		4				**5**			5				EA: written examination, 60 min
B 5.3 Foundations of electrical engineering III		see FPOEEI				**5**			5				see FPOEEI
B 5.4 Choose 2 of 4:						**10**				10			
B 5.4.1 Signals and systems II		see FPOEEI				**(5)**				(5)			see FPOEEI
B 5.4.2 Passive components and their RF properties		see FPOEEI				**(5)**				(5)			see FPOEEI
B 5.4.3 Circuit technology		see FPOEEI				**(5)**				(5)			see FPOEEI
B 5.4.4: Fundamental principles of system programming		see FPOINF				**(5)**				(5)			see FPOINF
B 5.5 Electromagnetic fields I		see FPOEEI				**2.5**				2.5			see FPOEEI
B 5.6 Choose 1 of 2:						**5**					5		
B 5.6.1 Sensory systems		see FPOEEI				**(5)**					(5)		see FPOEEI
B 5.6.2 Advanced programming techniques for engineers		4				**(5)**					(5)		EA: written examination, 60 min
B 5.7: Fundamental principles of technical computer science		see FPOINF				**7.5**					7.5		see FPOINF
B6 Core specialization modules [4)] Medical device technology, production technology and prosthetics						**40**			**15**	**12.5**	**12.5**		
B 6.1 Production engineering I + II	Production technology I	see FPOMB				**5**			2.5				see FPOMB
	Production technology II									2.5			
B 6.2 Materials and their structure/metallic materials		see FPOET				**5**			5				see FPOET
B 6.3 Foundations of metrology		see FPOMB				**5**			5				see FPOMB

Module name	Teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits						Type and scope of the examination
		L	T	P	S		1st sem.	2nd sem.	3rd sem.	4th sem.	5th sem.	6th sem.	
B 6.4 Engineering drawing I				4		**2.5**			2.5				CA: PA
B 6.5 Biomechanics		2				**2.5**				2.5			EA: written examination, 60 min
B 6.6: Choose 1 of 2						**5**				5			
B 6.6.1 Technical thermodynamics for medical engineering		4	2			**(5)**				(5)			EA: written examination, 120 min
B 6.6.2 Finite element method		see FPOMB				**(5)**				(5)			see FPOMB
B 6.7 Surfaces of biomaterials		2				**2.5**				2.5			EA: written examination, 60 min
B 6.8: Choice of a total of 12.5 ECTS credits						**12.5**					12.5		
B 6.8.1 Light in medical engineering		2	2			**(5)**					(5)		EA: written examination, 90 min
B 6.8.2 Robotics in medical engineering		2	2			**(5)**					(5)		EA: written examination, 90 min
B 6.8.3 Quality management I – Quality engineering for product design		2				**(2.5)**					(2.5)		EA: written examination, 60 min
B 6.8.4 Dynamics of rigid bodies		see FPOMB				**(7.5)**					(7.5)		see FPOMB
B7 Practical and additional qualifications						**15**			**2.5**			**12.5**	
B 7.1 Academic laboratory course Basic laboratory for medical engineering and mechatronics				8		**2.5**			2.5				CA: PA
B 7.2 Free choice Uni		[4]				**2.5**						2.5	EA[4]
B 7.3 Industrial internship	10 week internship of 40 hours per week					**10**						10	CA: Report pursuant to guidelines for internships in medical engineering
B8 Specialization modules pursuant to catalog of optional specializations for B8 pursuant to Section 39a						**17.5**					**15**	**2.5**	

Module name	Teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits						Type and scope of the examination
		L	T	P	S		1st sem.	2nd sem.	3rd sem.	4th sem.	5th sem.	6th sem.	
B8: Choice of specialization modules pursuant to Section 39a with a total of 17.5 ECTS credits		cf. Section 39a				**17.5**					15	2.5	cf. Section 39a
B 9 Bachelor's thesis						**12.5**						**12.5**	
Bachelor's thesis	Bachelor's thesis			8		**10**						8	EA: written assign-ment +
	Advanced seminar Bachelor's thesis				2	**2.5**						2	EA: presentation
		58	**32**	**16**	**5**		**30**	**30**	**30**	**30**	**30**	**30**	
Total semester hours (at least):		**111**					**Total ECTS credits: 180**						

EA: examination achievement (graded achievement)
CA: course achievement (ungraded achievement)
W: written examination 60, 90 or 180 min
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)] 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.
[2)] The equivalence of the mathematics modules in the degree programs of the Faculty of Engineering shall be announced according to local practice.
[3)] Instead of the module examination worth 180 minutes, students can choose to take two partial examinations worth 90 minutes per semester.
[4)] The choice of modules offered in module groups B5 and B6 can be extended if a resolution is passed on this by the Degree Program Committee.
[4] The type and scope of the examination depend on the specific manner in which the respective module is taught and are regulated by the applicable **(degree program and) examination regulations** and/or the relevant module handbook.

Appendix 2a: Master's study plan template Medical Engineering (full-time)

Name of module (group)	Module / teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits[1]				Type and scope of the examination [2) 3)]
		L	T	P	S		1st semester	2nd semester	3rd semester	4th semester	
M1 Medical specialization modules pursuant to Section 44a (1)	pursuant to catalog of compulsory elective modules for all specializations; obligatory compulsory elective modules See Appendix 3a	(6)	(2)			**10**	5	5			see Section 44a (7)
M2 Engineering core modules **pursuant to Section 44a (2)**	pursuant to catalog of compulsory elective modules for respective specialization; obligatory compulsory elective modules see Appendices 3b to 3f	(12)	(4)			**20**	10	10			see Section 44a (7)
M3 Medical engineering core modules pursuant to Section 44a (3)	pursuant to catalog of compulsory elective modules for respective specialization; obligatory compulsory elective modules see Appendices 3b bis 3f[4)]	(12)	(4)			**20**	10	10			see Section 44a (7)
M4 Advanced seminar in medical engineering pursuant to Section 44a (4)	pursuant to seminar catalog for all specializations				2	**5**			5		SA (handout + presentation pursuant to specifications of chair)
M5 Medical engineering specialization modules pursuant to Section 44a (5)	pursuant to catalog of compulsory elective modules for all specializations[5)]	(6)	(2)			**10**		5	5		see Section 44a (7)
M6 Medical engineering practical modules **pursuant to Section 44a (6)**	pursuant to catalog of compulsory elective modules for all specializations			(8)		**10**			10		CA (written assignment) + CA (LA)
M7 Flexible budget Faculty of Engineering and School of Business and Economics **pursuant to Section 43 (4)**		according to applicable (degree program and) examination regulations [6)]				**10**			10		EA: according to applicable (degree program and) examination regulations [6)]
Free choice uni		according to applicable (degree program and) examination regulations [6)]				**5**	5				EA: according to applicable (degree program and) examination regulations [6)]

Name of module (group)	Module / teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits[1]				Type and scope of the examination [2) 3)]
		L	T	P	S		1st semester	2nd semester	3rd semester	4th semester	
M9 Master's thesis	Master's thesis					**30**				27.5	EA (written assignment) + EA (presentation)
	Advanced seminar Master's thesis				2					2.5	
		36	**12**	**8**	**4**		**30**	**30**	**30**	**30**	
		Total SWS (semester hours): 60					**Total ECTS:**			**120**	

EA: examination achievement (graded achievement)
CA: course achievement (ungraded achievement)
SA: seminar achievement pursuant to Section 6 (3) **ABMPO/TechFak** (generally a presentation and written handout)
LA: laboratory achievement pursuant to Section 6 (3) **ABMPO/TechFak** (generally practicing practical tasks, written experiment protocol and oral or written tests)

1) The third and fourth semesters are designed as mobility windows during which students can spend time 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 program, students are expected to prove that they will acquire additional skills in the Master's degree program in Medical Engineering compared to the skills acquired in their previous Bachelor's degree program when choosing modules from the catalog of modules available for the respective specialization.
3 cf. 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 catalogs 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 specialization or from module groups M2, M3 and M5 from other specializations in the degree program.
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 specialization or from module groups M2, M3 and M5 from other specializations in the degree program.
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 program and) examination regulations** and/or the module handbook.

Appendix 2b: Master's study plan template Medical Engineering (part-time)

Name of module (group)	Module / teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits[1]								Type and scope of the examination [2) 3)]
		L	T	P	S		1.	2.	3.	4.	5.	6.	7.	8.	
M1 Medical specialization modules pursuant to Section 44a (1)	pursuant to catalog of compulsory elective modules for all specializations; obligatory compulsory elective modules see Appendix 3a	(6)	(2)			**10**	5		5						see Section 44a (7)
M2 Engineering core modules pursuant to Section 44a (2)	pursuant to catalog of compulsory elective modules for respective specialization; obligatory compulsory elective modules see Appendices 3b to 3f	(12)	(4)			**20**	10		10						see Section 44a (7)
M3 Medical engineering core modules pursuant to Section 44a (3)	pursuant to catalog of compulsory elective modules for respective specialization; obligatory compulsory elective modules see Appendices 3b to 3f [4)]	(12)	(4)			**20**		10		10					see Section 44a (7)
M4 Advanced seminar in medical engineering pursuant to Section 44a (4)	pursuant to seminar catalog for all specializations				2	**5**						5			SA (handout + presentation pursuant to specifications of chair)
M5 Medical engineering specialization modules pursuant to Section 44a (5)	pursuant to catalog of compulsory elective modules for all specializations[5)]	(6)	(2)			**10**				5	5				see Section 44a (7)
M6 Medical engineering practical modules pursuant to Section 44a (6)	pursuant to catalog of compulsory elective modules for all specializations			(8)		**10**						10			CA (written assignment) + CA (LA)
M7 Flexible budget Faculty of Engineering and School of Business and Economics pursuant to Section 43 (4)		according to applicable (degree program and) examination regulations [6)]				**10**					10				EA: according to applicable (degree program and) examination regulations [6)]

Name of module (group)	Module / teaching unit	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits[1]								Type and scope of the examination [2) 3)]
		L	T	P	S		1.	2.	3.	4.	5.	6.	7.	8.	
M8 Free choice uni		according to applicable (degree program and) examination regulations [6)]				**5**		5							EA: according to applicable (degree program and) examination regulations [6)]
M9 Master's thesis	Master's thesis					**30**							15	12.5	EA (written assignment) + EA (presentation)
	Advanced seminar Master's thesis				2									2.5	
		36	**12**	**8**	**4**		**15**	**15**	**15**	**15**	**15**	**15**	**15**	**15**	
	Total SWS (semester hours): 60					**120**	**Total ECTS credits: 120**								

EA: examination achievement (graded achievement)
CA: course achievement (ungraded achievement)
SA: seminar achievement pursuant to Section 6 (3) **ABMPO/TechFak** (generally a presentation and written handout)
LA: laboratory achievement pursuant to Section 6 (3) **ABMPO/TechFak** (generally practicing practical tasks, written experiment protocol and oral or written tests)

1) The sixth, seventh and eighth semesters are designed as mobility windows during which students can spend time 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 program, students are expected to prove that they will acquire additional skills in the Master's degree program in Medical Engineering compared to the skills acquired in their previous Bachelor's degree program when choosing modules from the catalog of modules available for the respective specialization.
3 cf. 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 catalogs 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 specialization or from module groups M2, M3 and M5 from other specializations in the degree program.
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 specialization or from module groups M2, M3 and M5 from other specializations in the degree program.
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 program 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 specializations

Name of module groups	Module	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits				Type and scope of the examination
		L	T	P	S		1st semester	2nd semester	3rd semester	4th semester	
M1 BDV/ IDP/ MEL/ GPP/ HMDA/MER Medical specialization modules pursuant to Section 44a (1)	Anatomy and physiology for non-medical students	see Section 44a (8)				**5**	2.5	2.5			EA: see Section 44a (7)

Appendix 3b: Obligatory compulsory elective modules for the specialization "Medical image and data processing"

Name of module groups	Module	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits				Type and scope of the examination
		L	T	P	S		1st semester	2nd semester	3rd semester	4th semester	
M2 BDV/IDP Engineering core modules pursuant to Section 44a (2)	Pattern recognition	see Section 44a (8)				**5**	5	5			EA: see Section 44a (7)
	Pattern analysis										EA: see Section 44a (7)

Appendix 3c: Obligatory compulsory elective modules for the specialization "Health & medical data analytics and entrepreneurship"

Name of module groups	Module	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits				Type and scope of the examination
		L	T	P	S		1st semester	2nd semester	3rd semester	4th semester	
M2 HMDA Engineering core modules pursuant to Section 44a (2)	Pattern recognition	see Section 44a (8)				**5**	5				EA: see Section 44a (7)
	Pattern analysis					**5**		5			EA: see Section 44a (7)

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

Name of module groups	Module	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits				Type and scope of the examination
		L	T	P	S		1st semester	2nd semester	3rd semester	4th semester	
M2 MEL Engineering core modules pursuant to Section 44a (2)	Signals and systems II	see Section 44a (8)				**5**		5			EA: see Section 44a (7)
M2 MEL Engineering core modules pursuant to Section 44a (2)	Passive components and their RF properties	see Section 44a (8)				**5**		5			EA: see Section 44a (7)
M2 MEL Engineering core modules pursuant to Section 44a (2)	Circuit technology	see Section 44a (8)				**5**		5			EA: see Section 44a (7)
M2 MEL Engineering core modules pursuant to Section 44a (2)	Control engineering A (foundations)	see Section 44a (8)				**5**	5				EA: see Section 44a (7)
M3 MEL Medical engineering core modules pursuant to Section 44a (3)	Medical electronics	see Section 44a (8)				**5**		5			EA: see Section 44a (7)

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

Name of module groups	Module	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits				Type and scope of the examination
		L	T	P	S		1st sem.	2nd sem.	3rd sem.	4th sem.	
M3 GPP Medical engineering core modules pursuant to Section 44a (3)	Medical Engineering I (Biomaterials)	see Section 44a (8)				**5**	5				EA: see Section 44a (7)
M3 GPP Medical engineering core modules pursuant to Section 44a (3)	Surfaces of biomaterials	see Section 44a (8)				**2.5**		2.5			EA: see Section 44a (7)

Appendix 3f: Obligatory compulsory elective modules for the specialization ‘Medical electronics’

Name of module groups	Module	SWS (semester hours)				Total ECTS credits	Distribution of workload per semester in ECTS credits				Type and scope of the examination
		L	T	P	S		1st sem.	2nd sem.	3rd sem.	4th sem.	
M2 MER Medical engineering core modules pursuant to Section 44a (3)	Robotics 1	see Section 44a (8)				**5**		5			EA: see Section 44a (7)