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I. Legal and Administrative Provisions

Faculties

Study and Examination Regulations for the Master's Degree Program in Biomedical Engineering at Faculty V - Mechanical Engineering and Transport Systems at Technische Universität Berlin

of 17 January 2018

On 17 January 2018, the Faculty Board of Faculty V - Mechanical Engineering and Transport Systems of Technische Universität Berlin adopted the following Study and Examination Regulations for the Master's Program in Biomedical Engineering, in accordance with Section 18 (1) no. 1 of the Constitution of Technische Universität Berlin and Section 71 (1) no. 1 of the Berlin State Higher Education Act (*Berliner Hochschulgesetz – BerlHG*), in the version of 26 July 2011 (Berlin Gazette of Laws and Ordinances [GVBl.], p. 378), last amended by Section 17 BerlHG on 19 December 2017 (GVBl. P. 338).*)

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I. General regulations

Section 1 – Scope of application

These study and examination regulations govern both the objectives and organization of studies, and the requirements and conducting of examinations in the master's program in Biomedical Engineering. The program-specific provisions included herein supplement the Regulations Governing General Study and Examination Procedures of Technische Universität Berlin (*Ordnung zur Regelung des allgemeinen Studien- und Prüfungsverfahrens - AllgStuPO*).

Section 2 – Entry into force/expiration

(1) These regulations shall enter into force on the day after their publication in Technische Universität Berlin's Official Gazette and apply to students enrolling from the 2019 summer semester (1 April 2019) onwards.

(2) The Study and Examination Regulations for the program in Biomedical Engineering of 19 December 2007 (TU Official Gazette 08/ 2007 p. 122 and p. 236) cease to be effective three semesters after the entry into force of these regulations. Students who have not completed their studies at the time of expiry in accordance with Sentence 1 shall continue their studies in line with these regulations.

(3) Students enrolled in the master's program in Biomedical Engineering at Technische Universität Berlin prior to the entry into force of these Study and Examination Regulations shall decide within three semesters of the entry into force of these regulations as to which set of regulations they wish to continue their studies under. This decision is irrevocable and to be recorded on file at the department in the Central University Administration responsible for such documentation.

II. Program objectives and structure

Section 3 - Learning outcomes, program content and professional fields

(1) General study objectives

During the program, students acquire a comprehensive technical education as well methodological engineering skills within an area of specialization of biomedical engineering. They also acquire the skills needed to undertake scientific, systematic, and interdisciplinary work and to continue to learn throughout their entire professional career. The close link between research and teaching ensures that new developments in biomedical engineering are incorporated into class. A key component of the master's program is students' inclusion and active participation in research projects. Teaching content is regularly updated to reflect technical developments and current research findings.

The aim of the master's program is to ensure that engineers trained at Technische Universität Berlin obtain a degree that is equivalent to that of graduates of similar programs in Germany and abroad and that it is recognized as such. Numerous guidelines, including those of the German Society for Biomedical Engineering in the VDE, form the foundation for the design of the master's program in Biomedical Engineering. Graduates of the master's program can choose to do a doctorate to further develop their ability to tackle and find solutions to engineering and scientific problems.

(2) Technical study objectives

Graduates of the Biomedical Technology degree program

- a) Are familiar with current knowledge and methods in engineering and how to apply these to find solutions to problems in biomedical engineering on the basis of sound and structured underlying knowledge
- b) Are familiar with the basic principles of clinical work including technical support in diagnostic, therapeutic, and rehabilitative processes
- c) Understand medical diagnostic, therapeutic, and rehabilitative issues and are able to design and implement suitable technical solutions on the basis of specific, theoretically and practically in-depth, application-based expertise
- d) Are familiar with and consider the special aspects of the interaction of technical systems with the human body, particularly specific safety aspects of biomedical engineering

*) Approved by the TU Berlin Executive Board on 1 March 2019

(3) Skills

The master's program in Biomedical Engineering aims to develop the following skills in its students:

- a) Ability to identify, understand, and evaluate natural scientific and technical relationships and their further development and application
- b) Ability to use an interdisciplinary and holistic approach to identify and assess the influences and reciprocal relationships between technology and the environment
- c) Ability to understand and actively influence technological change in research, development, and application
- d) Ability to conduct scientific work and expand current research findings
- e) Independent, structured, and responsible conduct and work
- f) Creative collaboration in interdisciplinary groups, including the communication and social skills required in professional practice (including when working with patients)

(4) Professional fields

Biomedical engineers work in the following areas:

- a) The medical technology industry, including in the following departments: Research and development, product management, quality management (regulatory affairs), technical field support, sales
- b) Hospitals and other medical clinics (particularly in medical research institutions), including with responsibility for the monitoring of equipment safety and preventative maintenance, optimization of equipment use, and technical support during scientific work
- c) Medical technology service providers
Testing and certification bodies, processing service providers, medical logistics companies
- d) Academic research with a clinical or technical focus

Section 4 – Program start, standard period of study, and required coursework

(1) Students may begin their studies in the winter or summer semester. If a student commences studying in the summer semester, they need to plan particularly carefully to ensure they do not experience delays in the curriculum as a result of consecutive modules (see Annex 2). Students are strongly recommended to make use of advising services to plan accordingly.

(2) The standard period of study, including completion of the master's thesis, is four semesters.

(3) The program encompasses 120 credit points (CP).

(4) The teaching curriculum and examination procedures are structured and organized in such a way as to enable students to complete the program within the standard period of study.

Section 5 - Program structure

(1) Students can structure their studies individually. They are, however, obliged to comply with the provisions laid out in these Study and Examination Regulations. The recommended sequence in which modules should be taken is shown in the proposed course schedule in Annex 2 of these regulations.

(2) Students earn a total of 120 credit points, of which 96 are awarded for taught modules, 6 for a technical internship, and 18 for the master's thesis.

(3) A total of 24 credit points must be earned in compulsory modules: The modules assigned to the different components can be found in the module list (Annex 1).

(4) A total of 48 credit points must be earned from the following areas in the compulsory elective component:

1. Applied Medical Technology, Rehabilitation Technology, Imaging Systems in Medicine or Management in Health Care totaling 18 credit points
2. Engineering specialization totaling 18 credit points
3. Information technology totaling 6 credit points
4. A project totaling 6 credit points

The modules assigned to each category can be found in the module list (Annex 1).

(5) A total of 24 credit points must be earned in elective modules. These modules allow students to acquire additional subject-specific and generic skills as well as expertise that qualifies them for a profession and can be selected from the full range of subjects offered by Technische Universität Berlin, other universities or higher education institutions with equal status within the jurisdiction of the Framework Act for Higher Education as well as at universities and higher education institutions abroad recognized as equivalent. It is recommended that students select interdisciplinary courses. They can also choose modules for learning foreign languages.

(6) The skills taught in each module, module examination requirements, and admission requirements, if any, are updated annually in the form of program-specific module catalogs in accordance with Section 33 (6) of the Regulations Governing General Study and Examination Procedures (AllgStuPO) and published at the beginning of the winter semester in October and at the beginning of the summer semester in April in the Official Gazette of Technische Universität Berlin.

(7) Students must complete a technical internship worth 6 credit points. Further details are regulated by the Internship Guidelines.

III. Examination requirements and conduct of examinations**Section 6 - Purpose of the master's examination**

The master's examination determines whether a candidate has achieved the learning outcomes in accordance with Section 3 of these regulations.

Section 7 – Master's degree

On behalf of Faculty V - Mechanical Engineering and Transport Systems, Technische Universität Berlin awards the academic degree "Master of Science" (M.Sc.) to students who have passed the master's examination.

Section 8 – Scope of the master's examination, calculation of the overall grade

(1) The master's examination comprises the module examinations listed in the module list (Annex 1), the technical internship, and the master's thesis according to Section 9.

(2) The calculation of the overall grade is based on at least 75% of the student's overall performance (including the master's thesis), that is on module grades amounting to at least 90 credit points. Only fully completed modules are included in the calculation of the grade. Ungraded modules and modules where the student achieved their lowest grades amounting to no more than 25% of the overall performance (30 credit points maximum) as well as the technical internship are not included.

In the event that a student receives the same grade in different modules, the most recently completed module is not considered. Grades excluded from the calculation of the overall grade are identified accordingly on the final certificate. The grades of all modules are listed on the final certificate.

Section 9 – Master’s thesis

(1) The master’s thesis amounts to 18 credit points and is assigned a writing period of 4 months. If there are significant reasons beyond the student’s control preventing them from completing the thesis within this time frame, the examination board shall grant an extension of the deadline for so long as the reasons in question continue to exist. The total possible extension may not exceed four months. In the event that the combined extensions exceed the stipulated maximum period of extension, the student may withdraw from the examination.

(2) To apply for admission to the master’s thesis, students must present proof of successfully completed module examinations from Section 5 (3), worth at least 18 credit points, to the responsible department of the Central University Administration.

(3) The topic of the master’s thesis may be rejected once, however only within the first two months of being issued by the responsible department of the Central University Administration.

(4) The topic of the master’s thesis must be related to one of the selected modules (cf. Section 5)

(5) The examination board shall ensure the equivalence of topics and make certain that the master’s thesis can be completed within the writing period. Non-disclosure agreements and other regulations concerning secrecy extending beyond the usual obligations of confidentiality and care are not permitted.

(6) The procedures for applying for admission to and assessment of a final thesis are regulated in the current version of the Regulations Governing General Study and Examination Procedures (AllgStuPO) as amended.

(7) People with experience of professional activity and training can be appointed as examiners of final theses. As a rule, this primarily applies to second examiners as long as a full-time professor of TU Berlin is the first examiner.

Section 10 – Types of examination and registration for examinations

(1) The types of examination and the registration procedure for module examinations are regulated by the current version of the Regulations Governing General Study and Examination Procedures (AllgStuPO).

(2) The compensation principle is to be observed when conducting portfolio assessments. A passing grade for a single element must not be a necessary requirement for a student to pass the portfolio assessment as a whole.

(3) For compulsory elective or elective modules studied at other faculties or institutions of higher education, the types of examination specified in the module descriptions shall apply.

IV. Annexes

Annex 1: Module list

Annex 2: Proposed course schedule

Please refer to the website <https://www.tu.berlin/en/studying/study-programs/all-programs-offered/study-course/biomedical-engineering-m-sc/>

Application and Admission Regulations for the Consecutive Master's Program in Biomedical Engineering at Faculty V - Mechanical Engineering and Transport Systems at Technische Universität Berlin

of 14 February 2018

On 14 February 2018, the Faculty Board of Faculty V - Mechanical Engineering and Transport Systems of Technische Universität Berlin adopted the following Application and Admission Regulations for the master's program in Biomedical Engineering in accordance with Section 18 (1) no. 1 of the Constitution of Technische Universität Berlin and Section 10 (5) of the Berlin State Higher Education Act (*Berliner Hochschulgesetz – BerlHG*) in the version of 26 July 2011 (Berlin Gazette of Laws and Ordinances [GVBl.], p. 378), last amended by Article 6 of the same Act of 2 February 2018 (Berlin Gazette of Laws and Ordinances, p. 160), in conjunction with Section 10 of the Act on the Admission to Higher Education Institutions in the State of Berlin to Degree Programs with Restricted Admission (*Berliner Hochschulzulassungsgesetz – BerlHZG*) in the version of 18 June 2005 (GVBl. p. 393), last amended by Article I of the same Act of 26 June 2013 (GVBl. p. 198):**)

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I. General regulations

Sec 1 - Scope of application

In conjunction with the Regulations Governing General Study and Examination Procedures (AllgStuPO) and the Statutes of Technische Universität Berlin Governing University Selection Procedures (AuswahlSA) as last amended, these Application and Admission Regulations govern the application and admission modalities for the first semester of study of the consecutive master's program in Biomedical Engineering. The provisions of the AllgStuPO and AuswahlSA shall take precedence over the provisions of these application and admission regulations, unless exceptions are expressly permitted therein.

Section 2 – Entry into force/expiration

These application and admission regulations enter into force on the day after their publication in the Official Gazette of Technische Universität Berlin (Official Gazette TU). They shall be applied for the first time to the procedures of the 2019/20 winter semester.

***) Confirmed by the Executive Board of TU Berlin on 27 March 2018 and by the Senate Chancellery for Science and Research on 8 February 2019

II. Application

Section 3 – Admission requirements

(1) In addition to the general admission requirements set out in Sections 10 to 13 BerlHG, applicants must have:

1. A bachelor's or equivalent university degree in a degree program in mechanical engineering or a related study program
2. Technical knowledge amounting to at least:
 - a. 18 CP in Higher Mathematics
 - b. 12 CP in Mechanics
 - c. 12 CP in Design
 - d. 6 CP in Measurement Engineering, Control Engineering, or Data Processing
 - e. 6 CP in Materials Engineering
 - f. 6 CP in Manufacturing Engineering or Production Engineering
 - g. 6 CP in Electrical Engineering
 - h. 6 CP in Information Technology

(2) A degree program is considered related if proof of the required technical skills pursuant to (1) no 2 can be provided.

Section 4 - Procedure

(1) The fulfillment of the admission requirements must be proven during the enrollment procedure in accordance with Sections 16ff. of the Regulations Governing General Study and Examination Procedures (AllgStuPO), in cases outlined in Section 15 of the AllgStuPO as part of the application for admission. Supporting documents must be submitted in the original or as officially certified copies.

(2) The Central University Administration's office responsible for registration and admissions shall decide on whether study programs shall be deemed to be related within the meaning of Section 3 (1) no. 1, as well as on the existence and equivalence of the credits needed to fulfill the requirements laid down in Section 3 (1) no. 2 and Section 3 (2), and its decision shall be made on the basis of a vote by the examination board responsible for the study program.

III. Admission

Section 5 - Restriction of the number of eligible candidates

The number of eligible candidates for the selection process can be restricted. It must be at least double the designated number of admissions. The selection criterion for participation in the selection process is the applicants' qualification level. The selection committee decides on any restriction, the number of eligible candidates, and their selection at the beginning of the selection process.

Section 6 - Ranking criteria

(1) Participants are ranked according to the following selection criteria:

1. Overall grade in the study program in accordance with Section 3 (1) with a weighting of 75 out of 100, and
2. Completed vocational training courses, activities as a student assistant or working student, as well as practical professional experience, in each case in relation to the teaching content and academic objectives of the consecutive master's program in Biomedical Engineering, with a total weighting of 25/100.

(2) Up to 100 points are awarded for the criterion indicated in (1) no. 1 in accordance with the following table:

Grade	Points	Grade	Points
1.0	100	2.6	52
1.1	97	2.7	49
1.2	94	2.8	46
1.3	91	2.9	43
1.4	88	3.0	40
1.5	85	3.1	37
1.6	82	3.2	34
1.7	79	3.3	31
1.8	76	3.4	28
1.9	73	3.5	25
2.0	70	3.6	22
2.1	67	3.7	19
2.2	64	3.8	16
2.3	61	3.9	13
2.4	58	4.0	10
2.5	55		

(3) Up to 100 points are awarded for the criterion indicated in (1) no. 2 in accordance with the following principle:

1. 100 points are awarded for completed vocational training.
2. 3 points may be awarded for every 40 hours of activities completed as a student assistant and working student as well as for practical professional experience, in each case in relation to the teaching content and academic objectives of the consecutive master's program in Biomedical Engineering.

Section 7 - Procedure

(1) Proof of fulfillment of the selection criteria must be provided when submitting the application for admission. To this purpose, applications must include the following documents in the original or as officially certified copies:

1. The documents requested in the application form
2. Evidence that the additional admission requirements in accordance with Section 3 are met.
3. Insofar as the course content in accordance with Section 3 (1) no. 1 is not apparent from the degree certificate, evidence thereof, as a rule in the form of module descriptions.
4. If applicable, evidence of completed vocational training courses, activities as a student assistant or working student as well as practical experience, in each case in relation to the teaching content and academic objectives of the consecutive master's degree program in Biomedical Engineering.

(2) The Selection Committee awards points for each selection criterion in accordance with Section 6 (2) and (3).

(3) The Selection Committee draws up a ranking list. The list documents the following for each participant in the selection process:

1. Number of points achieved for each criterion.
2. Weighted number of points for each criterion in accordance with Section 6 (1) and
3. The total number of points