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I. Legal and Administrative Provisions

Faculties

Study and Examination Regulations for the Master's Degree Program in Computational Engineering Science 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 Computational Engineering Science, 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 of the BerlHG on 19 December 2017 (Berlin Gazette of Laws and Ordinances, p. 695).*)

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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 Computational Engineering Science. 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 regulations of 29 December 2009 (TU Official Gazette 19/2010 p. 302) and the exam regulations of 29 September 2008 (TU Official Gazette 7/2009, p. 81) for the master's program in Computational Engineering Science cease to be effective three semesters after the entry into force of the 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 Computational Engineering Science 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

The goal of the degree program is to award a Master of Science degree and thus a professional degree in the field of computational engineering science. The degree program aims to impart basic skills and advanced concepts from information technology and engineering as well as the methods needed to undertake activities in construction, production, and process engineering. Graduates will be able to apply and expand relevant methods from CES as well as optimize, automate, and implement machines, processes, and techniques. Graduates will also be able to understand information technology problems and phenomena in mechanical engineering, energy and process engineering, and related disciplines and develop solutions to these problems. They will have acquired a good understanding of the fundamental principles of computer-aided design and production as well as process systems engineering. Measurement and control technology and process control form a further central component of students' training. Graduates will be qualified to responsibly apply their knowledge in a variety of fields. It is recommended that graduates continue to develop their knowledge and adapt to new demands and requirements in the field.

Students in the Computational Engineering Science master's program can further their knowledge and skills in the following areas

- Construction and production
- Process systems engineering
- Mechatronics

and prepare for a possible doctorate.

Graduates will possess the following skills and qualities:

1. Command of the natural science and information technology methods needed to identify and analyze the basic structure of a problem

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

2. Command of engineering methods needed to develop and assess physical models
3. Command of program design and evaluation methods and the ability to analyze these
4. Command of mathematical and physical principles needed to develop models for the computer-aided analysis of the technical processes they represent
5. Ability to define problems and take on the resulting tasks working within teams whose members are assigned different responsibilities, process their own work independently, incorporate the results of others, as well as communicate their own results
6. Methodological skills needed to successfully solve synthesis problems, particularly those of high complexity with balanced consideration for the technical, economic, ecological, and social framework conditions
7. Familiarity with selected fields of technology, forming a bridge between computer science, engineering principles, and professional applications
8. Transferable skills, sensitizing them to non-technical demands in the profession
9. The intercultural skills required for their professional lives
10. Sufficient practical experience gained during their studies to provide them with the interpersonal skills essential for a successful start to their careers
11. Preparation for life-long learning and a career in a range of fields through the degree program's strong focus on fundamentals
12. Students of the master's program are qualified to tackle and solve engineering problems in the context of a subsequent optional doctorate.

Computational engineering science is the science of the development and application of information technologies for the construction, optimization, and automation of machines as well as processes and production plants. The degree program aims to impart sustainable, economic, ecological, and technical concepts for computer-aided planning and automated operation.

The interdisciplinary and research-oriented degree program in Computational Engineering Science encompasses a broadly designed, advanced engineering curriculum with the following areas of focus:

- Simulation
- Optimization
- Control engineering
- Computer science

These areas are supplemented by elective courses from other engineering applications and non-technical subjects. Together they highlight the technical, economic, ecological, legal, and social aspects of computational engineering science.

Students further develop their technical and methodological skills in a project and master's thesis.

The master's examination is intended, in particular, to determine a student's suitability for doctoral studies. The master's degree fully qualifies students to commence a career in engineering. Graduates are able to work in a broad range of fields and applications including, among others, the planning, design, simulation, optimization, construction, testing, and operation of information processing systems and software in CAE, process and plant engineering, mechanical engineering, automation, and safety engineering.

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

- (1) Students may begin their studies in the winter or summer semester.
- (2) The standard period of study 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) The master's program encompasses modules amounting to 90 credit points as well as a technical internship (12 credit points) and a master's thesis (12 credit points). These modules are to be taken from the following module groups:

1. A total of 48 credit points must be earned in compulsory elective modules in the core component:
 - Computer Science and Mathematics totaling 18 CP
 - Simulation and Optimization totaling 18 CP
 - Measuring, Controlling, and Regulating totaling 12 CP
2. Profile area 18 CP
3. Project 6 CP

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

4. The elective component totals 18 CP. Elective modules enable students to acquire additional specialized and interdisciplinary skills, as well as skills qualifying them for entry to a profession, and may be selected from the entire range of subjects offered at Technische Universität Berlin, other universities and equivalent institutions of higher education within the scope of application of the Framework Act for Higher Education (HRG), and foreign universities and institutions of higher education that have been accredited as equivalent. It is recommended that students select interdisciplinary courses. They can also choose modules for learning foreign languages.

(3) 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.

(4) 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 in accordance with Section 9.

(2) The overall grade is determined in accordance with the principles outlined in Section 47 AllgStuPO. It is based on the module examinations marked in the module catalogue as being graded and forming part of the overall grade.

(3) 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. 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 professional 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. Only fully completed modules are included in the calculation of the grade. 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 24 credit points and is to be assigned a writing period of 6 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 6 months. In the event that the combined extensions exceed the stipulated maximum period of extension, the student may withdraw from the examination.

(2) The topic of the master's thesis may be rejected once, however only within the first 2 months of being issued by the responsible department of the Central University Administration.

(3) 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.

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

(5) 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.

(6) People with experience of professional activity and training can be appointed as examiners of final theses. As a rule, this applies primarily for the appointment of second reviewers. The first assessor must be an approved examiner and professor at Technische Universität Berlin.

Section 10 – Types of examination and registration for examinations

(1) The different types of assessment and the procedure for registering for module examinations are established in the AllgStuPO as amended.

(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) To register for the final exam, students must submit proof of a technical internship to the responsible department in the Central University Administration.

(4) Module exams for courses offered by other degree programs, faculties or higher education institutions may use a different format to that stipulated in the AllgStuPO.

The regulations in the examination regulations and module descriptions of the respective institution 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/computational-engineering-science-informationstechnik-im-maschinenwesen-m-sc/>

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

of 21 March 2018

On 21 March 2018, the Faculty Board of Faculty V - Mechanical Engineering and Transport Systems of Technische Universität Berlin adopted the following Admission Regulations for the master's program in Computational Engineering Science 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 – BerHGG*) in the version of 26 July 2011 (Berlin Gazette of Laws and Ordinances [GVBl.], p. 378), last amended by Article 17 of the same Act of 19 December 2017 (Berlin Gazette of Laws and Ordinances, p. 695), in conjunction with Section 10a of the Act on the Admission to Higher Education Institutions in the State of Berlin to Degree Programs with Restricted Admission (*Berliner Hochschulzulassungsgesetz – BerHZG*) 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

Section 1 - Scope of application

In conjunction with the Regulations Governing General Study and Examination Procedures (AllgStuPO) as last amended, these Admission Regulations govern the admission modalities of the consecutive master's degree program in Computational Engineering Science. The provisions of the AllgStuPO shall take precedence over the provisions of these admission regulations, unless exceptions are expressly permitted therein.

Section 2 - Entry into force

These Admission Regulations shall enter into force on the day after their publication in the Official Gazette of Technische Universität Berlin. They shall be applied for the first time to the procedures of the 2019/20 winter semester. Procedures which apply to summer semester 2019 or earlier semesters will be discontinued pursuant to Section 5 of the study regulations for the consecutive master's degree program in Computational Engineering Science at Technische Universität Berlin dated 29 December 2009.

II. Application

Section 3 - Admission requirements

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

1. A bachelor's or equivalent university degree in a degree program in Computational Engineering Science or a related degree program

2. And technical knowledge amounting to:

a	b	c	d
Subjects	Desired number of ECTS	Minimum number of ECTS	Maximum number of ECTS accepted
i. Mathematical principles			
• Analysis, Linear Algebra, Numerical Mathematics, Differential Equations	21	18	24
ii. Natural science principles			
• Mechanics, Statics, Strength Theory, Kinematics, Dynamics	18	15	21
• Thermodynamics or Fluid Mechanics	6	5	7
• Electrical Engineering, Electronics	6	5	7
• Measurement Engineering, Control	12	10	14
iii. Technical-methodological principles			
• Theory of Design	6	5	9
• Computer Science, Computer Engineering, Compute-Oriented Mathematics, Programming, Computer Systems	21	18	24
• Proof of at least	90		

Column b lists the desired number of ECTS for each subject. Applicants must submit proof of a total of 90 ECTS to fulfill the admission requirements. The desired number of ECTS in column b is not required. The minimum number of ECTS required for admission is listed in column c. The maximum number of ECTS considered in the admissions procedure is listed in column d.

(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. AllgStuPO. Supporting documents must be submitted in the original or as officially certified copies in accordance with Section 7 (1).

(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.

***) Approved by the TU Berlin Executive Board on 1 March 2019 and by the Senate Chancellery for Science and Research on 13 March 2019