



# Study and Examination Regulations

Master of Science

Technomathematics

---

Please note that this is an **unofficial translation** of the Study and Examination Regulations.  
In case of inconsistency between the German and the English version, the German version of the agreement prevails.

---

Study and Examination Regulations

AMBI.

15/2014

Please note that this is an **unofficial translation** of the **Study and Examination Regulations for the Master's Program in Technomathematics from 2 July 2014 (AMBl. TU 11/2014, p. 142ff)**

In case of inconsistency between the German and the English version the German version of the agreement prevails.

## Study and Examination Regulations for the Master's Program in Technomathematics at Faculty II – Mathematics and Natural Sciences – of Technische Universität Berlin

of 2 July 2014

On 2 July 2014, the Faculty Board of Faculty II – Mathematics and Natural Sciences – of Technische Universität Berlin adopted the following Study and Examination Regulations for the Master's Program in Technomathematics, 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.*], page 378).<sup>\*)</sup>

### Contents

#### I. General regulations

Section 1 – Scope of application

Section 2 – Entry into force, expiry

#### II. Objectives and organization of studies

Section 3 – Learning outcomes, program content, and professional fields

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

Section 4a – Admission requirements

Section 5 – Program structure

Section 5a – Internship

#### III. Requirements and conduct of examinations

Section 6 – Purpose of the Master's examination

Section 7 – Master's degree

Section 8 – Scope of the Master's examination

Section 9 – Master's thesis

Section 10 – Calculation of the overall grade

#### IV. Annexes

##### 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 conduct of examinations in the Master's program in Technomathematics. The program-specific provisions included herein supplement the current version of the Regulations Governing General Study and Examination Procedures (*AllgStu-PO*) of Technische Universität Berlin with stipulations relating specifically to this study program.

##### Section 2 – Entry into force, expiry

(1) These Regulations shall enter into force on the day after their publication in the Official Gazette of Technische Universität Berlin (*Amtliches Mitteilungsblatt*).

(2) Students enrolled in the Master's Program in Technomathematics at Technische Universität Berlin prior to the entry into force of these Study and Examination Regulations shall decide whether they wish to continue their studies in accordance with these Regulations or with the Study and Examination Regulations for the Master's Program in Technomathematics of 24 January 2006 (Official Gazette of TU Berlin 25/2006). Students must give their decision in writing to the relevant office of the university administration, and have it officially recorded by the latter, when registering for the next module examination.

(3) The previously applicable Study and Examination Regulations for the Master's Program in Technomathematics of 24 January 2006 (Official Gazette of TU Berlin 25/2006) will expire no later than the end of the eighth semester after these Study and Examination Regulations will have entered into force. Students who have not completed their studies at the time of expiry in accordance with Sentence 1 shall continue their studies in line with the present Regulations.

##### II. Objectives and organization of studies

Section 3 – Learning outcomes, program content, and professional fields

One of the most striking features in the development of almost all fields of knowledge is the ever-increasing use of mathematical methods and ways of thinking. Mathematics has long been used in the natural sciences and in technical fields. More recently, mathematical methods and procedures have been playing an ever greater role in the economic and social sciences, in medicine, biology, psychology and linguistics. This goes hand in hand with the growing efficiency of data processing, which enables the solution of increasingly complex processes. Just as diverse as the fields of application are the potential areas of deployment for mathematicians in industry, business and administration, research institutes, institutions of higher education, and universities of applied sciences. Important fields of professional activity are to be found in the worlds of mechanical engineering (for instance, strength of materials, vibration problems) and electrical engineering (for instance, control engineering, field calculations, network planning, communication technology), in the chemical industry (for instance, reactor calculations, statistical methods), in the aerospace industry (for instance, flow calculations, path determinations, stability calculations), in civil engineering (for instance, statics, stability of materials), in biology and medicine (for instance, epidemic models, diagnostic evaluations), in information technology (for instance, data compression, encryption techniques) – and indeed for the most part in all of the aforementioned areas through the use of data processing, in which regard the computer industry itself represents a significant sphere of activity for mathematicians.

Building on the skills and knowledge acquired during a relevant Bachelor's program, the Master's Program aims to impart additional skills and knowledge that will qualify graduates to take on positions of responsibility in the professional fields listed above. An in-depth study of technomathematics and a research-related final thesis are designed to enable graduates to carry out independent scientific work, and to put them in a position to be able to classify new scientific findings critically

and to apply them in a target-oriented way. In the course of their studies, students shall develop the ability to mathematize concrete problems, analyze the underlying structures, generate approaches to solutions based on methods that already exist or are in need of broadening, and deliver solutions, particularly with the aid of computers.

Mathematics students have many opportunities to carry out internships at suitable research institutes, industrial firms or data-processing companies, thereby enhancing their understanding of the professional duties of mathematicians.

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

- (1) Students may begin with the program either in the winter semester or in the summer semester.
- (2) The standard period of study, including completion of the Master's thesis, is four semesters.
- (3) The required coursework in the Master's Program amounts to 120 credits.
- (4) The teaching curriculum and the entire examination procedure are structured and organized in such a way as to enable students to complete the program within the standard period of study.

#### **Section 4a – Admission requirements**

The prerequisite for admission to the Master's Program in Technomathematics is a Bachelor's or equivalent university degree in the subject area of technomathematics.

Admission may also be granted to persons who have obtained a Bachelor's or equivalent university degree in the subject area of mathematics, business mathematics or in a related study program, provided that knowledge in one application area amounting to at least 15 credits from modules in Area 6 in accordance with Section 5 (3) of the Study and Examination Regulations for the Bachelor's Program in Technomathematics at Technische Universität Berlin can be proven.

The relevant examination board shall decide on whether the technical and content-related requirements have been fulfilled and whatever exceptions may apply.

#### **Section 5 – Program structure**

(1) Students have the right to individually determine the order of progression of their own course of study. However, they are obliged to comply with the provisions of these Study and Examination Regulations. Students are recommended to follow the chronology of modules set down in the proposed course schedules in the Annex to these Regulations. This shall not apply to obligations arising from the definition of subject-specific admission requirements for modules.

(2) The Master's Program provides for the completion of modules amounting to 90 credits in the following areas:

- Area 1: Specialization in Mathematics,
- Area 2: Technical Field,
- Area 3: Electives,
- Area 4: Mathematical Seminar

as well as the preparation of a Master's thesis (30 credits).

(3) The following credits must be acquired in the individual areas:

Area 1: Specialization in Mathematics (40 credits)

This area comprises modules amounting to 40 credits that may be selected from the entire range of courses offered by the Institute of Mathematics. In this regard, the modules must be selected in such a way that at least 20 credits are earned from advanced modules of an area of concentration listed in Annex 1.

#### **Area 2: Technical Field (28 credits)**

In this area, modules with contents from the fields of technology and the engineering sciences, amounting to 28 credits and acquired as part of a Master's Program in Engineering Sciences at Technische Universität Berlin, are to be completed. In this regard, students must continue their studies in the study program chosen for the Bachelor's program, or in the area of application evidenced in accordance with Section 4a.

The Faculty Board of Faculty II shall decide on the Master's programs, as well as the modules therefrom, that are eligible for consideration (Annex 4). A corresponding overview will be published on the website of Faculty II. In case of doubt as to the admissibility of the choice of modules made, and in exceptional cases, the examination board shall decide.

#### **Area 3: Electives (16 credits)**

This area comprises modules with coursework amounting to 16 credits that may be selected from the entire range of courses 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*), or from the range of courses offered at foreign universities and institutions of higher education that have been accredited as equivalent.

#### **Area 4: Mathematical Seminar (6 credits)**

One "Mathematical Seminar" module worth 6 credits is to be selected from the range of courses offered by the Institute of Mathematics. This module is not graded.

(4) Modules that were the subject of the Bachelor's examination of the student concerned, or that have a considerable overlap in content with courses from the respective other modules, may not be considered in Areas 1 to 4. In cases of doubt, the examination board shall decide.

(5) In the event that students, as part of their Bachelor's studies, have already selected several advanced modules from one of the fields of study listed in Annex 1, the examination board may authorize that in Area 1 only 10 credits from the advanced modules of one field of study need to be acquired.

(6) In the event that the range of courses offered does not allow a combination of modules with the required number of credits in Areas 1 to 3, a total of up to 5 credits may be transferred between the areas.

(7) At the beginning of the Master's Program, students are recommended to draw up an individual course schedule in accordance with the requirements of these Regulations, taking into account, in particular, the specific content-related requirements of the topic area desired for the completion of a Master's thesis.

An overview of the specific content-related requirements of individual topic areas, as well as of the corresponding module combinations in compliance with these Regulations, will be published on the faculty website.

#### **Section 5a – Internship**

(1) Students may carry out an internship at a business enterprise or at a company applying mathematical procedures or the methods of computer science. Based on a certificate from the

internship employer indicating the internship's schedule, content, and successful performance, the internship coordinator shall decide on whether the internship is to be recognized as an elective module (Area 3) and on its valuation as an examination worth no more than 6 credits. Prior to starting an internship, students are recommended to seek advice from the internship coordinator with regard to the internship's recognition and the number of credits that can be awarded on its completion.

(2) The Faculty Board of Faculty II shall appoint from among the persons entitled to give examinations at the Institute of Mathematics an internship coordinator responsible for making the decisions in accordance with Section 5a (3).

(3) In the event that an internship is to be considered in Area 2, the internship coordinator shall decide on the basis of a certificate issued by the internship employer whether to recognize the internship as an ungraded examination and on the number of credits to be generated on its completion. The student concerned may appeal against the internship coordinator's decision to the examination board, which will reach a final decision on the matter.

### III. 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 according to Section 3 of these Regulations.

#### Section 7 – Master's degree

On behalf of Faculty II, Technische Universität Berlin will award the academic degree "Master of Science" (abbreviated: M.Sc.) to students who have passed the Master's examination.

#### Section 8 – Scope of the Master's examination

The Master's examination consists of the module examinations pursuant to Section 5 (3) and the Master's thesis according to Section 9.

#### Section 9 – Master's thesis

(1) The Master's thesis is usually completed in the fourth course semester. It amounts to 30 credits and is to be produced within six months. In exceptional cases, and in response to a reasoned request, the examination board may extend the period for writing the final thesis.

(2) To apply for admission to the Master's thesis, students must present proof of successfully completed module examinations worth at least 18 credits from Area 2, as well as a total of no fewer than 36 credits earned in Areas 1 and 3.

This shall not apply to content-related obligations arising from the topic area in which the Master's thesis is to be written. Students have no entitlement to any specific topic area.

An overview of the specific content-related requirements of individual topic areas, as well as of the corresponding module combinations in compliance with these Regulations, will be published on the faculty website.

In exceptional cases, and in response to a reasoned request, the examination board may approve admission to the Master's thesis without such proof being provided.

(3) The topic of the Master's thesis may be rejected once, however only within the first four weeks of being issued by the responsible department of the university administration.

(4) 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*).

#### Section 10 – Calculation of the overall grade

For determining the overall grade in accordance with Section 47 (6) of the Regulations Governing General Study and Examination Procedures (*AllgStuPO*), Area 3 (Electives) and Area 4 (Mathematical Seminar) shall not be considered in the calculation of the overall grade.

## IV. Annexes

### Annex 1: Fields of study

The fields of study in Area 1 in accordance with Section 5 (3) are listed in the following.

Both introductory and advanced modules are offered in the fields of study. The Faculty Board of Faculty II shall decide on the assignment of individual modules to the fields of study and on their classification as advanced modules, if applicable. The assignment of individual modules to the fields of study and their classification will be published on the website of Faculty II. A module may be assigned to more than one field of study.

Fields of study:

- 1) Numerical Mathematics
- 2) Differential Equations, Functional Analysis, Nonlinear Optimization, Modeling
- 3) Stochastics and Financial Mathematics
- 4) Geometry and Mathematical Physics
- 5) Discrete Mathematics and Algebra

### Annex 4: Eligible study programs and modules in Area 2 (technical field)

#### 1) Master's Program in Physical Engineering Science

Modules with a total volume of 28 credits must be taken from the *core area* or the *supplementary area* of one of the fields of study

- 2.2a/2.2b Fluid Mechanics,
- 2.3a/2.3b Mechatronics,
- 2.4a/2.4b Solid State Mechanics,
- 2.5a/2.5b Thermodynamics,
- 2.6a/2.6b Technical Acoustics

in Module Group 2. The *fields of study* must be chosen in accordance with the Annex / amendment list to the Examination Regulations for the Master's Program in Engineering Science.

## **2) Master's Program in Electrical Engineering**

Modules with a total worth of 28 credits must be selected from

the *Electrical Power Engineering field of study* or the *Electronics and Information Technology field of study* in the Annex / amendment list to the Examination Regulations for the Bachelor's Program in Electrical Engineering, or from the entire range of modules offered according to the Annex / amendment list to the Examination Regulations for the Master's Program in Electrical Engineering.

In this regard, the compulsory modules, as well as modules worth at least 12 credits, must be selected from one of the fields of study of the Master's Program in Electrical Engineering.

## **3) Transport Systems**

Modules with a total worth of 28 credits must be selected from Module Groups *1 (core modules)* or *2 (profile modules)* in accordance with the Annex / amendment list to the examination regulations for one of the Master's Programs in

*Vehicle Engineering,*  
*Aeronautics and Astronautics,*  
*Transportation Planning and Operation,*  
*Naval Architecture and Ocean Engineering.*

## **4) Master's Program in Mechanical Engineering**

Modules with a total worth of 28 credits must be selected from Module Groups *1 (core modules)* or *2 (profile modules)* in accordance with the Annex / amendment list to the Examination Regulations for the Master's Program in Mechanical Engineering.