Degree Program and Examination Regulations for the Bachelor's Degree Program in Nanotechnology and the Master's degree program in Nanotechnology at the Faculty of Engineering at Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU)
– FPONT –
Dated July 13, 2023

Based on Section 9 (1) in conjunction with Section 80 (1)(1), Section 84 (2)(1), Section 88 (9), Section 90 (1)(2) and Section 96 (3) Bavarian Higher Education Innovation Act dated August 5, 2022 (**BayHIG**), FAU enacts the following degree program and examination regulations:

Contents:

Part 1: General provisions

Section 35 Scope

[1]The degree program and examination regulations stipulate conditions for admission to and provisions for examinations in the Bachelor's degree program in Nanotechnology and the consecutive Master's degree program in Nanotechnology, leading to a Bachelor of Science (BSc) and Master of Science (MSc) 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, Degree Programs in Equivalent Subjects

(1) The modules and recommended program structure of the Bachelor's degree program are set forth in **Appendix 1**.

(2) The provisions in Section 24 (1)(2)(2) **ABMPO/TechFak** do not apply to degree programs in equivalent subjects.

Section 37 Master's Degree Program, Start of Degree Program, Related Degree Programs, Teaching and Examination Language

(1) [1]The consecutive Master's degree program in Nanotechnology consists of modules worth 120 ECTS credits. [2]These include compulsory modules, modules in the core subject, elective modules and the Master's thesis module including presentation and discussion.

(2) The modules and recommended program structure of the Master's degree program are set forth in **Appendix 2**.

(3) The Master's degree program in Nanotechnology starts in both the winter and the summer semester.

(4) The provisions in Section 30 (3)(2) **ABMPO/TechFak** do not apply to degree programs in equivalent subjects.

(5) [1]In deviation from Section 4 (5) **ABMPO/TechFak**, the teaching and examination language in the Master's degree program in Nanotechnology is English. [2]Individual teaching units and examinations in (compulsory) elective modules may be held in German. [3]This shall not affect the rest of Section 4 (5) **ABMPO/TechFak**.

Part II: Special Provisions

1. Bachelor's Examination

Section 38 Scope of the Grundlagen- und Orientierungsprüfung

(1) The Grundlagen und Orientierungsprüfung, GOP, shall consist of the modules set forth in **Appendix 1**.

1. B1: Materials and their structure I - Metallic materials
2. B2: Materials and their structure II - Inorganic and organic materials
3. B9: Nanotechnology I - Characterization
4. B17: Mathematics I.

(2) The Grundlagen und Orientierungsprüfung shall have been passed if the modules listed in (1) worth 30 ECTS credits have been passed.

Section 39 Scope and Structure of the Bachelor's Examination

(1) [1]All modules in the Bachelor's degree program are compulsory. [2]The distribution over the study semesters and the number of ECTS credits to be earned in the modules as well as the type and scope of the examinations are set forth in **Appendix 1**.

(2) The Bachelor's examination shall consist of:
1. The examinations of the preliminary examination according to Section 38 (1)
2. The examinations in modules B3 – B8, B10 – B16 and B18 – B21
3. Bachelor's thesis (module B22).

(3) The Bachelor's degree program shall have been passed once the student has passed all modules pursuant to **Appendix 1** and has acquired 180 ECTS credits.

Section 40 Broadening Horizons

(1) [1]The learning outcome of module B21 (Broadening Horizons) is for students to gain intercultural competence and practical work experience. [2]Students can choose according to their own interests, taking into account the guidelines published in the module handbook, whether they want to include industrial internships, study stays abroad and/or activities as student assistants at universities, research institutions and/or in industry, each worth up to 15 ECTS credits, or language courses with a certificate worth 5 ECTS credits.

(2) As a course achievement, a report in which students present and reflect on their experiences in the respective chosen area must be submitted according to the scope and format specifications in the module handbook.

Section 41 Bachelor's Thesis

(1) [1]The Bachelor's thesis is intended to enable students to learn to solve research problems relating to nanotechnology independently and document their evidence. [2]The thesis shall have a workload of approximately 300 hours to be completed within five months. [3]The results of the Bachelor's thesis shall be presented in a presentation with a maximum length of 30 minutes followed by a discussion. [4]The date of the presentation shall be determined by the supervising lecturer at the latest when the student submits their Bachelor's thesis and the student shall be informed of the date in good time. [5] 15 ECTS credits shall be awarded for the Bachelor's thesis including the presentation.

(2) [1]The topic of the Bachelor's thesis shall be issued by a part-time or full-time university lecturer from the Department of Materials Science pursuant to Section 53 (4) **BayHIG**. [2]The chair of the Examinations Committee shall decide on any exceptions for an individual thesis at the student's request.

(3) [1]The sixth semester is recommended for completing the Bachelor's thesis. [2]Admission to the Bachelor's thesis shall be governed by Section 27 (3)(2) **ABMPO/TechFak**.

2. Master's Degree Program

Section 42 Admissions Committee for the Master's Degree Program

[1]For the Master's degree programs in Materials Science and Engineering and Nanotechnology, a Joint Admissions Committee is appointed according to Section 11 **ABMPO/TechFak**. [2]This consists of one full-time university lecturer and one research associate from each of the chairs of the Department of Materials Science at the Faculty of Engineering of FAU. [3]The chair of the admissions committee is held by a professor.

Section 43 Qualification for a Master's Degree, Certificates, Admission Requirements, Admission Subject to Conditions

(1) [1]A subject-specific degree as specified in Section 29 (1)(1) **ABMPO/TechFak** is the Bachelor's degree in Nanotechnology according to these degree program and examination regulations or an equivalent degree in Nanotechnology from another university in Germany or abroad that leads to a qualification equivalent to the Bachelor's degree completed according to these degree program and examination regulations. [2]Subject-related degrees that show no considerable differences in terms of qualification pursuant to Section 29 (1)(1) alt. 2 **ABMPO/TechFak** are Bachelor's or Diplom degrees in Materials Science and Engineering, Physics, Chemistry and degree programs with a broad focus on topics related to nanotechnology, provided the following minimum content was covered:

1. at least 10 ECTS credits in mathematics
2. at least 20 ECTS credits in physics and chemistry
3. at least 10 ECTS credits in laboratory courses and IT
4. at least 20 ECTS credits in the foundations of nanotechnology.

[3]In accordance with (5)(4) of the **Appendix to the ABMPO/TechFak**, applicants with a subject-related degree as defined in Section 29 (1)(1) **ABMPO/TechFak** or a degree as defined in Section 29 (2)(2) **ABMPO/TechFak** shall only be admitted to the Master's degree program after passing an oral admission examination according to (4).

(2) [1]As stipulated in section (2)(4) of the **Appendix to ABMPO/TechFak**, applicants are required to provide additional proof of English language skills equivalent to at least Level B2 of the Common European Framework of Reference (CEFR) by submitting either relevant school reports or certificates issued by a language school or university. [2]The following are considered suitable proof of language skills:

1. A school leaving certificate or another certificate issued by the school providing evidence that English courses have been taken at school up until a level equivalent to B2 CEFR
2. A certificate indicating that the applicant has successfully passed the Test of English as a Foreign Language (TOEFL), attaining at least 85 points in the iBT test, or the
3. International English Language Testing System (IELTS) 5.0 or above;

Other possible alternatives for proving evidence of language proficiency are listed in the table of equivalence published by the FAU Language Centre. [3]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) Applicants shall be deemed as qualified for the Master's degree program in Nanotechnology according to paragraph 5 (2)(2) of the **Appendix to ABMPO/TechFak** if they have passed the compulsory subject-related or degree-

program specific modules B6, B7 and B8 from the Bachelor's degree program in Nanotechnology according to these examination regulations with an average module grade of 3.0 or better.

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

1. Basic knowledge in materials science and engineering, physics and chemistry of condensed materials (in particular atomic structure, thermodynamic, optical, electronic and magnetic properties of materials as well as characterization methods) (50 percent)
2. Sound knowledge of nanotechnology, for example chemical materials processing or nano characterization methods (50 percent).

Section 44 Scope and Structure of the Master's Degree Program

(1) [1]Type and scope of the course and examination achievements are set out in **Appendix 2**. [2]The academic project and the Master's thesis (M12 and M14) shall be taken in a core subject in which usually 25 ECTS credits have been achieved; the core subject elective module (M5) and modules M10 or M11 should be chosen accordingly. [3]Module M13 shall be taken in one of the three core subjects in order to explore the teaching content in more depth.

(2) The Master's degree program shall have been passed once the student has passed all modules pursuant to **Appendix 2** and has acquired 120 ECTS credits.

Section 45 Core Subject Modules (M6 – M9)

(1) [1]The learning outcome of the core subject modules M6 to M9 is for students to deepen and expand their expertise (properties of materials and components and how these effect the resulting structure and specific manufacturing processes) in one essential special area of nanotechnology by applying scientific methodology in theory and laboratory practice. [2]Each Chair of the Department of Materials Science offers a core subject, with the following special areas available for in-depth study:

1. General material properties
   [1]The focus of the foundation and supplementary module is on studying the fundamental relationships between microstructural properties and the resulting mechanical properties of different materials and material composites across length scales. [2]In particular, students learn materials science fundamentals using applied examples from different material classes, such as high-temperature materials, intermetallic phases, light metals, and coating systems. [3]The core subject consolidates material and physical fundamentals and expands expertise on basic concepts in materials and fracture mechanics, the effects of microstructure on mechanical properties, and modern simulation methods. [4]Furthermore, students learn the fundamentals of material fatigue and the essential deformation and damage processes of cyclic plasticity and gain insights into the special requirements and properties of high-temperature materials.
2. Materials science and engineering for metals
   [1]The focus of the foundation and supplementary module is on deepening students' knowledge of the fundamentals and technologies of metallic materials. [2]The foundation module covers the fundamentals of phase and microstructure transformation (e.g., in the material groups titanium, nickel-based, and copper

alloys) and their relationships supported by simulations, alongside important process technologies (such as casting, forming, powder metallurgy, and joining) as well as material properties and testing. [3]The supplementary module focuses on the process and microstructure formation as well as the introduction of special (new) process technologies. [4]In terms of materials, the module explores steels, particularly high-strength steels and lightweight steel construction, as well as an introduction to the material groups of refractory metals, metallic glasses, composites and cellular metallic materials in connection with their specific manufacturing methods.

3. Glass and ceramics

   [1]The focus of the foundation and supplementary module is on exploring the physical-chemical properties of glasses and ceramics as well as their relevance in manufacturing and application. [2]The foundation module covers the properties of glasses and ceramics in equilibrium and non-equilibrium systems in terms of microstructure, physical properties (e.g., thermal, chemical, time-dependent), and phase diagrams and the resulting differences between the two material classes. [3]In particular, high-temperature processes in polycrystalline ceramics (e.g., fundamentals of sintering, diffusion mechanisms, defects) and the possibility of microstructure control (e.g., sintering parameters, composition effects) are considered. [4]The application of ceramic materials under the influence of microstructure and the design for technical use as well as material testing and characterization convey the application relevance of glass and ceramics. [5]The supplementary module focuses on the practical implementation of different manufacturing and characterization methods of ceramic materials and material-related evaluation. [6]The functional and optical properties of glasses and ceramics are particularly addressed with regard to defect structures and doping.

4. Corrosion and surface technology

   [1]The focus of the foundation and supplementary module is on the teaching of technologies and characterization of surface modifications, calculation of corrosion problems, and fundamentals of electrochemistry with relevance to practical applications. [2]The foundation module covers the technologies for surface modification and functionalization in depth and is supplemented by case studies from application and research. [3]This is particularly important in the calculation of corrosion problems to deepen the knowledge of corrosion processes. [4]The methods and procedures of electrochemical processes form the basis for a deeper understanding of modern applications in energy technology (e.g., fuel cells, battery systems). [5]The supplementary module focuses on the practical deepening of the knowledge from the foundation module within the framework of corrosion technical experiments, e.g., conducting electrochemical measurements, anodizing, and characterizing the high-temperature oxidation resistance of metals and alloys.

5. Polymer materials

   [1]The focus of the foundation and supplementary module is on the fundamentals, technology, characterization, and applications of polymer materials, polymer blends, and composites. [2]The foundation module covers processing technologies in depth and links them with mechanical engineering solutions. [3]Furthermore, model concepts for describing the viscoelastic behavior depending on time and temperature are considered and transferred to practical examples (e.g., polymer components, fibers, films). [4]The supplementary module focuses on the influence of scale on physical properties as well as the teaching of processes at interfaces in polymer material systems and the compatibility of different polymers.

[5]Furthermore, complex model concepts for describing polymer properties (e.g., molecular weight dependence, phase diagrams) are addressed.

6. Materials in Electronics and Energy Technology
   [1]The focus of the foundation and supplementary module is on the crystalline structure of solids, crystal growth, and optical and electronic properties of semiconductors as well as their applications. [2]The foundation module links quantum mechanical fundamentals, charge transport, and the type of charge carriers with electrical/optical properties (e.g., resistance, defect density, pn-junction) in crystalline solids. [3]The technologies for the production (e.g., crystal growth from melt, solution, gas phase) of various semiconductor materials and their processing (e.g., oxidation, doping, lithography) into electronic components establish the practical application relevance (e.g., silicon-based semiconductors) also through practical experiments. [4]The supplementary module focuses on thin-film processes for manufacturing semiconductor contacts and devices (e.g., displays, photovoltaics, photodetectors). [5]Further module content includes transistor-based memory materials and energy harvesting technologies.
7. Biomaterials
   [1]The focus of the foundation and supplementary module is on biomaterials, their cell-material interaction, tissue engineering and regenerative medicine, and drug-delivery systems. [2]The foundation module defines biomaterials as implant materials and covers cell-material interaction over surfaces (e.g., surface chemistry, topography, functionalization) and the interface between biomaterials and body, as well as exploring these aspects through practical experiments.
   [3]The supplementary module focuses on biomaterials for tissue engineering through the use of (multifunctional) scaffolds (e.g., for bone and soft tissue) and practical implementation.
8. Materials simulation
   [1]The focus of the foundation and supplementary module is on simulation methods for different length scales and their mathematical fundamentals as well as implementation in algorithms. [2]The foundation module deepens the mathematical and numerical methods and conveys different simulation approaches (e.g., molecular dynamics, Monte Carlo, finite elements, phase-field theory). [3]The supplementary module focuses on atomistic simulation methods as well as continuum models for material simulation, supported by mathematical discretization schemes.
9. Micro and nanostructure research
   [1]The focus of the foundation and supplementary module is on the fundamentals and physical principles of scattering probe-material interaction and their application in studying process-structure-property relationships of materials down to the atomic scale. [2]The foundation module builds on module M1 and students gain an introduction to the foundations of various imaging (e.g., BF, DF, HRTEM, STEM), diffraction (e.g., ED, CBED), spectroscopy (e.g., EDXS, EELS, EFTM) and 3D techniques (ET) and their application, in particular in the area of nanostructured materials and films. [3]In addition, students are introduced to scanning electron microscopy and its applications in nanotechnology. [4]The focus lies on the physical background of different contrast mechanisms and different characterization modes in reciprocal space and real space. [5]Lectures are always complemented with practical exercises based on the material, where students can apply their knowledge using modern software. [6]The supplementary module focuses on the practical implementation of the learned content from the foundation module. [7]In

this context, various TEM, SEM, and X-ray methods are applied to diverse sample systems using state-of-the-art microscopes during a practical course.
[4]The laboratory courses allow students to put the theory they have covered into practice.

(2) The core subject foundation module M6 worth 10 ECTS credits generally consists of one lecture (4 SWS), one tutorial (2 SWS) and one laboratory course (2 SWS), or one lecture (4 SWS), one tutorial (2 SWS) and one seminar (2 SWS), or a combination of lectures, tutorials, laboratory courses and a seminar coming to a total of 8 SWS.

(3) The core subject supplementary module M7 worth 5 ECTS credits generally consists of one lecture (2 SWS) and one tutorial (2 SWS), or one lecture (1 SWS), one laboratory course (2 SWS) and one seminar (1 SWS), or one laboratory course (4 SWS).

(4) The elective modules M8 and M9 each worth 5 ECTS credits generally consist of one lecture (2 SWS) and one laboratory course (2 SWS) or one lecture (1 SWS), one tutorial (1 SWS) and one laboratory course (2 SWS).

(5) [1]The type and scope of the examination are dependent on the skills taught in the respective module pursuant to (1) and are stated in **Appendix 2** and the module handbook. [2]Possible examinations for each foundation module are: written examination (90 min), oral examination (30 min), seminar achievement or practical achievement pursuant to Section 6 (3) **ABMPO/TechFak**. [3]Possible examinations for each core subject supplementary module (M2) and core subject elective module (M3-M9) are: written examination (45 min), oral examination (15 min), seminar achievement or practical achievement pursuant to Section 6 (3) **ABMPO/TechFak**. [4] Section 6 (2)(3) **ABMPO/TechFak** stipulates that in justified exceptional circumstances, combinations of the individual achievements stated in sentence 2 or 3 may also be possible. [5]The module handbook is published before the beginning of the semester in accordance with local practice.

Section 46 Scientific-technical elective modules (M10 + M11)

(1) [1]The overriding learning outcome of the scientific-technical elective modules M10 to M11 is for students to expand their subject-related skills going beyond the core subject modules and gain more advanced knowledge in the various subject areas. [2]Students may choose from the modules offered by the Faculty of Engineering and from those offered by the Faculty of Sciences. [3]The choice of scientific-technical elective modules, in particular in combination with the core modules M6 to M9, gives students the opportunity to tailor their profile in view of their future careers. [4]The specific learning outcomes of the individual modules depend on the chosen module and are stated in the relevant **degree program and examination regulations** and the module handbook. [5]No module may be taken twice, see Section 4 (3) **ABMPO/TechFak**.

(2)[1]The scientific-technical elective modules from the Department of Materials Science and Engineering worth 5 ECTS credits each generally consist of one lecture (1 SWS), one tutorial (1 SWS), and one laboratory course (2 SWS) or one lecture (1 SWS), one tutorial (1 SWS), and one seminar (2 SWS), or one laboratory course (4 SWS). (5)

[2]Any deviations from the provisions in sentence 1 and the module structure are set out in the module handbook.

(3) [1]The type and scope of the examinations are dependent on the skills taught in the respective module pursuant to (1) and sentence 2, in (3), and in the module handbook. Possible examinations in modules from the Department of Materials Science and Engineering are: written examination (90 or 45 min), oral examination (30 or 15 min), seminar achievement or laboratory 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]The module handbook is published before the beginning of the semester in accordance with local practice.

(4) For modules imported from other departments and the Faculty of Sciences, the provisions stipulated in the relevant degree program and examination regulations or the module handbook will apply in deviation from (3) and (4).

Section 47 Academic Project (M12)

(1) [1]The learning outcome of the Academic project module (M12) is for students to independently gather, assess, interpret and provide a clear and concise summary of scientifically and technologically relevant information on a research area of relevance for their Master's thesis. [2]The aim of the practical work is to enable students to put the knowledge they have gained from literature into practice. [3]The choice of the topic for the academic project therefore determines the topic of the Master's thesis.

(2) [1]The Academic project module usually consists of an advanced seminar (4 SWS) and self-study (8 SWS). [2]Any deviations and the exact structure of the modules are stipulated in the module handbook.

(3) [1]The type and scope of the examination are dependent on the skills for the relevant module according to paragraph (1) and the module handbook. [2] Students have to complete one graded seminar achievement for each module pursuant to Section 6 (3) **ABMPO/TechFak**, depending on the specific manner in which the module is taught. [3]The module handbook is published before the beginning of the semester in accordance with local practice.

Section 48 Soft Skills (M13)

(1) [1]The Soft Skills module generally consists of a seminar in presentation skills (3 SWS) and an excursion (1 SWS). [2]Any exceptions are detailed in the module handbook.

(2) [1]The learning outcome of the "Soft Skills" module is firstly to allow students to acquire relevant skills that will enable them to present and discuss scientific results and findings on a topic of the Master's degree program. [2]A second learning outcome is aimed at promoting personal and social skills through preparing, reporting on and presenting a topic relating to the subject for a specialist audience at a Master's level and in a manner tailored to suit the target group, as well as working under supervision in a group to develop and test subject-related applications and possibilities for implementation with respect to the chosen subject. [3]Thirdly, the choice of excursions

allows students to tailor their profile in view of their career plans and/or their own personality. [4]Section 46 (1)(3) applies.

(3) [1]The type and scope of the examination are dependent on the skills for the relevant module according to paragraph (1) and the module handbook. [2] Students have to complete one graded seminar achievement and an excursion achievement for each module pursuant to Section 6 (3) **ABMPO/TechFak**, depending on the specific manner in which the module is taught. [3]The module handbook is published before the beginning of the semester in accordance with local practice.

Section 49 Requirements for Admission to the Master's Thesis

(1) The requirements for admission to the Master's thesis(Module M14) shall be as follows:

1. Acquiring at least 60 ECTS credits in the Master's degree program
2. Submission of relevant certificates if admission to the Master's degree program was granted with conditions according to Section 29 (2)(2) **ABMPO/TechFak**.

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

Section 50 Master's Thesis

(1) [1]The Master's thesis module shall be worth 30 ECTS credits. [2]It consists of the written Master's thesis worth 27 ECTS credits and the presentation worth 3 ECTS credits.

(2) [1]The Master's thesis is intended to demonstrate students' ability to solve scientific problems in the field of nanotechnology independently. It shall usually deal with a scientific subject from the core subject. [2]The thesis shall have a workload of approximately 825 hours to be completed within six months. [3]Section 41 (2) shall apply accordingly. [4]The Master's thesis shall be written in English. [5]In justified exceptional cases, e.g., if the scientific language in the field of the Master's thesis topic is predominantly German, the Examinations Committee may allow the thesis to be written in German upon request.

(3) [1]In addition to the Master's thesis, students shall hold a presentation lasting approximately 30 minutes presenting the Master's thesis and its results, followed by a discussion. [2]The date of the presentation shall be determined by the supervisor at the latest by the date the Master's thesis is due, and the student shall be informed of the date in good time.

Part III: Transitory and Final Provisions

Section 51 Legal Validity

(1) [1]These degree program and examination regulations shall come into effect on October 1, 2023. [2]They shall apply to all students who start the Bachelor's or Master's degree program in Nanotechnology in the winter semester 2023/2024 or later.

(2) [1]At the same time, the degree program and examination regulations for the Bachelor's degree program in Nanotechnology and the Master's degree program in

Nanotechnology at the Faculty of Engineering at Friedrich Alexander Universität Erlangen-Nürnberg (FAU) – **FPONT** – dated December 15, 2008, last amended by statute of September 29, 2021 shall become invalid as of September 30, 2027. [2]Students who are already enrolled in the Bachelor's degree program in Nanotechnology or the Master's degree program in Nanotechnology at the time these degree program and examination regulations come into effect shall complete their studies according to the version of the degree program and examination regulations applicable to them as stated in sentence 1. [3]Examinations in accordance with previous versions of these examination regulations will be offered for the last time in summer semester 2027 for the Bachelor's degree program and in summer semester 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 **FPONT**.

Appendix 1: Structure of the Bachelor's Degree Program in Nanotechnology

No.	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		1. sem.	2. sem.	3. sem.	4. sem.	5. sem.	6. sem.	
B1	**Materials and their structure I - Metallic materials (GOP)**	Materials and their structure	2	1			**7.5**	3.5						EA (WE, 90 min)
		Fundamentals of metallurgical technology	1	1				2.5						
		Supplements to materials and their structure		1				1.5						
B2	**Materials and their structure II - Inorganic and organic materials (GOP)**	Non-metallic inorganic materials	1	1			**10**		2.5					EA (WE, 90 min) + CA (LA)
		Organic materials	1	1					2.5					
		Exercises on non-metallic materials		2					2.5					
		Labworks for NT I			2				2.5					
B3	**Materials science I - Mechanics and structural characterization**	Mechanical properties	2				**12.5**			2.5				EA (WE, 90 min) + CA (LA)
		Characterization and inspection of materials	1	1						2.5				
		Exercise on mechanical properties and characterization		2						2.5				
		Labworks for NT II			4					5				
B4	**Materials science II - Functional properties of materials**	Properties and characterization of functional materials I	1	1			**12.5**				2.5			EA (WE, 90 min) + CA (LA)
		Properties and characterization of functional materials II	1	1							2.5			
		Exercises on characterization and properties		2							2.5			
		Labworks for NT III			4						5			
B5	**Data acquisition and modeling**	Scientific computing	1	1			**10**				2.5			EA (WE, 90 min)
		Introduction to simulation methods	1	1						2.5				
		Measurement analytics and sensor technology	1	1						2.5				
		Jupyter notebooks in use for measurement analytics	1	1							2.5			
B6	**Applied materials science I - Materials with different bonding types**	General material properties	1	1			**7.5**					2.5		EA (WE, 90 min)
		Polymer materials	1	1								2.5		
		Materials science and engineering for metals	1	1								2.5		

No.	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		1. sem.	2. sem.	3. sem.	4. sem.	5. sem.	6. sem.	
B7	**Applied materials science II Structure and functions of materials A**	Glass and ceramics	1	1			**7.5**					2.5		EA (WE, 90 min)
		Materials in electrical engineering	1	1								2.5		
		Micro and nanostructure research	1	1								2.5		
B8	**Applied materials Science III Structure and functions of materials B**	Materials simulation	1	1			**10**					2.5		EA (WE, 90 min) + CA (LA)
		Biomaterials	1	1								2.5		
		Corrosion and surface technology	1	1								2.5		
		Labworks for NT IV			2							2.5		
B9	**Nanotechnology I - Characterization (GOP)**	Nano I: Introduction to nanotechnology	1	1			**5**	2.5						EA (WE, 60* min)
		Nano II: Characterization	1	1				2.5						
B10	**Nanotechnology II - Thermodynamics & kinetics of materials**	Solid-state kinetics	1	1			**5**		2.5					EA (WE, 60* min)
		Solid state thermodynamics	1	1					2.5					
B11	**Nanotechnology III - Nanostructures**	Nano III: Materials	1	1			**5**			2.5				EA (WE, 60* min)
		Particles	1	1						2.5				
B12	**Nanotechnology IV - Semiconductors**	Nano devices, nano sensors	1	1			**5**				2.5			EA (WE, 60* min)
		Nano IV: Semiconductor devices	1	1							2.5			
B13	**Quantum mechanics for nanotechnology**	Quantum mechanics	4	2			**7.5**			7.5				EA (WE, 90 min)
B14	**Sold-state physics for nanotechnology**	Solid-state physics	4	2			**7.5**				7.5			EA (WE, 90 min)
B15	**Experimental physics I**		3	1			**5**	5						EA (WE, 90 min)
B16	**Experimental physics II**		3	1	2		**7.5**		7.5					EA (WE, 90 min) + CA (LA)
B17	**Mathematics for NT 1 (GOP)**		4	2			**7.5**	7.5						EA (WE, 90 min) + CA (TA)
B18	**Mathematics for NT 2**		4	2*			**7.5**		7.5					EA (WE, 90 min) + CA (TA)
B19	**General and inorganic chemistry for MWT/NT**		4				**5**	5						EA (WE, 45 min)
B20	**Elective module from the university module catalog**		4				**5**					5		CA[1]

No.	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		1. sem.	2. sem.	3. sem.	4. sem.	5. sem.	6. sem.	
B21	**Broadening Horizons according to Section 40**						**15**						15	CA: see Section 40 (2)
B22	**Bachelor's thesis**	Bachelor's thesis					**15**						12	EA (Bachelor's thesis) + EA (presentation, 30 min plus discussion) (80 % + 20 %)
		Presentation											3	
Total SWS and ECTS credits:			**63**	**45**	**12**	**0**	**180**	**30**	**30**	**30**	**30**	**30**	**30**	
			120											

* **Editorial note**: To be corrected with an amendment statute.

[1] The type and scope of the examination depend on the specific manner in which the respective module is taught, see module handbook for details.

Key:
GOP: Grundlagen- und Orientierungsprüfung
EA: graded examination achievement, see Section 6 (3) sentence 9 **ABMPO/TechFak**
CA: ungraded course achievement, see Section 6 (3) sentence 10 **ABMPO/TechFak**
WE: written examination
TA: tutorial achievement
LA: laboratory achievement, see Section 6 (3) sentence 4 **AMBPO/TechFak** and module handbook
SA: seminar achievement, see Section 6 (3) sentences 7 and 8 **ABMPO/TechFak** and module handbook
ExA: excursion achievement
BT: Bachelor's thesis

Appendix 2: Structure of the Master's Degree Program

No.	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		1. sem.	2. sem.	3. sem.	4. sem.	
M1	**Nanocharacterization**	Electron microscopy	2				**10**	3				EA: (oral 30 min)
		Nanospectroscopy	2					3				
		Scanning electron microscopy / nanoindentation	2	1					4			
M2	**Laboratory course: Synthesis/characterisation**				5		**5**	5				LA
M3	**Computational nanoscience**		2	2			**5**		3	2		EA (written examination, 45 min)
M4	**Top-down nanostructuring**	Nanoelectronics	2				**10**		3			EA: (oral 30 min)
		Photolithography	2	1				4				
		Plating technology	2					3				
M5	**Bottom-up nano synthesis / self-assembly**	Molecular nanostructures	2				**10**			3		EA: (oral 30 min)
		Nanotechnology of disperse systems	2	1						4		
		Self-assembly on surfaces	2						3			
M6	**Core subject – foundational module**	see Section 45	4	(0-4)	(0-4)	(0-2)	**10**	5	5			see Section 45
M7	**Core subject – supplementary module**	see Section 45	(0-2)	(0-2)	(0-4)	(0-2)	**5**	5				see Section 45
M8	**1. Elective module in materials science and engineering from core subject**	see Section 45	(0-2)	(0-2)	(0-4)	(0-2)	**5**		5			see Section 45
M9	**2. Elective module in materials science and engineering from core subject**	see Section 45	(0-2)	(0-2)	(0-4)	(0-2)	5	3	2			see Section 45
M 10	**1. Elective module: Engineering or sciences (from Faculty of Engineering including materials science or Faculty of Sciences)**	see Section 46	(0-2)	(0-2)	(0-4)	(0-2)	**5**		5			CA, see Section 46

No.	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		1. sem.	2. sem.	3. sem.	4. sem.	
M 11	**2. Elective module: Engineering or sciences (from Faculty of Engineering including materials science or Faculty of Sciences)**	see Section 46	(0-2)	(0-2)	(0-4)	(0-2)	**5**			5		CA, see Section 46
M 12	**Academic project**	Literature research and methods				4	**10**			5		SA
		Advanced seminar				4				5		
M 13	**Soft skills pursuant to Section 48**	Presentation techniques				3*	**5**			4		EA: see Section 48 (3)
		1 Excursion				1*				1		
M 14	**Master's thesis**	Master's thesis					**30**				27	EA (MT) + EA (Presentation 30 min and discussion) (90 % + 10 %)
		Presentation									3	
Total SWS and ETCS credits:			**24 - 34**	**5 - 19**	**5 - 29**	**12 - 24**	**120**	**31**	**30**	**29**	**30**	
			46–106									

*** Editorial note:** The provisions stipulated in Section 48 (1) shall apply; the details in the degree program structure will be corrected by amendment statute.

Key:
EA: graded examination achievement, see Section 6 (3) sentence 9 **ABMPO/TechFak**
CA: ungraded course achievement, see Section 6 (3) sentence 10 **ABMPO/TechFak**
WE: written examination
o: oral examination
LA: laboratory achievement, see Section 6 (3) sentence 4 **AMBPO/TechFak** and module handbook
SA: seminar achievement, see Section 6 (3) sentences 7 and 8 **ABMPO/TechFak** and module handbook
MT: Master's thesis