Technische Universität Dresden
Faculty of Mechanical Science and Engineering

Study Regulations for the Diploma degree programme Materials Science

From 29 April 2019

On the basis of § 36 paragraph 1 of the Saxon Higher Education Freedom Act (Sächsisches Hochschulfreiheitsgesetz) in the version published on 15 January 2013 (SächsGVBl. p. 3), Technische Universität Dresden enacts the following study regulations as statutes.

Table of contents

§ 1
Scope

Based on the Saxon Higher Education Freedom Act and the examination regulations, these study regulations govern the objectives, content, structure and procedure of the study programme for the Diploma degree course in Materials Science at the Technische Universität Dresden.

§ 2
Aims of the study

(1) Materials scientists are high-performing individuals who meet the growing challenges in practice and science through a holistic research-oriented education and have the necessary leadership and social skills. They possess comprehensive basic knowledge of natural sciences and engineering and master methods to recognise, abstract and solve problems in their subject (analysis, modelling, simulation, design, evaluation). Due to the acquired holistic problem-solving competence, they can successfully work on engineering problems with balanced consideration of technical, economic, ecological, social and ethical boundary conditions. They can organise and take on tasks in teams based on the division of labour, work independently, take on the results of others and communicate their own results in the team and beyond for different target groups. Due to the increasing research orientation, they are familiar with current research questions in their subject and related fields and have insights into methodology and the state of research.

(2) Graduates are able to meet the requirements in professional practice in the strongly interdisciplinary field of materials science due to their scientific-technical knowledge, mastery of specialist knowledge and scientific methods. They are able to apply their knowledge and, due to a high degree of general education as well as existing specialist knowledge, are able to fulfil their economic, social and ecological responsibilities. They are able to make professional and social judgements early in their professional development. Possible occupational fields can be found in the areas of development and research of properties, the testing and further development of a wide range of materials and their manufacturing processes. Graduates have the basis for the optimal and efficient processing of materials such as metal, ceramics or plastics and can work, for example, in companies in the metalworking, chemical or ceramic industry, the wood or glass industry or plastics processing, but also in mechanical and plant engineering, in medical technology or with public authorities. In addition, graduates have opportunities for professional work in scientific institutions, testing and expert bodies, in the public sector and as freelancers by developing and marketing their own products, ideas and processes.

(3) Graduates possess the necessary socialisation skills in the business environment and have intercultural competence that enables them to work together with people from other cultural backgrounds and solve professional problems together. They can reflect on their actions and decisions on the basis of ethical and ecological aspects, integrate corresponding values into their work, translate visions into concrete action steps and initiate change processes.

§ 3
Access requirements

The prerequisite for admission to the degree programme is a general higher education entrance qualification, a subject-specific higher education entrance qualification in the relevant subject area or a higher education entrance qualification recognised as equivalent by the higher education institution.

§ 4
Start and duration of studies

(1) The degree programme can be commenced in the winter semester.

(2) The standard period of study is ten semesters and includes attendance, self-study, supervised practical periods and the Diploma examination.

§ 5
Teaching and learning methods

(1) The course content is structured in modules. In the individual modules, the teaching content is conveyed, consolidated and deepened through lectures, exercises, practicals, work placements, excursions, language courses, self-study and tutorials. In modules that are recognisably subject to several study regulations, synonyms are permitted for teaching and learning methods with the same content.

(2) Lectures introduce the subject matter of the modules. Exercises enable the application of the subject matter in exemplary sub-areas. Internships serve the application of the taught material as well as the acquisition of practical skills in potential professional fields. In work placements, the student is introduced to the practical occupational activity by working on technical-planning and operational-organisational tasks. Excursions enable students to experience the acquired knowledge in practical application and to get to know potential occupational fields. Language courses impart and train knowledge, skills and abilities in the respective foreign language. Students develop communicative and intercultural competence in an academic and professional context as well as in everyday situations. Self-study enables students to acquire basic as well as in-depth subject knowledge independently with the help of various media (teaching materials, literature, internet, etc.) in individual work or in small groups. In tutorials, students, especially first-year students, are supported in acquiring practical and theoretical skills.

§ 6
Structure and sequence of studies

(1) The degree programme has a modular structure. The courses are spread over nine semesters. The tenth semester is used to write the Diploma thesis. The eighth and ninth semesters are designed in such a way that they are particularly suitable for a temporary stay at another university (mobility window). Part-time study is possible in accordance with the regulations on part-time study.

(2) The degree programme comprises 26 compulsory modules and compulsory elective modules totalling 50 credit points, which allow the student to choose a focus. The choice of compulsory elective modules is binding. A one-time change of choice is possible; it is made by a written application of the student to the examination office, in which the compulsory elective module to be replaced and the newly chosen one are to be named.

(3) Qualification goals, contents, teaching and learning methods, requirements for participation, usability including any combination restrictions, frequency, workload and duration

of the individual modules can be found in the module descriptions (Annex 1).

(4) The courses are held in German or in English according to the module descriptions.

(5) The appropriate allocation of the modules to the individual semesters, the observance of which enables the completion of the degree programme in the standard period of study, as well as the type and scope of the courses included in each case and the number and standard time of the required study and examination achievements are to be taken from the attached study schedule (Annex 2) or an individual study schedule confirmed by the faculty for the part-time degree programme.

(6) The range of compulsory elective modules as well as the study schedule can be changed by the Faculty Council on the proposal of the Study Commission. The current range of compulsory elective modules shall be announced at the beginning of the semester in the usual manner of the faculty. The amended study schedule shall apply to the students to whom it is announced in the customary manner at the beginning of the semester. The examination board shall decide on exceptions to sentence 3 upon application by the student.

§ 7
Content of the study programme

(1) The essential contents include, in particular, differential and integral calculus, linear algebra, stochastics, atomic structure, energetic consideration of chemical reactions, basic concepts of thermodynamics and catalysis, basic principles of cost accounting with cost types, cost centres and cost unit accounting as well as the structure of business accounting, study and work-related communication, mechanics, thermodynamics, electricity and magnetism, wave mechanics and optics, equilibrium of plane and spatial structures, moments of area, Differential calculus for functions of several variables, ordinary differential equations and differential geometry, basic knowledge of organic chemistry, relationships between charge, electric current, electric voltage, power and energy, Fourier series, basics of producing and understanding technical documentation, use of complex computer systems, methods of software technology, material properties and their causes as well as possibilities of influencing and changing them, material production processes for important metallic materials, manufacturing fundamentals of component manufacture by forming, machining and joining, fundamentals and applications of procedures for determining the structural and damage state of materials, fundamentals of steels and cast iron as well as aluminium, titanium, nickel and magnesium alloys, chemical-physical fundamentals of ceramics, fundamentals of manufacture, structure, structural principles including processing and application-relevant material properties as well as application of polymer materials and biomaterials, fundamentals of modelling the properties of materials, Theoretical and practical basics of grinding, contrasting and microscopic microstructure analysis, powder metallurgical processes and theoretical basics of sintering processes, basics of chemical equilibria in materials, the structural chemistry of compound structures and the basics of solid-state reactions, measures for corrosion protection and methods of material selection, social science, environmental protection, work science and organisation as well as business and patent law.

(2) The area of Fundamentals and Methods includes, in particular, the solution of field equations and variational problems in materials science, mathematical and physical fundamentals of molecular dynamics simulations, collective molecular oscillations, the Monte Carlo method and electronic structure, ionic bonding, covalent bonding, metallic bonding as well

as Van der Waals interactions, thermomechanical properties of atomic oscillations, fundamentals of quality assurance and statistics in materials engineering, thermoelastic properties of heterogeneous materials, basics of the phenomenological description of the alternating deformation behaviour of materials, basics of the interaction of electron and X-rays in the solid state and method-specific characteristics of spectroscopy procedures, thermophysical properties of metallic materials at high temperatures, atomic force microscopy, electron microscopy, micro-computer tomography as well as the rules for alloy design and the procedures for alloy production.

(3) The area of Applied Materials Science includes in particular an overview of degradable materials and their biological environment in the recipient tissue, requirement profiles for non-biodegradable materials and surface conditions in implantology, mechanical properties of biological materials, fundamentals of the processes involved in the contact of biomaterials with biological systems, basic interrelationships of tissue regeneration and reconstruction (tissue engineering), dental implantology, bone replacement materials, manufacture and production of different types of dental prostheses, the electronic properties and lattice vibrations of metallic and semiconducting solids, structure and properties of technically relevant functional ceramics, fundamentals of materials science and component technology of materials of micro- and nanoelectronics, description of functional materials on the basis of their structure-property relationships, surface coating processes as well as structure, production and application of modern layer architectures, strategies of material design from different types of components, Properties of nanostructured materials, physical top-down and biological/chemical bottom-up methods, the basics of modelling structure formation and microstructure development in materials, nanomaterials and nanoparticles as well as the methods for characterising nanomaterials and their application in environmental technology.

§ 8
Credit points

(1) ECTS credit points document the average workload of students as well as their individual study progress. One credit point corresponds to a workload of 30 hours. As a rule, 60 credit points are awarded per academic year, i.e. 30 credit points per semester. The total workload for the degree programme corresponds to 300 credit points and includes the forms of teaching and learning described in the module descriptions in terms of type and scope, the course and examination achievements as well as the Diploma thesis and the colloquium.

(2) The module descriptions indicate how many credit points can be acquired through a module in each case. Credit points are acquired if the module examination has been passed. Section 27 of the examination regulations remains unaffected.

§ 9
Student advisory service

(1) General student counselling is provided by the Central Student Counselling Office of the Technische Universität Dresden and covers questions regarding study opportunities, enrolment modalities and general student matters. The student counselling of the Faculty of Mechanical Science and Engineering is responsible for the academic counselling during the studies. This academic counselling supports the students in particular in questions of study design.

(2) At the beginning of the third semester, every student who has not yet completed a course

of study shall take part in a course guidance session.

§ 10
Adaptation of module descriptions

(1) In order to adapt to changed conditions, the module descriptions can be changed in a simplified procedure within the framework of an optimal study organisation with the exception of the fields "Module name", "Qualification goals", "Contents", "Teaching and learning methods", "Requirements for the award of credit points" as well as "Credit points and grades".

(2) In a simplified procedure, the Faculty Council of the Faculty of Mechanical Science and Engineering decides on the amendment of the module description on the proposal of the Study Commission. The changes are to be published in the customary manner of the faculty.

§ 11
Entry into force, publication and transitional provisions

(1) These study regulations shall enter into force on 1 June 2019 and shall be published in the Official Announcements of the Technische Universität Dresden.

(2) It applies to all students newly enrolled in the Diploma degree programme in Materials Science for the winter semester 2019/2020 or later.

(3) For students enrolled earlier than the winter semester 2019/2020, the study regulations for the Diploma degree programme in Materials Science previously valid for them before the entry into force of these regulations shall continue to apply.

(4) These study regulations shall apply from the winter semester 2020/2021 for all students enrolled in the Diploma degree programme in Materials Science.

(5) In the case of transfer in accordance with Paragraph 3 or Paragraph 4, the module examinations already taken, including the grades, shall be taken over primarily and individual examinations shall also be taken over subordinately on the basis of equivalency tables determined by the examination board and announced in the usual manner at the faculty. on the basis of equivalency tables, which are determined by the examination board and published as customary in the faculty. With the exception of § 15 Paragraph 5 of the Examination Regulations, module examinations and examinations not graded with at least "sufficient" (4.0) or "passed" shall not be transferred. In principle, the module grade is not recalculated on the basis of the grades of exclusively transferred examinations; exceptions can be found in the equivalency tables.

Issued on the basis of the resolution of the Faculty Council of the Faculty of Mechanical Science and Engineering of 19 December 2018 and the approval of the Rectorate of 19 February 2019.

Dresden, 29 April 2019

The Rector
of the Technical University of Dresden

Prof. Dr.-Ing. habil. DEng/Auckland Hans Müller-Steinhagen