Technische Universität Dresden
Faculty of Mechanical Science and Engineering

Study Regulations for the Diploma degree programme in Mechanical Engineering

From 17 May 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.

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§ 1
Scope

On the basis of 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 programme in Mechanical Engineering at the Technische Universität Dresden, which can be completed both as a face-to-face course and as a distance learning course.

§ 2
Aims of the study

(1) Students have a broad but at the same time detailed and critical understanding of the subject of Mechanical Engineering and are able to meet the growing challenges in practice and science through the holistic research-oriented education. They possess comprehensive basic knowledge of natural sciences and engineering. The students master appropriate methods to recognise, abstract and solve problems in their subject (analysis, modelling, simulation, design, evaluation). They have holistic problem-solving competence and can successfully work on engineering problems taking into account new strategic approaches as well as 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 on them independently, take on the results of others and specifically 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. In addition, they possess the necessary socialisation skills in the operational environment.

(2) Graduates are able to meet the requirements in the field of Mechanical Engineering in professional practice through their scientific-technical knowledge, mastery of specialist knowledge and scientific methods and are able to apply their knowledge. Possible occupational fields can be found in the areas of development, design, work preparation and production, the technical service sector as well as teaching and training at home and abroad in various application sectors. Future employers may be capital goods companies, technology companies or manufacturing companies in the commercial industries. Fields of employment include, for example, companies and institutions in mechanical engineering and equipment manufacturing, measurement and automation technology, automotive engineering and its supplier industry, the plastics processing industry, aerospace technology, energy technology and the textile processing industry. Other opportunities open up in scientific institutions, testing and expert bodies, in the public sector and in freelance work. The development and marketing of one's own products, ideas and processes also opens up promising prospects for the future.

(3) Due to a high level of general education as well as existing professional knowledge, students are enabled to meet their economic, social and ecological responsibilities. They are able to reach professional and social judgement early in their professional development. The ability to take a holistic view of global contexts in conjunction with an awareness of social responsibility enables graduates in various contexts of professional life. Graduates are universally applicable specialists with cross-disciplinary knowledge and the ability to think in a networked manner; they can combine technical, economic and social competence.

§ 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 course content is taught, consolidated and deepened through lectures, exercises, practicals, work placements, seminars, language courses, self-study, tutorials and projects. In the distance learning programme, the lectures and exercises are replaced by blocked consultations with the same content. In modules that are recognisably subject to several study regulations, synonyms are permissible 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 through his or her cooperation in technical-planning and operational-organisational tasks. Seminars enable students to inform themselves about a selected problem area on the basis of specialist literature or other materials under guidance, to present what they have worked out, to discuss it in the group and/or to present it in writing. Language courses impart and train knowledge, skills and abilities in the respective foreign language. They 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 skills. In projects, the connection between theory and practice is supported and special topics are developed with the inclusion of interdisciplinary questions. In particular, projects enable the application and deepening of methodological and social skills. In consultations, the material areas of the modules are presented and discussed and the students are given the opportunity to discuss the acquired teaching material and solve exercises.

§ 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. In addition, within the framework of the cooperation agreement for the implementation of a binational study programme with a double degree, there is the possibility for a stay with a cooperation partner in accordance with the cooperation agreement.

(2) The degree programme comprises 22 compulsory modules and one field of study, at the student's choice, with the compulsory modules or compulsory elective modules provided according to the study schedule (Annex 2). The following fields of study can be selected: General and Structural Mechanical Engineering, Power Engineering, Automotive and Railway Vehicle Engineering, Lightweight Engineering, Aerospace Engineering, Production Engineering, Simulation Methods in Mechanical Engineering as well as Processing Machines and Textile Machines Engineering. In the distance learning programme, students can choose from the following fields of study: General and Structural Mechanical Engineering, Power Engineering, Aerospace Engineering and Production Engineering. The choice of the field of study and the compulsory elective modules is binding. A one-time change of choice is possible in each case; it is made by a written application of the student to the examination office, in which the field of study to be replaced and the newly chosen field of study or the compulsory elective module to be replaced and the newly chosen compulsory elective module must be named in each case.

(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) If participation in an elective or non-elective course of a compulsory elective module is limited by the number of available places according to the module description, the selection of participants shall be made according to the order of enrolment for the corresponding course. The form and deadline of the enrolment option shall be announced to the students in good time in the usual manner of the faculty.

§ 7
Content of the study programme

(1) The essential contents include in particular differential and integral calculus, linear algebra and stochastics, equilibrium of plane and spatial load-bearing structures, moments of area,

tensile, compressive and shear stress, stress and distortion states as well as the calculation of translational movements, the methods of physics, the periodic system and the fundamentals of chemical bonds, the manufacture of products in mechanical, plant and vehicle engineering, the fundamentals of dimensioning components, calculation methods for electrical direct, alternating and three-phase circuits, the use of complex computer systems and methods of software technology, Properties of thermodynamic systems, application of the conservation laws of mass, energy and momentum, consideration of measurement uncertainties, the measurement of electrical and non-electrical quantities, sensor technology and the description of dynamic behaviour, basic features of cost accounting with cost types, cost centres and cost unit accounting as well as the structure of company accounting, study and occupation-related, written and oral communication of professional and scientific language, social science, environmental protection, work science and organisation, business and patent law.

(2) Natural science and engineering fundamentals with a strong emphasis on Mechanical Engineering processes, methods and applications create the prerequisites for study in one of the eight elective compulsory fields of study, giving students the opportunity to focus on one area of Mechanical Engineering.

1. The field of study General and Constructive Mechanical Engineering comprises fundamentals and methods for the development of Mechanical Engineering products and systems, for the solution of typical machine-dynamic problems and for the constructive design, layout and use of essential mechanical, electrical and fluidic drive elements and systems. Further contents of the field of study are simulation processes in drive technology, tools and methods of product development, transport technology and system planning in intralogistics, mobile machines and their applications in process chains, components and systems of hydraulics, pneumatics and sealing technology, vibration analysis and technical diagnostics, materials and damage analysis, design, design processes and design tools, as well as the interdisciplinary development of complex mechatronic products.
2. The field of study Power Engineering covers fundamental aspects of fluid mechanics relevant to energy technology, process thermodynamics, heat and mass transfer, energy machines, refrigeration and air conditioning technology, non-fossil primary energy utilisation as well as heat exchangers and storage systems. Further contents of the field of study are construction and modes of operation of energy machines, building energy technology and heat supply, Refrigeration, cryogenics and compressor technology, regenerative and conventional energy supply, analytical and numerical methods in energy technology as well as hydrogen and nuclear energy technology.
3. The field of study Automotive and Railway Vehicle Engineering includes fluid-technical and electrical drive systems, fundamentals of dynamic dimensioning of machines, development processes and development methods in vehicle construction, construction materials, fundamentals of operational stability and special mobile cooling tasks. Further contents of the field of study are vehicle components and their functions, development processes for drive systems, mechatronic systems, diagnostics, acoustics, vehicle and road safety, networked and automated driving, motorbike technology and commercial vehicle technology, as well as the basics of rail vehicles, the necessary supporting and running gear, drive and brake technology for rail vehicles, train conveying mechanics, and the design and construction of rail vehicles.
4. The field of study Lightweight Engineering comprises the design, calculation, production and testing of modern functionally integrative lightweight construction products in multi-material design from materials with or without reinforcing materials, in particular the presentation of the complex interactions between the metals, plastics, ceramics, natural materials or composite materials used with the respective direction-independent or direction-dependent property characteristics, the material-specific design concepts, the analytical and numerical calculation methods as well as the material-specific production processes with adapted process control and tool design. Further contents of the field of study are constructive and

technological methods for increasing the material and component functionality.

5. The field of study Aerospace Engineering covers fundamentals for the development of technical systems of aerospace engineering including fluid mechanics and aerodynamics, flight mechanics as well as flight and space propulsion, structural mechanics and operational stability, aircraft structures as well as space systems and propulsion. Further contents of the field of study are aircraft manufacturing, flight dynamics and flight control systems, design of space missions as well as the modelling of turbulent flows.
6. The field of study Production Engineering comprises the basics of manufacturing processes, production and logistics, production planning and work science as well as the basics of machine tools. Further contents of the field of study are the selection, application and development of production processes and tools, safeguarding by means of production measurement technology, the development, constructive design and use of machine tools and production equipment including control technology, process design, factory planning and factory operation related to parts production and assembly, as well as the labour science design of technical products, machines and production systems and the assessment of hazards and risks.
7. The field of study Simulation Methods in Mechanical Engineering includes numerical methods (e.g. finite elements) as well as methods of fatigue and operational strength, material modelling of continuum mechanics, active and passive structures, damage and fracture mechanics as well as multi-field problems, the solution of differential equations in space and time, tensor calculation and stability analysis, fundamentals of multi-scale continuum mechanical modelling, as well as multi-body systems and fundamentals of system dynamics and vibration theory. Further contents of the field of study are compressible flows in tubes, nozzles and diffusers as well as turbulent flows and multiphase flows and their simulation on high-performance computers, basics and methods for the development of products in the product development process, the preparation of CAD models as well as methods of 3D data acquisition, data preparation and digitisation. The content of the field of study also includes experimental methods and experimental techniques as well as methods of measured value processing, experimental modal analysis and mechanism dynamics, the fundamentals of rheometry and rheology as well as the fundamentals of typical aeroelastic phenomena in aircraft.
8. The field of study Processing Machines and Textile Mechanical Engineering covers aspects of machine, technology and product development along the entire process chain, starting with mass consumer goods such as food or pharmaceuticals up to textile high-tech products for technical or medical applications as well as composites, the constructive development of machines and their dynamically appropriate design and layout, associated system analysis and diagnostics as well as machines and technologies for high-performance, functional and biomedical fibres and yarn constructions. Further contents of the field of study are control and drive technologies of special processing machines such as packaging machines, food and pharmaceutical machines, their interlinking and project planning, drive solutions required for this including design and optimisation, special technological aspects of the processing of complex textile constructions for technical applications, implants and tissue engineering, lightweight structures based on fibre composites, functionalisation and boundary layer design as well as joining technology of flexible materials.

§ 8
Credit points

(1) ECTS credits document the average workload of the 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 28 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 shall apply to all students newly enrolled in the Diploma degree programme in Mechanical Engineering in 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 Mechanical Engineering 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 Mechanical Engineering.

(5) In the case of transfer according to Paragraph 3 or Paragraph 4, the module examinations

already completed, including the grades, shall be transferred ex officio, and individual examination performances shall also be transferred ex officio on the basis of equivalence tables which are determined by the Examination Committee and announced in the customary manner of the faculty. With the exception of § 16 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 15 August 2018 and the approval of the Rectorate of 15 January 2019.

Dresden, 17 May 2019

The Rector
of the Technical University of Dresden

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