

The present English version of the study regulations is a non-official version. It has no legal binding effect. Only the German version is legally binding.

Study regulations for the consecutive Master programme
Distributed Systems Engineering

as per (date after being signed by the rector)

Pursuant to § 36 of the Law Governing the Universities in the Free State of Saxony (Sächsisches Hochschulgesetz - SächsHSG) of 10 December 2008 (SächsGVBl. p. 900), last amended by article 10 of the Act of 26 June 2009 (SächsGVBl. pp. 375, 377), the Technische Universität Dresden enacts the following Study Regulations as a statute.

Summary

- § 1 Area of applicability
- § 2 Aims of the programme
- § 3 Admission requirements
- § 4 Beginning and duration of studies
- § 5 Types of teaching and learning
- § 6 Structure and organisation of the programme
- § 7 Course contents
- § 8 Credit Points
- § 9 Student advisory service
- § 10 Adaptation of module descriptions
- § 11 Coming into force and public notice

Appendix 1a: Descriptions of mandatory modules

Appendix 1b: Descriptions of elective modules

Appendix 2: Curriculum plan

§ 1

Area of applicability

These Study Regulations define the objectives, the contents, the structure and the order of events during studies within the consecutive Master programme *Distributed Systems Engineering* at the Technische Universität Dresden.

§ 2

Aims of the programme

(1) Graduates from the Master programme *Distributed Systems Engineering* have been trained to analyse tasks in the subject area of distributed systems and – on the basis of this analysis – to develop efficient solutions. On the one hand, they have acquired a sound basic knowledge of the various technical directions represented in the programme and, on the other, they benefit from the application-oriented structure of the programme and are able to apply this knowledge in practicable scenarios. They will have developed the necessary skills to design, develop and operate distributed systems, they know different middleware architectures and their possible applications, they are familiar with mobile communication and they are able to analyse distributed systems in terms of their reliability, safety and potential weak points.

(2) Thanks to their broad technical knowledge and their familiarity with the distributed systems international research communities, which they acquired in the modules with an international orientation, graduates are fit to solve complex tasks in the development and operation of distributed computer systems after an adequate settling-in period in the industry.

§ 3

Admission requirements

(1) To be admitted to the programme, students must have earned a first job-qualifying university degree in Computer Science that is acknowledged in Germany.

(2) A good command of English is also essential for admission.

(3) Moreover, students are expected to have particular technical knowledge in the fields of practical, theoretical and applied computer science. Proofs are rendered in the aptitude test in accordance with the regulations governing aptitude test (*Eignungsfeststellungsordnung*).

§ 4

Beginning and duration of studies

(1) Students can commence studies in the winter semester.

(2) During the standard period of study, students are required to accomplish face-to-face studies, self-study and the Master examination. The standard period is four semesters (2 years).

§ 5

Types of teaching and learning

(1) The academic material is organised in a modular structure. In the individual modules, the academic contents is communicated, consolidated and deepened in lectures, seminars, discussion sections, lab classes and also in self-study.

(2) Lectures are designed to communicate the subject matter. Discussion sections serve to further deepen the contents communicated in lectures in practical application scenarios and in the discussion of current research results and developments. Discussion sections offer students the chance to work in small groups with expert mentoring and to discuss the solutions they found. Seminars are designed to develop the students' skills to gather information about a task field from literature, documentations and other sources and to present and underpin their findings. Lab classes are an integral part of the programme and serve the practical application and deepening of the subject matter communicated and also the acquisition of practical skills when working with hardware and software. Students repeat and deepen the contents of the subject matter in self-study.

§ 6

Structure and organisation of the programme

(1) The programme has a modular structure. The courses are offered in three semesters. During the fourth semester, students work on their Master theses and the colloquia.

(2) The programme is divided into one part that is compulsory for all students (mandatory modules with 42 credits) and an eligible part (elective modules with at least 48 credit points). The elective modules enable students to tailor their studies to their individual needs and interests.

(3) The module descriptions contain contents and qualification aims, the types of teaching and learning used, prerequisites, usability, frequency, amount of work involved and duration of the various modules (Appendix 1).

(4) The appropriate distribution of the modules across the semesters, the observance of which allows the completion of studies within the standard period of study, and also the types and numbers of hours of the courses are listed in the curriculum plan attached (Appendix 2).

(5) Classes are held in English.

(6) If the number of participants in an elective module is limited by the number of available places, students are selected in the order they registered. Students will be informed about form and deadline for the registration and also the number of places by the faculty in the known manner and in good time.

(7) The elective modules offered and the curriculum plan can be modified by the Faculty Council on suggestion of the Academic Committee. The currently offered elective modules shall be communicated by the faculty in the known manner as the semester starts. The modified curriculum plan is binding on those students to whom the faculty communicates it in the known manner as the semester starts. On application, the Examination Committee may decide on exceptions to sentence 3.

§ 7

Course contents

- (1) The major focus of the Master programme *Distributed Systems Engineering* is on research.
- (2) The mandatory modules comprise topics such as:
- fundamentals of the design, development and operation of distributed systems,
 - middleware architectures and platforms for the design of distributed applications and information systems,
 - design of distributed and safe systems from the angle of reliability and data security,
 - basic methods, constructional elements and notations for the systematic development of big software systems using design patterns and frameworks.
- (3) The elective modules offered comprise modules on data security, networks and computer networks, distributed operating systems, simulation and component-based software development, Internet-based systems, software fault tolerance, real-time systems, microkernel-based systems, application development for mobile environments, principles of reliable systems and logic.

§ 8

Credit points

- (1) ECTS credits document the average student workload and assess individual progress. One credit is equivalent to a workload of 30 hours. As a rule, students can earn 60 credit points per academic year, i.e. 30 credits per semester. A total of 120 credits can be earned through lectures and other types of courses, type and number of hours of which are described in the module descriptions, academic achievements and assessments, by self-study and also through the Master thesis and its defense.
- (2) Principally, credit points for modules can only be earned if students have passed the module exam. § 27 of the examination regulations remains unaffected. The module descriptions (Appendix 1) govern the number of credit points that can be earned in one module and the detailed prerequisites for this.

§ 9

Student advisory service

- (1) The general student advisory service is the responsibility of the Central Student Advisory Service of TU Dresden and answers all questions regarding programmes offered, terms of enrolment and general student affairs. The subject-related advisory service throughout studies is the responsibility of the Faculty of Computer Science. This subject-related advisory service helps students, in particular, tailor and plan their studies.
- (2) As the third semester starts, students who have not yet earned an attestation by that time, are obliged to seek advisory service.

§ 10

Adaptation of module descriptions

(1) A simplified procedure is used to adapt module descriptions to changed conditions to ensure the organisational conditions for the programme. The fields „module name“, „contents and qualification aims“, „types of teaching and learning“, „prerequisites for earning credit points“ and also „credit points/ and grades“ cannot be modified.

(2) In the simplified procedure, the Faculty Council on suggestion of the Academic Committee decides upon the modification of the module description. The modifications shall be communicated by the faculty in the known manner.

§ 11

Coming into force and public notice

These Study Regulations become effective as of 1 October 2010 and are publicly announced in the Official Notices of Technische Universität Dresden.

Issued on the basis of the decision of the Faculty Council of the Faculty of Computer Science made on 27 September 2010 and the approval of the Rectorial Board of #date#.

Dresden, #date of issue#

The Rector
of the Technische Universität Dresden

Prof. Hermann Kokenge

Appendix 1a

Descriptions of mandatory modules

Module no.	Module name	Responsible lecturer
DSE-M1	Systems Engineering	Prof. Fetzner
Contents and qualification aims	Upon completion of this module, students have become familiar with the basics of design, development and operation of computer-based systems. They have obtained a general idea of the structures of such systems, which usually consist of various hardware layers and software components. Most importantly, students have acquired the necessary knowledge of non-functional aspects of systems, e.g. reliability and availability, and they have learned to employ procedures of providing such non-functional aspects. The students understand fundamental aspects of the subject matter and to use them practically in the course of the programme.	
Types of teaching and learning	The module comprises lectures with 4 class hours per week per semester and discussion sections with 2 class hours per week per semester and self-study.	
Prerequisites for participation	Basic knowledge in the areas systems architecture, modularisation and structuring of complex systems (at Bachelor level). For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/ .	
Usability	The module is compulsory within the Master programme <i>Distributed Systems Engineering</i> and provides the fundamentals for the elective modules DSE-E8 and DSE-E12.	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam consists of a written exam of 120 minutes. Students solve exercise tasks as prerequisites for this exam.	
Credit points and grades	Students can earn 7 credit points through the module. The module grade is equivalent to the grade given for the assessment.	
Frequency of the module	The module is offered each winter semester.	
Workload	The workload is a total of 210 hours.	
Duration of the module	The module lasts one semester.	

Module no.	Module name	Responsible lecturer
DSE-M2	Ubiquitous Information Systems	Prof. Schill
Contents and qualification aims	<p>After having completed the module, students will have learned to classify middleware architectures and platforms for the design of distributed applications and information systems. This applies to both the fields of mobile communication and mobile processing and the transaction processing in distributed environments (especially in the field of large information systems). Students are able to classify and develop concepts and architectures for distributed and omnipresent application and information systems, choose the right solution and assess modern technological developments in the subject area.</p>	
Types of teaching and learning	<p>The module comprises lectures with 7 class hours per week per semester and discussion sections with 3 class hours per week per semester and self-study.</p>	
Prerequisites for participation	<p>Basic knowledge in the areas computer networks, operating systems and modelling and architecture of databases including transaction processing (at Bachelor level).</p> <p>Recommended literature Tanenbaum, A.S.: <i>Computer Networks</i> (4th ed.).</p>	
Usability	<p>The module is compulsory within the Master programme <i>Distributed Systems Engineering</i>.</p>	
Prerequisites for earning credits	<p>Students can earn credit points after having passed the module exam. The module exam consists of an oral assessment of 30 minutes or a written test of 90 minutes duration.</p>	
Credit points and grades	<p>Students can earn 13 credit points through the module. The module grade is equivalent to the grade given for the chosen assessment.</p>	
Frequency of the module	<p>The module is offered each winter semester.</p>	
Workload	<p>The workload is a total of 390 hours.</p>	
Duration of the module	<p>The module lasts one semester.</p>	

Module no.	Module name	Responsible lecturer
DSE-M3	Distributed and Secure Platforms	
Contents and qualification aims	Students who complete this module are able to discuss further topics of the construction of distributed and secure systems from the angle of data security and apply their knowledge in practical scenarios. They have a basic understanding of data security in distributed systems and have learned how to solve questions in this area on their own.	
Types of teaching and learning	The module comprises lectures and discussion sections of 2 class hours per week per semester each and also self-study.	
Prerequisites for participation	Basic knowledge in the areas operating systems, computer architecture, databases and software engineering (at Bachelor level). For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/ .	
Usability	The module is compulsory within the Master programme <i>Distributed Systems Engineering</i> and provides the fundamentals for the elective module DSE-E1.	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam consists of an oral assessment of 30 minutes or a written test of 90 minutes duration.	
Credit points and grades	Students can earn 5 credit points through the module. The module grade is equivalent to the grade given for the chosen assessment.	
Frequency of the module	The module is offered each winter semester.	
Workload	The workload is a total of 150 hours.	
Duration of the module	The module lasts one semester.	

Module no.	Module name	Responsible lecturer
DSE-M4	System Design	Prof. Aßmann
Contents and qualification aims	After having completed the module, students have learned how to apply basic methods, constructional elements and notations for the systematic development of large software systems and also the methodology of modelling and simulating discrete event systems. The framework of the module is based on the software development process with its life cycle models and phase models and additionally on the application of simulation and modelling techniques to the design of large and flexible application systems. Students who have completed the module are able to assist the development of large, consolidated, state-of-the-art software systems and to apply the methods of systems analysis to practical scenarios.	
Types of teaching and learning	The module comprises lectures and discussion sections of 2 class hours per week per semester each and also self-study.	
Prerequisites for participation	Fundamental and practical knowledge of the techniques listed below: principle of object orientation, Java programming, UML modelling (class diagrams, state diagrams, sequence diagrams), skills in the calculus of probabilities and statistics (at Bachelor level). For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/ .	
Usability	The module is compulsory within the Master programme <i>Distributed Systems Engineering</i> .	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam consists of an oral assessment of 30 minutes and a lab course.	
Credit points and grades	Students can earn 5 credit points through the module. The module grade is equivalent to the grade given for the oral assessment.	
Frequency of the module	The module is offered each winter semester.	
Workload	The workload is a total of 150 hours.	
Duration of the module	The module lasts one semester.	

Module no.	Module name	Responsible lecturer
DSE-Int	Internship	Prof. Fetzner
Contents and qualification aims	After having completed the module, students will be able to independently accomplish individual research projects that focus on the practical application of the skills acquired during studies to distributed systems. They will have learned to analyse complex tasks and work out efficient solutions. This will enable them to understand and discuss practical scenarios in their professional lives and find feasible solutions.	
Types of teaching and learning	The module consists of lab classes of 8 class hours per week per semester.	
Prerequisites for participation	Mastery of the fundamentals and scientific methods of <i>Distributed Systems Engineering</i> in accordance with the mandatory modules DSE-M1 to DSE-M4.	
Usability	The module is compulsory within the Master programme <i>Distributed Systems Engineering</i> .	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam is passed after students have submitted a certificate/certificates of lab courses to the Service Center for International Students.	
Credit points and grades	Students can earn 12 credit points through the module. No grade is given for the module.	
Frequency of the module	The module is offered in each semester.	
Workload	The workload is a total of 360 hours.	
Duration of the module	The module lasts one semester.	

Appendix 1b

Descriptions of elective modules

Module no.	Module name	Responsible lecturer
DSE-E1	Advanced Security and Cryptography	
Contents and qualification aims	<p>After having successfully completed this module, students have learned to discuss general aspects of security and particular multilateral security aspects of IT systems and to identify the aspects that should be protected and their dependencies on each other. They are able to classify attack models and various security mechanisms and they know how to assess cryptosystems as the fundamental security mechanisms to provide confidentiality and integrity. Students can analyse the security factors of IT systems in two ways: Which security precautions are necessary and how can maximum security against attacks be ensured? On completion of the module students will know the fundamentals of and have acquired the necessary skills for the development of IT systems.</p>	
Types of teaching and learning	<p>The module comprises lectures and] discussion sections [of] 2 [class hours per week per semester each and also self-study.</p>	
Prerequisites for participation	<p>Fundamental knowledge of data security tasks in accordance with module DSE-M3. For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/.</p>	
Usability	<p>The module is an elective module within the Master programme <i>Distributed Systems Engineering</i>.</p>	
Prerequisites for earning credits	<p>Students can earn credit points after having passed the module exam. The module exam consists of an oral assessment of 30 minutes.</p>	
Credit points and grades	<p>Students can earn 6 credit points through the module. The module grade is equivalent to the grade given for the assessment.</p>	
Frequency of the module	<p>The module is offered each summer semester.</p>	
Workload	<p>The workload is a total of 180 hours.</p>	
Duration of the module	<p>The module lasts one semester.</p>	

Module no.	Module name	Responsible lecturer
DSE-E2	Introduction to Simulation	Prof. Rose
Contents and qualification aims	Upon completion of this module, students have learned to understand the fundamentals of the simulation of discrete events for the performance analysis of complex systems, such as telecommunication and production systems, and to apply their knowledge to practical scenarios. The participants understand the structure of simulation studies and know how simulation software works and which related statistical methods can be employed (in particular in experimental design).	
Types of teaching and learning	The module comprises lectures and] discussion sections [of] 2 [class hours per week per semester each and also self-study.	
Prerequisites for participation	Fundamental knowledge of statistics (at Bachelor level). For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/ .	
Usability	The module is an elective module within the Master programme <i>Distributed Systems Engineering</i> .	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam consists of an oral assessment of 30 minutes.	
Credit points and grades	Students can earn 6 credit points through the module. The module grade is equivalent to the grade given for the assessment.	
Frequency of the module	The module is offered each summer semester.	
Workload	The workload is a total of 180 hours.	
Duration of the module	The module lasts one semester.	

Module no.	Module name	Responsible lecturer
DSE-E3	Wireless Sensor Networks	Prof. Schill
Contents and qualification aims	<p>Upon the successful completion of this module, students are familiar with the areas <i>Ubiquitous Computing</i> and <i>Wireless Sensor Networks</i> and are able to expertly discuss topics such as the application of wireless sensor networks and their main components. They will know the typical aspects of sensor networks, e.g. energy consumption, communication, processing within the network and self-organisation. They have learned to understand algorithms for link building and media access control in wireless sensor networks and can design them on their own. Since a wireless sensor network is a distributed network, students have also learned to master such aspects as time synchronization, topology control and data aggregation. They are familiar with routing techniques and query distribution. Students can see and discuss open questions and problems in the field of wireless sensor networks as a whole.</p>	
Types of teaching and learning	<p>The module comprises lectures and seminars of 2 class hours per week per semester each and also self-study.</p>	
Prerequisites for participation	<p>Fundamental knowledge in the areas computer architecture, distributed systems, mobile communication and software engineering (at Bachelor level). For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/.</p>	
Usability	<p>The module is an elective module within the Master programme <i>Distributed Systems Engineering</i>.</p>	
Prerequisites for earning credits	<p>Students can earn credit points after having passed the module exam. The module exam consists of a seminar paper and the alternatives of an oral assessment of 30 minutes or a written test of 90 minutes duration.</p>	
Credit points and grades	<p>Students can earn 6 credit points through the module. The module grade is calculated from the average of the grades given for the individual assessments.</p>	
Frequency of the module	<p>The module is offered each summer semester.</p>	
Workload	<p>The workload is a total of 180 hours.</p>	
Duration of the module	<p>The module lasts one semester.</p>	

Module no.	Module name	Responsible lecturer
DSE-E4	Distributed Operating Systems	Prof. Härtig
Contents and qualification aims	<p>Upon completion of the module, students have learned to solve complex problems of the design of distributed systems on their own, to analyse case studies and to make comparisons with other projects to identify potential critical issues. They can make argumentative points and defend them.</p> <p>Moreover students are familiar with scalability, fault tolerance, security and robustness and can see things in context with issues, such as database development and computer architecture. Thanks to their broad knowledge, students can also assess the latest developments and discuss them.</p>	
Types of teaching and learning	<p>The module comprises lectures of 2 class hours per week per semester, discussion sections and seminars of 1 class hour per week per semester each and also self-study.</p>	
Prerequisites for participation	<p>Understanding of the fundamentals of operating systems (at Bachelor level). For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/.</p>	
Usability	<p>The module is an elective module within the Master programme <i>Distributed Systems Engineering</i>.</p>	
Prerequisites for earning credits	<p>Students can earn credit points after having passed the module exam. The module exam consists of a seminar paper or an oral assessment of 30 minutes duration. As prerequisites, students are expected to write short summaries about the scientific works they went through in the seminar.</p>	
Credit points and grades	<p>Students can earn 6 credit points through the module. The module grade is equivalent to the grade given for the chosen assessment.</p>	
Frequency of the module	<p>The module is offered each summer semester.</p>	
Workload	<p>The workload is a total of 180 hours.</p>	
Duration of the module	<p>The module lasts one semester.</p>	

Module no.	Module name	Responsible lecturer
DSE-E5	Component-Based Software Engineering	Prof. Aßmann
Contents and qualification aims	Upon the successful completion of this module, students are able to face the challenges of modern complex software systems using a component-based development concept. They know how to build applications step by step using independent components and how to increase their flexibility. Thanks to very practical exercises, they are also capable of solving realistic tasks and to tackle new challenges on the basis of the sound fundamental skills they acquired.	
Types of teaching and learning	The module comprises lectures and] discussion sections [of] 2 [class hours per week per semester each and also self-study.	
Prerequisites for participation	Fundamental and practical knowledge of the techniques listed below: principle of object orientation, Java programming, UML modelling (class diagrams, state diagrams, sequence diagrams), skills in the calculus of probabilities and statistics (at Bachelor level). For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/ .	
Usability	The module is an elective module within the Master programme <i>Distributed Systems Engineering</i> .	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam consists of an oral assessment of 30 minutes or a written test of 90 minutes duration.	
Credit points and grades	Students can earn 6 credit points through the module. The module grade is equivalent to the grade given for the chosen assessment.	
Frequency of the module	The module is offered each summer semester.	
Workload	The workload is a total of 180 hours.	
Duration of the module	The module lasts one semester.	

Module no.	Module name	Responsible lecturer
DSE-E6	Internet-Based Systems	Prof. Schill
Contents and qualification aims	<p>Upon completion of the module, students have learned to understand and discuss general Internet technologies and protocols and also the technical basics and methodological principles. This includes traditional applications and protocols, such as HTTP, DNS or IPv4 and also more recent developments, e.g. IPv6, IPSec, mobile IP or VoIP. Starting from these fundamental skills, students can go further into the field and work on problems on their own.</p> <p>Moreover, students understand innovative web applications and web technologies and can apply and extend them on their own. This applies not only to basic principles but also actual standards, systems and techniques, such as Web 2.0, Ajax, OWL, podcasts, blogs, Wikis, BitTorrent etc.</p>	
Types of teaching and learning	The module comprises lectures with 4 class hours per week per semester and discussion sections with also 4 class hours per week per semester and self-study.	
Prerequisites for participation	<p>Fundamental knowledge of computer networks (at Bachelor level).</p> <p>For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/.</p>	
Usability	The module is an elective module within the Master programme <i>Distributed Systems Engineering</i> .	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam consists of a written test of 90 minutes duration or an oral assessment of 30 minutes. Students solve exercise tasks as prerequisites for this exam.	
Credit points and grades	Students can earn 12 credit points through the module. The module grade is equivalent to the grade given for the chosen assessment.	
Frequency of the module	The module is offered each summer semester.	
Workload	The workload is a total of 360 hours.	
Duration of the module	The module lasts one semester.	

Module no.	Module name	Responsible lecturer
DSE-E7	Current Topics in Computational Engineering	Prof. Fetzer
Contents and qualification aims	<p>Upon completion of this module, students will be able to analyse and assess the latest developments in <i>Computational Engineering</i>. Students have adopted scientific working methods and search techniques and can work on tasks using available literature, documentations and many other sources. They can defend their point of view by making argumentative points.</p> <p>Moreover, students have a good understanding of the fundamentals of concurrent and distributed systems, which are necessary for the construction and operation of concurrent and distributed applications. They can work with transactional memory systems, which will be supported by most CPUs in the future. This enables them to develop concurrent and distributed systems and to analyse their functionality on their own.</p>	
Types of teaching and learning	The module comprises lectures of 4 class hours per week per semester, discussion sections and seminars of 2 class hours per week per semester each and also self-study.	
Prerequisites for participation	<p>Students should already have acquired basic knowledge of multiprocessor programming (at Bachelor level).</p> <p>Recommended literature: Herlihy, M. & N. Shavit: <i>The Art of Multiprocessor Programming</i>.</p>	
Usability	The module is an elective module within the Master programme <i>Distributed Systems Engineering</i> .	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam consists of a seminar paper of a workload of 20 hours or an oral assessment of 30 minutes duration.	
Credit points and grades	Students can earn 12 credit points through the module. The module grade is equivalent to the grade given for the chosen assessment.	
Frequency of the module	The module is offered each summer semester.	
Workload	The workload is a total of 360 hours.	
Duration of the module	The module lasts one semester.	

Module no.	Module name	Responsible lecturer
DSE-E8	Software Fault Tolerance	Prof. Fetzer
Contents and qualification aims	<p>On completion of this module, students are able to develop and use mechanisms and system designs that address system faults in distributed systems, which extremely often occur as software faults, at runtime. They have the necessary expertise in fault tolerance and use their knowledge to discuss and assess current scientific work in this field.</p> <p>At the end of the module, students have also acquired the necessary practical skills to analyse faults in actual application scenarios and to eliminate them. Moreover they know how to apply the skills they acquired in the module to new unknown scenarios and how to develop practical solutions.</p>	
Types of teaching and learning	The module comprises lectures and discussion sections of 2 class hours per week per semester, lab classes of 4 class hours per week per semester and self-study.	
Prerequisites for participation	The module is based on the mandatory module DSE-M1. Participants should be familiar with the fundamentals of the design, development and operation of computer-based systems.	
Usability	The module is an elective module within the Master programme <i>Distributed Systems Engineering</i> .	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam consists of an oral assessment of 30 minutes and a lab course. Students solve exercise tasks as prerequisites for this exam.	
Credit points and grades	Students can earn 12 credit points through the module. The module grade is equivalent to the grade given for the chosen assessment.	
Frequency of the module	The module is offered each summer semester.	
Workload	The workload is a total of 360 hours.	
Duration of the module	The module lasts two semesters.	

Module no.	Module name	Responsible lecturer
DSE-E9	Microkernel-Based Operating Systems	Prof. Härtig
Contents and qualification aims	<p>Upon completion of the module, students have acquired broad knowledge of <i>microkernels</i>, i.e. those small OS kernels on which operating systems can be built flexibly. Students are able to use these <i>microkernels</i> in safety-critical or embedded applications and also in real-time systems to provide a small system kernel for critical tasks. Moreover they can use them to design well-structured operating systems for a wide range of tasks. In practical experiments students have learned to understand the basic principles and to use them to solve problems on their own. They are familiar with CPU data structures, system calls, virtual memory management, the communication between processes, virtualisation and also the area of portability. They know how to design operating systems, manage the memory at the highest level, synchronise, they are familiar with interface description languages, software drivers, the use of Linux with microkernels and real-time operating systems and also secure operating systems.</p>	
Types of teaching and learning	The module comprises lectures with 2 class hours per week per semester and discussion sections with 1 class hour per week per semester and self-study.	
Prerequisites for participation	<p>Basic knowledge in terms of operating systems, computer architecture and software engineering. Knowledge of the programming language C or C++ (at Bachelor level).</p> <p>For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/.</p>	
Usability	The module is an elective module within the Master programme <i>Distributed Systems Engineering</i> .	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam comprises an oral assessment of 30 minutes.	
Credit points and grades	<p>Students can earn 6 credit points through the module.</p> <p>The module grade is equivalent to the grade given for the assessment.</p>	
Frequency of the module	The module is offered each winter semester.	
Workload	The workload is a total of 180 hours.	
Duration of the module	The module lasts one semester.	

Module no.	Module name	Responsible lecturer
DSE-E10	Real-Time Systems	Prof. Härtig
Contents and qualification aims	<p>Upon the successful completion of the module, students have learned to classify, model and assess real-time-systems, i.e. systems whose correct functioning implies the keeping of operational deadlines. This comprises the fundamentals of load and resources, time, clocks and clock synchronisation, time-controlled vs. event-controlled design and scheduling methods. Thanks to these skills students understand related and advanced topics, such as real-time programming languages (synchronous and event-driven), real-time OS, real-time systems and hardware, microcontrollers, caches, real-time communication in field buses and wide area networks and the general applications of real-time systems. This module takes a holistic approach to real-time systems and aims at providing students with this broad knowledge.</p>	
Types of teaching and learning	<p>The module comprises lectures with 2 class hours per week per semester and discussion sections with 1 class hour per week per semester and self-study.</p>	
Prerequisites for participation	<p>Basic knowledge in the areas operating systems, computer architecture, databases and software engineering (at Bachelor level). For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/.</p>	
Usability	<p>The module is an elective module within the Master programme <i>Distributed Systems Engineering</i>.</p>	
Prerequisites for earning credits	<p>Students can earn credit points after having passed the module exam. The module exam consists of an oral assessment of 30 minutes.</p>	
Credit points and grades	<p>Students can earn 6 credit points through the module. The module grade is equivalent to the grade given for the assessment.</p>	
Frequency of the module	<p>The module is offered each winter semester.</p>	
Workload	<p>The workload is a total of 180 hours.</p>	
Duration of the module	<p>The module lasts one semester.</p>	

Module no.	Module name	Responsible lecturer
DSE-E11	Application Development for Mobile & Ubiquitous Computing	Prof. Schill
Contents and qualification aims	<p>Upon completion of the module students are able to discuss mobile computer applications and their implementation. They are familiar with fields such as <i>ambient intelligence</i> and <i>ubiquitous computing</i> and they have learned to classify various functionalities, such as network aspects (different communication capacities for short and long distances) and special mobile computer concepts (e.g. disconnected and autonomous operation, mobile agents and context-based adaptation). They are able to design and implement different types of architectures for mobile, distributed systems and they are familiar with communication aspects, local and distributed platforms (e.g., OSGi, J2ME, J2EE) and also graphic interfaces. Students have acquired further skills of other concepts, e.g. mobile security, data synchronisation, the adaptation of applications to address the specific needs of mobile devices and also databases for mobile devices, location-based services, the Semantic Web and autonomous behaviour. They can apply tools, environments, platforms and emulators in specific situations and know the state of the art of international research in the area.</p>	
Types of teaching and learning	The module comprises lectures and] discussion sections [of] 2 [class hours per week per semester each and also self-study.	
Prerequisites for participation	<p>Fundamental knowledge in the areas computer architecture, distributed systems, mobile communication and software engineering (at Bachelor level). For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/.</p>	
Usability	The module is an elective module within the Master programme <i>Distributed Systems Engineering</i> .	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam consists of an oral assessment of 30 minutes or a written test of 90 minutes duration. Students solve exercise tasks as prerequisites for this exam.	
Credit points and grades	Students can earn 6 credit points through the module. The module grade is equivalent to the grade given for the chosen assessment.	
Frequency of the module	The module is offered each winter semester.	
Workload	The workload is a total of 180 hours.	
Duration of the module	The module lasts one semester.	

Module no.	Module name	Responsible lecturer
DSE-E12	Principles of Dependable Systems	Prof. Fetzer
Contents and qualification aims	Upon the successful completion of this module students have learned to design and implement extremely reliable and secure systems. They have acquired special knowledge in the design of distributed protocols for critical systems because of the great number of possible error and failure types in this area. Students use their theoretical knowledge to work out efficient solutions for practical scenarios.	
Types of teaching and learning	The module comprises lectures and] discussion sections [of] 2 [class hours per week per semester each and also self-study.	
Prerequisites for participation	The module is based on the mandatory module DSE-M1. The participants should be familiar with the fundamentals of the design, development and operation of computer-based systems.	
Usability	The module is an elective module within the Master programme <i>Distributed Systems Engineering</i> .	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam consists of an oral assessment of 30 minutes. Students solve exercise tasks as prerequisites for this exam.	
Credit points and grades	Students can earn 6 credit points through the module. The module grade is equivalent to the grade given for the assessment.	
Frequency of the module	The module is offered each winter semester.	
Workload	The workload is a total of 180 hours.	
Duration of the module	The module lasts one semester.	

Module no.	Module name	Responsible lecturer
DSE-E13	Introduction to Computational Logic	Prof. Hölldobler
Contents and qualification aims	Upon completion of the module students have acquired the skills to independently work on tasks of the field <i>computational logic</i> and apply techniques and methods of this field. They know the fundamentals of propositional logic and first-order logic and they are also familiar with the computational complexity theory and computer algebra. They have also developed competencies in the field of <i>equational reasoning</i> , in the principles of deduction, abduction and induction, in proof theory and nonmonotonic reasoning, in logic-based program development, in processing natural languages and in machine learning and also in the field of logic and connectionism.	
Types of teaching and learning	The module comprises lectures and] discussion sections [of] 4 [class hours per week per semester each and also self-study.	
Prerequisites for participation	Fundamental knowledge in the fields of theoretical computer science (at Bachelor level). For the independent acquisition of these prerequisites, search the sources given at this website: http://dse.inf.tu-dresden.de/ .	
Usability	The module is an elective module within the Master programme <i>Distributed Systems Engineering</i> .	
Prerequisites for earning credits	Students can earn credit points after having passed the module exam. The module exam consists of a written exam of 90 minutes. Students solve exercise tasks as prerequisites for this exam.	
Credit points and grades	Students can earn 12 credit points through the module. The module grade is equivalent to the grade given for the assessment.	
Frequency of the module	The module is offered each winter semester.	
Workload	The workload is a total of 360 hours.	
Duration of the module	The module lasts one semester.	