Only the german version of the module description as part of the study regulations is legally binding.

Module name	**Model Checking**
Module number	INF-25-Ma-FTK-MC
Responsible lecturer	Prof. Dr. Christel Baier christel.baier@tu-dresden.de
Qualification objec-Tives	Students know and master the basics of formal analysis of parallel systems with the help of model checking. They have internalized the central theoretical concepts such as transition systems mantics, specification of properties using temporal logics and automata and the associated model checking algorithms and abstraction techniques and can apply these in practice using current model checkers. They are aware of the fundamental challenges, both from a theoretical and practical point of view, and are able to constantly develop their own creative solutions that enable the successful application of model checking in practice despite these challenges.
Content	The module covers mathematical models and techniques for specifying, analyzing and verifying software and hardware systems. This includes basic concepts of modelling parallel systems and in particular transition systems and associated parallel operators, characterizations of safety and liveness properties, automata over infinite words and in particular Büchi automata, temporal logics such as LTL, CTL and their variants, Model checking algorithms and complexity of the model checking problem for temporal logic specifications ons, formalisms for abstraction and refinement and in particular trace, bisimulation and simulation relations) as well as stochastic or real-time extensions of transition systems and associated temporal logics and model checking algorithms. Further content includes the applicability of model checking tools in practice.
Teaching and learning methods	The module comprises lectures of 4 SWS, exercises of 4 SWS and the self bststudium. The teaching language of the lectures and exercises may be German or English and will be specified by the lecturer at the beginning of the semester and announced in the usual manner.
Prerequisites for par-ticipation	In the Diploma degree course in Computer Science and in the Bachelor's degree course in Computer Science, the competences to be acquired in the modules INF-25-Ba-AuD Algorithms and Data Structures, INF-25-Ba-AuB Automata and Computability Theory, INF-25-Ba-LuK Logic and Comp exity, INF-25-Ba-Ma1 Linear Algebra and Analysis, INF-25-Ba-Ma2 Discrete Structures, INF-25-Ba-Ma3 Algebra and INF-25-Ba-Ma4 Probability Theory and Statistics are assumed. In the Master's degree course g Computer Science, knowledge of the fundamentals of algorithm design, formal languages, theoretical computer science and propositional and predicate logic as well as knowledge of mathematics at Bachelor's level are required.
Applicability	The module is a compulsory elective module in the Diploma program in Computer Science in the main course of study in the subject area of

	Theoretical Computer Science at d Symbolic Artificial Intelligence, which must be selected in accordance with Annex 2 to the Examination Regulations. In the Bachelor's degree program Computer Science, the module is a compulsory elective module in the subject specialization, which must be selected in accordance with the appendix to the examination regulations. In the Master's degree program in Computer Science, the module is a compulsory elective module in the Open Track in the subject area of Theoretical Computer Science at d Symbolic Artificial Intelligence and the supplement, which must be selected in accordance with Annex 2 to the Examination Regulations. The module can only be chosen once in the Master's degree program in Computer Science. The module cannot be selected in the Master's degree program in Computer Science if this module or a module with essentially the same content from a degree program with which the admission requirements according to Section 3 of the study regulations have already been met has already been completed. The module fulfills the prerequisites for the modules listed under prerequisites for participation.
Requirements for earning credit points	The credit points are earned if the module examination is passed. The module examination consists of a non-public oral examination as an individual examination lasting 30 minutes. The examination language may be German or English and will be specified by the lecturer at the beginning of each semester and announced in the usual manner.
Credit points and grades	12 credit points can be acquired through the module. The module grade corresponds to the grade of the examination.
Module frequency	The module is offered every winter semester.
Workload	The total workload is 360 hours.
Module duration	The module comprises one semester.
Accompanying literature	Principles of Model Checking, C. Baier, J.-P. Katoen. MIT Press, 2008.