

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

Module name	Foundations of Certified Programming Language and Compiler Design
Module number	INF-25-Ma-FSP-FCPL
Responsible lecturer	Dr. Sebastian Ertel sebastian.ertel@barkhauseninstitut.org
Qualification objectives	Students are able to develop programs with strong guarantees about their properties in order to minimize testing effort and avoid complex runtime errors during the development process. To this end, students know the basics of strongly-typed programming languages, so-called dependently-typed languages, and their connection to logic. They can develop programs in programming languages such as Agda or theorem provers such as Coq and formally prove their properties. You will be familiar with essential proof procedures for formally verifying the properties of programming languages, compilers and hardware-related programs.
Content	Contents of the module are the theories of the untyped and typed lambda calculus, type systems with dependent types and their connection to propositional and predicate logic as a basis for the Curry-Howard isomorphism. Further contents are programming with strongly-typed programming languages such as Agda and theorem provers such as Coq. The basics of the properties of programming languages and compilers, their effect on the design process and how to prove them formally are further central contents. This also includes important proof techniques and formal concepts for defining operational and denotational semantics.
Teaching and learning methods	The module comprises lectures of 2 SWS, exercises of 2 SWS and the self-studium. The language of instruction for the lectures and exercises is English.
Prerequisites for participation	In the Diploma degree program in Computer Science, the competencies to be acquired in the modules INF-25-Ba-Prg Programming and RoboLab, INF-25-Ba-LuK Logic and Complexity, INF-25-Ba-DMF Data Management Foundations, INF-25-Ba-SWT Software Technology and INF-25-Ba-KI Artificial Intelligence are required. Knowledge of programming and logic at Bachelor's level is a prerequisite for the Master's degree course in Computer Science.
Applicability	The module is a compulsory elective module in the Diplom degree course in Computer Science in the main course in the subject area Software Technology and Programming Languages, which must be selected in accordance with Annex 2 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 Software Technology and Programming Languages and the supplement, which must be selected in accordance with Annex 2 to the Examination

	Regulations. The module can only be selected 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 substantially the same content has already been completed from a degree program in which the admission requirements according to Section 3 of the study regulations have been fulfilled . 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 is English.
Credit points and grades	6 credit points can be earned 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 180 hours.
Module duration	The module comprises one semester.