

Module Name	VLSI Processor Design
Module Number	Eul-ET-E-VLSI, Eul-IST-E-VLSI, Eul-NES-E-VLSI
Responsible Lecturer	Prof. Dr.-Ing. habil. Christian Georg Mayr christian.mayr@tu-dresden.de
Qualification Objectives	After completing the module, students are capable of performing a complete implementation and verification of a VLSI system using the model of a processor, such as one with the complexity of an 8051, by utilizing industrial design software like Synopsys or Cadence.
Contents	The module covers: - Fundamentals, concepts, and methods for the development of complex digital VLSI systems - Architectural concepts for highly integrated digital processing systems, particularly in the areas of processor systems and application-specific systems for signal processing - Methods for efficiently transferring architectural concepts into the highly integrated implementation of a digital system - Specification and abstract modeling of the system, transfer to a register-transfer level (RTL) description, automated circuit synthesis, and physical implementation such as place & route and layout synthesis, which results in the data required for chip fabrication - Verification of the design at all levels of abstraction, i.e., behavior/implementation through simulation (functional verification) - Proof of equivalence of transformation steps through formal verification, checking compliance with design rules (signoff verification) - Collaboration in the design team, including task distribution, interface definition, workflow, and scheduling
Teaching and Learning Forms	2 hours per week of lectures, 2 hours per week of exercises, 2 hours per week of practical lab courses, and self-study. The language of instruction for lectures, exercises, and practical sessions is English.
Prerequisites for Participation	In the Master's program "Nanoelectronic Systems," knowledge in the fields of circuit design and systems theory at the Bachelor's level is required. In the diploma programs "Electrical Engineering" and "Information Systems Engineering," the competencies to be acquired in the modules "Basics of Electrical Engineering," "Function Theory," "Partial Differential Equations and Probability Theory," "Circuit Design," and "Systems Theory" are required.
Usability	The module is an elective module according to § 6 paragraph 2 SO and § 33 paragraph 3 PO of the specialization "Nanoelectronics" in the Master's program "Nanoelectronic Systems." Furthermore, it is an elective module in the elective area "Competence Deepening" according to § 6 paragraph 3 SO and § 33 paragraph 4 PO of the main study phase of the specializations "Information Technology" and "Microelectronics" in the diploma program "Electrical Engineering." Additionally, it is an elective module in the elective area "Competence Deepening" according to § 6 paragraph 3 SO and § 33 paragraph 3 PO of the main study phase of the specialization "Microelectronics, Electronic Circuits, and Systems" in the diploma program "Information Systems Engineering." It creates the prerequisites for the modules that list this module in the field "Prerequisites for Participation."
Prerequisites for the Award of Credit Points	Credit points are awarded when the module examination is passed. The module examination consists of a complex assignment with a workload of 50 hours.
Credit Points and Grades	7 credit points can be earned through the module. The module grade corresponds to the grade of the examination performance.

Frequency of the Module	The module is offered every summer semester.
Workload	The total workload is 210 hours.
Duration of the Module	The module lasts one semester.