System Test Engineering

3. Semester

Subject to Approval by the Relevant Bodies

Course	Type	THW	ECTS
Project Management	SE	2	3
Electronic Engineering Project	PT	0,5	6
Design for Test	IC	2	3
Validation Test Development	IC	3	5
Automotive Testing	IC	4	6
Production Testing	IC	5	7
		16,5	**30**

SE   Seminar

PT   Project

IC   Integrated course

THW   Hours per week

ECTS European Credit Transfer and Accumulation System

Project Management   2 SWS/3 ECTS

Teaching Content

- Project types and methodologies

- Project phases, milestones and gates

- Project plans

- Effort estimation methodologies

- Communication plans and meeting structures

- Resource-based and skill-based planning

- Risk management

- Failure mode and effect Analysis

- Agile project management

Competence Acquisition

After finishing this course, students can

- explain the nature of projects,

- compare different methods of project management,

- describe the different roles of persons involved into a project,

- create a project plan and add phases, milestones and gates of projects,

- estimate the efforts for tasks, work packages, and projects, and

- explain the risk management of a project.

Electronic Engineering Project   0,5 SWS/6 ECTS

Teaching Content

- Solving a specific technical task on the under supervision that corresponds to the level of education.

Competence Acquisition

After finishing this course, students can

- work on and solve a technical problem independently, and

- document and present the solution.

Design for Test   2 SWS/3 ECTS

Teaching Content

- JTAG: boundary scan architecture and description language, tap controller internals

- Testing of digital circuits: test modes, parallel tests, scan test, built-in self-tests

- Modularization and testing

- Lifetime management: wafer test, backend test, test of product returns (field tests)

- Fault simulation: controllability, observability, accessibility of circuits

- Scan Design

- Automatic Test Pattern Generation

- Test Compression

- Delay test

- Iddq testing

- Logic Built in self test

- Memory testing

- Fault Diagnosis

- Analog and mixed signal testing (IEEE 1149.4)

Competence Acquisition

After finishing this course, students can

- describe methods to ensure the testability of electronic products,

- explain the life cycle management of electronic products,

- compare structural tests, application tests and system tests,

- discuss the problems of testing modes and information security,

- apply the JTAG standard in a test environment for semiconductor devices, and

- apply the most important testing methods for digital and mixed-signal circuits.

Validation Test Development   3 SWS/5 ECTS

Teaching Content

- Validation and production test
- Preparing a verification plan
- Automatic test vector generation (ATVG)
- Structural, block and system test
- Automated test
- Characterization, comparison with data sheet, Corner Testing
- Robustness validation

Competence Acquisition

After finishing this course, students can

- explain the structural differences of validation and production tests,
- explain the benefits of product validation and their differences to production tests,
- plan complex measurement tasks in semiconductor validation and execute/monitor them based on a structured plan,
- plan the required test equipment and assess its capabilities,
- implement measurement tasks in test automation software tools, and
- write a verification and validation reports.

Automotive Testing   4 SWS/6 ECTS

Teaching Content

- Introduction to testing of automotive systems
- Complete vehicle testing overview
- CAN and LIN busE/E test benchesFlexRay and Ethernet
- System integration testing (FRS)
- HV battery and testing
- Electromagnetic compatibility (EMC)
- EMC standards for road vehicles and integrated circuits
- Functional safety (IEC EN 61508, ISO 26262)
- Introduction to automated driving
- ADAS/AD: system architecture, sensors and features, development process
- Virtual description of the static environment
- Test execution environments for verification and validation
- Introduction to scenario based verification and validation
- Description of the dynamic environment („scenarios")
- Safety argumentation

Competence Acquisition

After finishing this course, students can

- explain the basics of automotive vehicle testing,
- explain the different areas of automotive mechatronics testing (HW/SW, E/E system, special components like HV battery),
- create their own test strategy for an automotive system,
- create their own test campaign including pre- and postprocessing,
- explain the fundamentals of functional safety,
- explain basics of automated driving, sensors and how to verify and validated these complex systems,
- create static environments and dynamic content for testing, and
- execute simple tests in a virtual environment.

Production Testing   5 SWS/7 ECTS

Teaching Content

- Processes in electronic production and chip fabrication
- Test program development and debugging
- Remote debugging and remote development
- Compliance matrix
- Methods for test time optimization
- Test flow, test insertions
- Guard band (test-limit management)
- PAT (part average testing)
- PCB with test adapter
- Test equipment overview and architecture
- Binning and Grading
- Data Logging
- Wafer test and package test
- ATE programming
- Traceability
- Trimming and fusing

Competence Acquisition

After finishing this course, students can

- explain the test indicators of a complex semiconductor supply chain (yield, throughput, quality, test escapes etc.),
- discuss the differences between defect-oriented, parametric and sample-based testing,
- develop and optimize testing methods,
- describe the structure and the functioning principles of test cells, handling systems and probers,
- use professional Automatic Test Equipment (ATE), and
- develop a production ready Test Solution for a given Semiconductor Device based on a Data Sheet.