Certificate Course

Industry 4.0: Electronic Systems & Software Engineering

The certificate course **Electronic Systems & Software Engineering** is focused on the field of systems engineering in general and automotive in particular. It is an interdisciplinary field of engineering that focuses on how to design and manage complex engineering systems over their life cycles. Issues such as e.g. requirements engineering, reliability, coordination of different teams, testing and evaluation become more difficult when dealing with large or complex projects. Adequate System Life Cycle References for specific company challenges such as Agile Modeling, design according to the V-Model or risk based are discussed and compared with each other.

Systems engineering deals with work-processes in such projects and ensures that all likely aspects of a project or system are considered, and integrated into a whole.
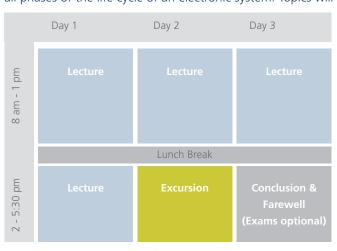
Course Benefits & Take Away for Participants

The participants will

- be introduced to the application of methods and tools of the model based analysis from requirements to testing;
- further be enabled to optimize embedded systems regarding quality, cost and market introduction criteria; understand the complex interaction of Cyber Physical Sytems (CPS).

Overview Course Agenda

The goal of the Technical Short Course is to comprehend theory, methodologies and application of computer aided processes in all phases of the life cycle of an electronic system. Topics will be:

	Day 1	Day 2	Day 3
8 am - 1 pm	Lecture	Lecture	Lecture
	Lunch Break		
2 - 5:30 pm	Lecture	Excursion	Conclusion & Farewell (Exams optional)

Exemplary Schedule of a 3-day Certificate Course

- Introduction of the characteristics of embedded systems
- Advantages and common examples of System Lifecycle Models
- Creativity techniques
- Maturity models (CMMI and SPICE)
- HW, SW and Co-design alternatives
- Embedded programming and operating systems
- Modeling systems (UML, OO, Petri Nets, e.g.)
- Managing versions
- Systems Testing (HiL, Rapid Prototyping, …)

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www.hectorschool.kit.edu/certificate_courses.php

Agenda in Detail

Day 1:

Session 1: Motivation & Introduction
Motivation | Examples | Realization | Terms & definitions | Introduction to methods, basic description concepts, system structure, communication, interfaces, validation, and verification

Session 2: System Lifecycle Models
System lifecycle models (Waterfall, Spiral, Y-Diagram, V-Model, Agile, Scrum) | Requirements definition | Creativity techniques | Maturity models | Testing methods

Session 3: Creativity Techniques
Mind mapping | SWOT | Morphological analysis | Requirement management | Quality function deployment

Session 4: Maturity & Assessment
CMMI | SPICE | Examples

Day 2

Session 4: Testing
Testing as part of Life Cycle | Hardware-in-the-loop (HIL) | Test process reference

Session 5: Realisation, Operating Systems & Scheduling
Implementation alternatives (hardware, codesign) | Embedded systems programming | Timing | Embeeded operating systems | Example for software architecture

Excursion

Day 3

Session 6: Modeling Techniques & Examples
Modeling & simulation | Modeling software systems

Session 7: Reliability, Redundancy & Versions
Software reliability & test | Algorithmic cost modeling | Managing versions

Summary & Feedback

Registration & Organizational Details

Duration	3 days
Prize	2.495 € per participant
Group Size	max. 15 participants
Certificate	Certificate of the HECTOR School of Engineering & Management, Technology Business School of the Karlsruhe Institute of Technology (KIT)
Requirements	First University Degree (Bachelor or equivalent)
	A minimum of 5 years of professional experience in the specific field of the course is recommended
	The course can be held in German or in English – appropriate skills in the respective language are required. For international companies translators can be hired.
Registration	Register online via www.hectorschool.kit.edu/certificate_courses.php

For consultancy or company arrangements please contact:

Program Consultancy
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Course Instructor

Prof. Dr.-Ing. Eric Sax
Head of the Institute for Information Processing Technologies at the KIT

Prof. Sax was appointed head of the ITIV end of 2014. At the same time he received the call as department director at the FZI Research Center for Information Technology. In 2016 he was appointed as program director for the part-time master program Embedded Systems Engineering at the HECTOR School.

At the HECTOR School he combines scientific expertise with his broad experience from being in industry for more than 15 years, e.g. as *head of electronic development* for Daimler Buses worldwide and from the MBtech Group as *department manager for system testing*.

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