Ruhr Master School
of Applied Sciences

Dieses Wahlpflichtmodul ist ein Angebot der:

Fachhochschule Dortmund
University of Applied Sciences and Arts

Master Embedded Systems for Mechatronics

Applied Embedded Systems

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University of Applied Sciences

STIFTUNG MERCATOR

Applied Embedded Systems (MOD-E01)

Code Number	Workload	Credits	Semester	Frequency	Duration
10401	180 h	6		annually	1 Semester

1	Course Title	Contact hours	Self-Study	Planned Group Size
	Applied Embedded Systems 1	4 SWS / 60 h	120 h	25 students

2 Course Description

Applied embedded systems such as embedded controllers for industrial (i.e. robotics) applications are surrounded from sensors and actuators. Together with other embedded systems they can be groups of networked computers, which have a common goal for their work. This course gives an overview about the recent state of the art in embedded and cyber physical systems. Each semester, a selected CPS application will be analyzed in depth. This can be from robotic, energy, mobile communications or industrial scenarios (industry 4.0). The student will learn how to explore and structure a certain application domain and how to map the acquired skills and knowledge to that particular domain. CPS applications will be selected from recent research projects.

3 Course Structure

1. Introduction to the application domain
2. Characteristics of CPS in the application domain
3. Architectures for application specific CPS
    a. Standards
    b. Platforms and Frameworks
    c. Design methodology and processes
4. Domain specific languages (DSL) and applications
    a. DSL engineering
    b. Tools and Tool Chain Integration
5. Target Platforms and Code Generation
    a. Code generation
    b. Using real time operating systems (RTOS)

4 Parameters

- Course characteristics: elective
- Course frequency: every year - summer semester
- Capacity: 25 students
- Course admittance prerequisites: none
- Skills trained in this course: theoretical, practical and methodological skills
- Assessment of the course: Oral Exam (30 min) at the end of the course (50%) and group work as homework (50%): modeling and target mapping of an example with AMALTHEA tools, demonstration and presentation
- Teaching staff: Prof. Dr. Burkhard Igel, (Prof. Dr. Carsten Wolff)

5 Learning outcomes

5.1 Knowledge

- Knows standards and platforms for specific domain
- Knows target systems
- Has acquired overview of target domain

	5.2 Skills • Can describe relevant characteristics and challenges of application domain • Can model mechatronic systems for the domain • Can apply methodology and state of the art tools on real use cases • Can select tools and define tool chains and design flows 5.3 Competence - attitude • Can structure a real mechatronic systems design project • Can communicate and find solutions with domain experts • Understands issues from application domains and can integrate solutions into a holistic design
6	**Teaching and training methods** • Lectures, Labs (with AMALTHEA tools), homework • Access to tools and tool tutorials • Access to recent research papers
7	**Course mapping** Requires: • MOD1-02 – Distributed and Parallel Systems • MOD1-03 - Embedded Software Engineering Connects to: • MOD-E03 – SW Architectures for Embedded and Mechatronic Systems • MOD-E10 – Automotive Systems
8	**References** Research papers of IDiAL institute and research group: https://www.fh-dortmund.de/en/idial/index.php Specifically: APP4MC: http://wiki.eclipse.org/APP4MC KUKSA: https://www.eclipse.org/kuksa/ Vyacheslav Kharchenko, Ah Lian Kor, Andrzej Rucinski: Dependable IoT for Human and Industry - Modeling, Architecting, Implementation, River Publishers Series in Information Science and Technology (2018)