

Module Description IPE ES

Official data		
Course of studies	Course of studies	Course of studies
International Program in Engineering	Production Systems Engineering	-

Description of module	Language	No. of module	Version	Responsible person of module
Embedded Systems	English	T3IPE004	0001	Maurus Bien
Embedded Systems				

Placement of modules on studies			
Type of module	Type of module	Type of module	Moduldauer
1.	- no formal prerequisites -	Local Profile Module	1 Semester

Used learning and examination methods			
Examination performance	Examination performance	Examination performance	Examination performance
Methods: Lecture, Lab Practice, seminar	<ul style="list-style-type: none"> ▪ Exam (written) ▪ graded Lab Practice 	<ul style="list-style-type: none"> ▪ yes 	<ul style="list-style-type: none"> ▪ 60 min

Workload and ECTS			
Workload (per h, a multiple of 30)	In total: (divided in)	150 h	ECTS: 5
	1. Attendance time (lecture and examination time)	52 h	-
	2. self-study	98 h	-

Intention of qualifications and competences	
Professional qualifications:	<ul style="list-style-type: none"> - Understanding of the concepts and technologies of Embedded Systems, including new concepts in particular Internet of Things. - Knowledge of basic technological concepts regarding Embedded Systems, especially combining software technologies and common hardware platforms. - Practical design and use of embedded systems, including the connection of system peripherals. - Discussion of benefits and future potential of embedded systems, insights in application cases for interdisciplinary scenarios.
Social and ethical competence:	<ul style="list-style-type: none"> - experience in teamwork and self-organized solutions for a given technical problem
Personal competence:	<ul style="list-style-type: none"> - proficiency in defining and developing own creative ideas to solve current application cases in embedded systems
Comprehensive professional competence:	<ul style="list-style-type: none"> - interdisciplinary collaboration to implement and transfer solutions.

Feature
Prerequisites: <ul style="list-style-type: none"> - Basic knowledge of electronics and computer science - Some experience in software engineering / at least one programming language (can be mitigated by team approach/self-learning units)

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Learning units and contents			
Teaching and learning units		Präsenz h	Selbst- studium h
(teaching and learning unit 1):	Embedded Systems/IoT - Basics	4	8
English Term:	Embedded Systems/IoT - Basics		
Content (non-binding guideline)			
<ul style="list-style-type: none"> - Terms and Buzzwords (Embedded, M2M, IoT, CPS) – Definitions, Components (incl. Sensors and Actors) - Internet of Things – History, Examples - Cyber-Physical Systems - Trends, Service Enabled Paradigm - Basic Communication Patterns 			
Literature			
<ul style="list-style-type: none"> - Andelfinger, Internet der Dinge: Technik, Trends und Geschäftsmodelle, Springer 			
(teaching and learning unit 2):	Technical Information Management	24	32
English Term:	Technical Information Management		
Content (non-binding guideline)			
<ul style="list-style-type: none"> - Technical Communication & Network Management - WebTechnology: Selection of basic technologies (Client/Server), HTML5, CSS, Server Side Javascript (SSJS) - IT-Security basic concepts (encryption, authentication) - IT Security Risk assessment (quality assurance, incident response, digital forensics) - Cloud Computing, Mobile Computing 			
Literature			
<ul style="list-style-type: none"> - Craig Hunt, TCP/IP Network Administration, O'Reilly - Amazon WebServices, Amazon Elastic Compute Cloud (EC2) User Guide - Eric Elliott, Programming JavaScript Applications: Robust Web Architecture with Node, HTML5, and Modern JS Libraries 			
(teaching and learning unit 3):	Lab Practice: Embedded Systems Seminar	24	58
English Term:	Lab Practice: Embedded Systems Seminar		
Content (non-binding guideline)			
<ul style="list-style-type: none"> - Architecture: Developing of a solution architecture, Model-Driven Development - Software: WebProgrammming Microcontroller programming, integration of external devices/sensors/actors/interface/etc. - Hardware: Arduino-like experimental board and/or RaspBerryPi - Remark: Entry level individually adaptable to prior student knowledge (teamwork of 2-3 students) 			
Literature			
<ul style="list-style-type: none"> - <i>Own Script (Task description) – w/ moodle and Internet links for knowledge rampup</i> 			