International Program in Engineering **(IPE)**

Track: 'Production Systems Engineering'
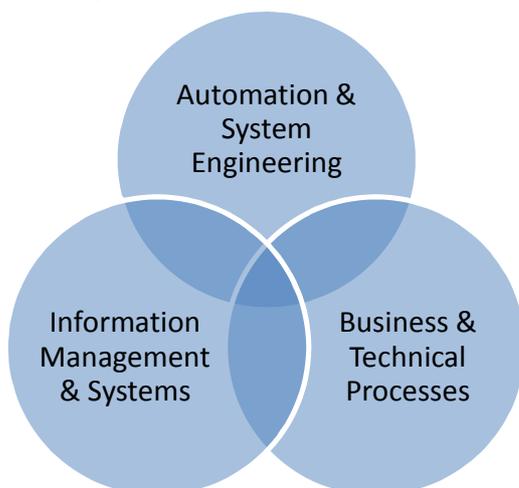
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November 11th, 2014	Prof. Dr.-Ing. Christian Kuhn	PRELIMINARY (V3.1)			

Introduction & Motivation

→ *How do we run the production of the future? What will change, what do we need?*
→ *What are the competencies, skills and capabilities of future engineers to make this happen?*

These are major questions which are currently discussed in production companies around the world – in the context of globalization and market & costumer requirements, but also new upcoming technologies. Nearly all 'production' countries of the world identified local production as strategic focus to keep and strengthen the competitiveness of their industry. Many countries started initiatives with participation of science, economy and politics, like in Germany the initiative 'Industry 4.0' (Source: VDI, www.vdi.de/industrie40), other often used keywords are 'Integrated Industry' or 'Industrial Internet'. Around this initiatives, a lot of new technical 'buzzwords' have been created – Digital Factory, Internet of Things and Services, M2M, Big & Smart Data, Cloud Computing, Event-Driven Process Management, Human-Process-System-Interface … and many more. But these initiatives include also a revival of existing, but extended concepts in production and automation, like ERP, PPS, MES, OPC, PLC/fieldbus, Human-Machine-Interface, Embedded Systems and others. This content will be covered in this program.

With the funding of the first track 'Production Systems Engineering' of our 'International Program in Engineering', we want to support and push these initiatives by offering undergraduate academic studies and enabling students to gain the skills and competencies needed to get companies on track to the 'future of production' and 'Digitization'. The business focus of the program track is the broad field of production, which includes manufacturing (products, components and machines), logistics and asset & service management. Additional to basic engineering modules in Automation & System Engineering and Embedded Systems, there will be a strong focus on Information Management & Systems with embedded knowledge about basics of typical business processes in the company.

This program is a generic engineering program, focused on technical aspects. However, organizational and business aspects also are important to understand and transfer the core principles and methods. Process & project management topics as well as international business are also included in the program track. The program has a highly interdisciplinary approach, so students with different backgrounds and skills can successfully complete the program, and also interact and work effectively with the colleagues. Therefore, the modules have a broad, but no deep specialized content, and offer a chance to gain social and communication skills and self-competence. A seminar-like approach in classes support to train mixed hard- and softskills, learning to work in heterogeneous teams like in the company practice. Students should be able to transfer

their knowledge and competencies to find suitable solutions by using and transferring current methods and technology in the practice of the producing industry sector ('Executive Engineer').

Entry requirement for students is a 'near-bachelor' level (>= 5 semesters, undergraduate) in an engineering study course, so that basic knowledge in mathematics, physics, information management/programming (at least one programming language) and general technical modules is covered. However, we want to attract a wide range of engineering disciplines, so the program should be open and feasible for a variety of studies, including Mechatronics, Information Technology, Electrical Engineering, Industrial Business Engineering and Business Information. Students need to have the ambition to obtain and develop cross-disciplinary skills and competencies.

The language of instruction is English, including all documentation, lectures and lab modules (Recommended: English B1 or better). It's planned to have native English speakers as lecturers (in block sessions) as well as local expert professors. Remark: in the first round, we'll plan mainly with local lecturers with DHBW experience.

The target group of the program consists of two different segments:
- Students from International DHBW Partner Universities
- Students of DHBW Mosbach, School of Engineering

The final goal is to have a ratio of 50/50 and establish a 'buddy' concept, so that an international student gets direct support from a local student.

Organizational Details of the Program IIEP
- Location: DHBW Mosbach (www.dhbw-mosbach.de, close to Heidelberg), Baden-Wuerttemberg, Germany
- Organization and management by DHBW Mosbach
- Rooms in an apartment house are offered for external students (managed by International Office).
- Track length of 12 weeks, in German spring semester (6. Semester), beginning of April – Beginning of July (Start 2015: 13. April 2015 – before: 2 weeks German class in HD)
- Max. 30 students per class, sustainable approach (start small, get bigger …) → start with one course (> 10 students)
- ~ 25 Credits ECTS → completely replaces ‚usual' Semester 6 [30 ECTS for international students]
- Modules in blocks or continuous over semester (dep. on lecturer), rolling exams during semester (shortly after each module)
- Project (individual student research project): each student selects a project (5 ECTS) to promote his/her interests or to conform to home institution requirements, but topic has to be near to the content of the program (supervised by lecturers)
- Application process will start in January 2015, criterias & deadline to be announced (Webpage)

More information: international.dhbw-mosbach.de/ (available soon …)

Overview of the program modules (Planning status October 2014, subject to be adapted):

A.) Automation Systems Engineering	5 ECTS / 150 Units	
A1.) Extended Concepts in Automation	Components, Sensors/Actors, Control Engineering, Shop Floor Interfaces, OPC, SCADA, Auto-ID, Big Data/Smart Data, I40 Trends,	
A2.) Technical Information Management	Technical Communication & Network, WebTechnology / WebServices, SOA, IT-Security (encryption, authentification, prevention), Cloud Computing, Mobile Computing	
A3.) Simulative Engineering	Software-based Modeling, Simulation and Visualization (of Technical Processes) → MATLAB/Simulink	

B.) Engineering Operations & Business Management	5 ECTS / 150 Units	
B1.) PPQM	Project/Process/Quality-Management, Performance Management & Process Controlling, TQM/KVP, Operations Management, Entrepreneurship/Strategic Planning	
B2.) Business Process Management	Event-Driven Process Management, BPMN, Process Orchestration	
B3.) International Business	Marketing, Sales & Distribution, Transport & Logistics, Law, Finance, Custom Control	

C.) Production– and Information Management	5 ECTS / 150 Units	
C1.) Business Information Systems in Production and Logistics	ERP, MES, WMS, Business Systems Architecture, Business Intelligence, PLM, SAP ERP Practice (PP, SD, MM)	
C2.) Advanced Concepts in Production Management	Application Use Cases, Lean Manufacturing, KPI Management, Industry 4.0, Predictive Maintenance, Energy Management, Business Models	
C3.) Interdisciplinary Seminar & Lab Practice	FIM Lab Seminar - Production & IT (Scenarios & Use Cases in different application areas)	

D.) Embedded Systems	5 ECTS / 150 Units	
D1.) Embedded Systems - Basics and Advanced Concepts	Principles, Cyber-Physical Systems, Internet of Things/M2M, Sensors and Actors, Basic Communication Patterns	
D2.) Embedded Systems – Architecture	MIPS-ISA, assembler, computer arithmetics, single/multi-cycle-datapaths, exception handling, interrupts, other components	
D3.) Lab Practice: Embedded Systems Seminar	microprocessor programming with external devices/sensors/actors, tasks with different levels, group of 2-3	

E.) Student Research Project	5 ECTS / 150 Units	
Studienarbeit II (T2_3200)	w/ documentation and presentation	

F.) Social and non-technical skills	5 ECTS / 150 Units	Only international students!	International Office of DHBW
F1.) Intensive German language course	Before official start, in HD		"
F2.) Additional intercultural lectures	Studium Generale, Presentations/Events from other classes		"
F3.) Social programs, Excursions & Trips	all students		"