Modulbezeichnung (Kürzel)	**ICPS, IIoT and Industry 4.0** (III4)
Modulbezeichnung (eng.)	ICPS, IIoT and Industry 4.0
Semester (Häufigkeit)	1 (jedes Sommersemester)
ECTS-Punkte (Dauer)	5 (1 Semester)
Art	Pflichtfach
Sprache(n)	Englisch
Studentische Arbeitsbelastung	60 h Kontaktzeit + 90 h Selbststudium
Voraussetzungen (laut MPO)	
Empf. Voraussetzungen	Module "xxx", Module "xxx"
Verwendbarkeit	MII
Prüfungsform und -dauer	Mündliche Prüfung oder Studienarbeit
Lehr- und Lernmethoden	Vorlesung
Modulverantwortliche(r)	A. W. Colombo

Qualifikationsziele

The rapid advances in computational power, communication and storage coupled with the benefits of the cloud and services, is giving rise to a new generation of industrial systems whose communication features are based on Industrial-Internet-Technology (IIoT), whose functionalities reside on-device (edge) and/or in-cloud and are exposed and/or consumed based on the application of the Industrial-Internet-of-Services (IoS) paradigm. The result are Industrial Cyber-Physical Systems (ICPS), core of Industry 4.0 solutions. ICPS are the backbone, the enabler of digitalization, connectivity, composability and interoperability between seemingly disparate domains and application sectors like Energy, Healthcare, Transportation, Robotics, Smart Cities, Industry, etc. Students will be qualified to understand and work with Industry 4.0 frameworks covering "digitalization and networking of systems based on the ICPS technologies".

Lehrinhalte

Understanding the outcomes of the 3rd Industrial Revolution: Production Paradigms, Flexible and Reconfigurable Systems, traditional CIM-Pyramid for Control and Automation. Learning a set of technologies and architectural patterns to enable the specification, implementation and operation of industrial cyber-physical systems under the DIN SPEC 91345:2016-04 (RAMI4.0: Reference Architecture Model for Industrie 4.0) and Industrial Internet-Reference Architecture (IIRA) standards. Learning the major specifications of the (i) enterprise standard architectures PERA, ISA´88, ISA´95 (IEC 62264, IEC 61512), Smart Grid Reference Architecture Model (SGAM), Bosch Connected Industry, Schneider Electric EcoStruXure, etc, (ii) Life Cycle and Value Stream (IEC 62890) and (iii) Standards and Technologies for specifying and implementing different layers of the RAMI 4.0 vertical dimension (e.g. Big Data Reference Architecture, Collaborative Manufacturing Model (CMM), OPC UA Companion Specification, vertical and horizontal OT/IT Connectivity among ICPS, Edge/Fog and Cloud computing, etc.). Individual studies and analysis (technology and trend screening) of currently implemented industrial solutions for ICPS, performed by the students.

Literatur

Industrial Cloud-based Cyber-Physical Systems: The IMC-AESOP Approach. Springer, doi:10.1007/978-3-319-05624-1; DIN SPEC 91345:2016-04: Reference Architecture Model Industrie 4.0 (RAMI4.0). DIN - VDI/VDE 2016; Industrial Internet Reference Architecture (IIRA). Industrial Internet Consortium. [Online]. Available: http://www.iiconsortium.org; Learning Industrial Cyber-Physical Systems and Industry 4.0-Compliant Solutions, doi: 10.1109/ICPS48405.2020.9274738.

Lehrveranstaltungen		
Dozenten/-innen	**Titel der Lehrveranstaltung**	**SWS**
A. W. Colombo	ICPS and Industry 4.0	2
O. Bergmann	IIoT	2