Modulbezeichnung (eng.)	**Robotic Systems** (Robotic Systems)
Semester	WPM
ECTS-Punkte (Dauer)	5 (1 Semester)
Art	Wahlpflichtmodul Zertifikat Industrial Cyber-Physical Systems und Zertifikat Informationsverarbeitung für cyber-physische Systeme
Sprache(n)	Englisch
Studentische Arbeitsbelastung	60 h Kontaktzeit + 90 h Selbststudium
Voraussetzungen (laut MPO)	
Empf. Voraussetzungen	
Verwendbarkeit	MaII
Prüfungsform und -dauer	Klausur 1,5 h oder mündliche Prüfung
Lehr- und Lernmethoden	Vorlesung, Praktikum
Modulverantwortlicher	A. W. Colombo

Qualifikationsziele
The students understand and are able to describe the mechatronics and SW structure of robots. They have know-how about robotic applications, centered around industrial processes. In these areas they gain knowledge about both, the hardware components of robots, their many sensors, actuators, and physical configurations, as well as the algorithmic kinematics and dynamics and software components required to drive them. The students become familiar with the periphery of a standard industrial robotic cell, and its interaction in the complete process environment. Knowledge about standard SW-Interfaces to integrate robots in an Industrial Cyber-Physical System are acquired by learning the robot as a CPS-component within a RAMI4.0-compliant automation architecture. The students are to gain an insight in the emerging trends in the fields of robotics, Man-Machine Interaction, Light Weight Robots and the widening fields of robotics in an industrialized nation, including Medical Robotics, Agricultural Robots, Search and Rescue Robots and more.

Lehrinhalte
Overview of different types of robots including structural and behavioral specifications: working-space, energy-sources, etc. Introduction to Robotic Kinematics (forward and backward), Robotic Dynamics. HW- and SW- Interfaces for integrating the robot in an industrial flexible cell. Selection of different types of Sensors, Actuators and Grippers as well as their application domains. Overview of current and emerging fields for robotics: Industrial Robotics, Medical Robotics, Delivery Robotics, Agricultural Robotics. Overview of traditional industrial robotized processes: welding, cutting, cleaning, palletizing, tendering, assembly/disassembly: which kind of robot and energy source is recommendable for each kind of application. SW-Communication Interfaces for connecting a robot to a ICPS-based service cloud. Introduction to ROS, IROS, SKIROS (Robot Operating Systems). Combining seminars and practical projects, contents will be adapted to the latest outcomes of research and Innovation projects of the I2AR Institute.

Literatur
John J Craig: Introduction to Robotics, Mechanics and Control. Prentice Hall 2003.
Heimann, B., Gerth,G. und Popp, K.: Mechatronik, 3. Auflage, Hanser 2007.
Roddeck, W.: Einführung in die Mechatronik, Teubner, Stuttgart, 1997.
Vogel, J.: Elektrische Antriebe, Hüthig, Berlin, 1988.
Steven M. LaValle, Planning Algorithms, Cambridge University Press, 2006

Lehrveranstaltungen

Dozent	**Titel der Lehrveranstaltung**	**SWS**
G. Kane	Robotic Systems 1	2
A. W. Colombo	Robotic Systems 2	2