Modul **Advanced Robotics**					Abk. **AdRo**
Studiensem. **2**	Regelstudiensem. **2**	Turnus **Jedes SS**	Dauer **1 Semester**	SWS **3**	ECTS-Punkte **4**

Modulverantwortliche/r	Prof. Dr. Ing. Rainer Müller
Dozent/inn/en	Prof. Dr. Ing. Rainer Müller und Mitarbeiter
Zuordnung zum Curriculum	Master Systems Engineering PS, Kernbereich Master Systems Engineering SAS, Erweiterungsbereich
Zulassungsvoraussetzungen	Keine formalen Voraussetzungen
Leistungskontrollen / Prüfungen	Mündliche/schriftliche Prüfung
Lehrveranstaltungen / SWS	Vorlesung: 2 SWS, Übung: 1 SWS
Arbeitsaufwand	Präsenzzeit Vorlesung 15 Wochen á 2 SWS 30 h Präsenzzeit Übung 15 Wochen á 1 SWS 15 h Vor- und Nachbereitung Vorlesung und Übung 45 h Klausurvorbereitung 30 h Summe 120 h (4 CP)
Modulnote	Prüfungsnote

Learning objectives

This course deals with advanced topics in robotics. Thereby the process and the tools of developing efficient and intelligent robotics applications are considered. The course covers the topics of integration of sensors, data planning and QM and TM. Furthermore, applications of robots in the automotive and aircraft industry are discussed. An introduction to Artificial Intelligence (AI) with a focus on robotics is given. Moreover, the topic of logistics and its relation to robotics is presented. In this context, the topic of mobile robotics will be addressed. The use of robotics in the environmental and health care field will also be a focus of the lecture. The students will learn the conception and realization of robotics application based on simulation.

The goal is for students to learn how to develop an intelligent robotics application that uses sensory data and AI methods. In addition, the students will learn to use the robotics applications in the field of environmental and health care.

Learning outcomes

Students are expected to have:

- Knowledge of current topics in robotics
- Knowledge of programming methods in robotics
- Attendance of the lecture Human-Robot Cooperation in Industrial Production is an advantage

At the end of the course, students should be able to:

- Independently solve complex problems in robotics using sensor data and AI methods.
- Identify the different AI methods and their application in the robotics
- Program and set up robotics applications in the simulation environment.
- Identify the structure of a mobile robotic system and its component.

- Understand the kinematic structure and control strategy that can be considered in mobile robotics.
- Program and control a robotic system.
- Have knowledge about the fields and applications targeted by Soft Robots und the relevant materials und strategies.
- Identify the complementarity between humans and robots that makes them suitable for surgical assistance.
- Identify and solve problems in the field of logistics, environmental technology and health care based on the presented methods and concepts in the robotics.

Content

- Sensor technologies in robotics and inspection applications
- Robotics in the automotive and aircraft
- Artificial intelligence in the robotics
- Mobile robots kinematics and control
- Introduction to soft robots and comparison with conventional robots
- Nature inspired soft robotic system
- Specific challenges in disassembly and separation technologies
- Disassembly-friendly connection techniques and planning
- Robotics in a global computer-assisted surgery framework
- Theoretical and practical aspects for the modelling and the simulation of robots
- Deployment of Exoskeletons in industrial application and their control strategies

Weitere Informationen: http://www.zema.de

Unterrichtssprache: englisch