

COURSE DESCRIPTION CARD

Course name	Virtualization methods for automation systems and industrial robotics				
Course type	optional	Course code	SDPB0006	ECTS credits	2
Forms and number of hours	lecture: 10 h project: 10 h	Scientific discipline	automation, electronic and electrical engineering		
Course objectives	The aim of the course is to familiarize PhD students with the methods of virtualization for industrial processes as a new element of automation and robotics control systems. In particular, the use of IT tools supporting the process of designing, commissioning and testing automation and industrial robotics systems.				
Course content	<p>Lecture:</p> <ol style="list-style-type: none"> 1. Smart factory technologies and components of industrial parts, controllers, sensors, feeders, robot cells and other industrial machinery and equipment. 2. Scenarios design for the operation of machines and devices in production lines that make up the virtual model of an smart factory. 3. IT tools supporting the virtualization of automation and robotics systems. 4. Real-time simulation methods of industrial systems using the most popular automatic technologies while maintaining full functionality of the real system. 5. Support for PC-based virtual drivers, HMI simulators and others. 6. Tools for 3D model simulation of a machine in industrial environment. 7. Modelling, simulation and optimization of logistics systems and production processes. <p>Project:</p> <ol style="list-style-type: none"> 8. Development of a simulation model of a selected production line. 9. Simulation of discrete events and optimization of production efficiency. 10. Simulation of the work of selected robotics, robotic and automated production systems. 11. Development of a model of material flow, resource use and logistics at the levels of production planning and management. 				
Teaching methods	<p>Lecture: informative-problem lecture, discussion; case study; students' own studies based on the indicated sources.</p> <p>Project: project tasks realization; preparation of a report.</p>				
Assessment method	<p>Lecture: written exam.</p> <p>Project: project report, presentation of the virtual industrial system.</p>				
Symbol of learning outcome	Learning outcomes		Reference to the learning outcomes for the field of study for the 8th level of Polish Qualification Framework (PRK)	Methods of assessing the learning outcomes	
LO1	knowledge of virtual model design of the automated production system		SD_W1, SD_W2	Exam	
LO2	knowledge of the methods of planning and simulating robotic systems		SD_W1, SD_W2	Exam	

LO3	practical programming modelling skills of work scenarios for machines and devices in production lines	SD_U1, SD_U2	Exam Project tasks
LO4	Implementation of IT tools in virtual models of an smart factory	SD_U1, SD_U2	Exam Project tasks
LO5	ability to develop a model of material flow, resource use and logistics at the levels of planning and production management	SD_U1, SD_U2	Project tasks

Student workload (in hours)	
Lecture / project	10 / 10
Consultations	2
The unassisted student work	20
Implementation of project tasks and preparation for and participation in exams/tests	10
Total	52
ECTS credits	2

Basic references	<ol style="list-style-type: none"> 1. Didactic resources of the teacher. 1. Technical guides of Siemens, Astor, Fanuc, Festo. 2. Rajkumar R., Niž D., Klein M., Cyber-Physical Systems, Addison-Wesley Professional, 1 ed., 2017. 3. Anderson G.D., Industrial Network Basics: Practical Guides for the Industrial Technician, CreateSpace Independent Publishing Platform, 2014. 4. Tatjewski P., Sterowanie zaawansowane obiektów przemysłowych, struktury i algorytmy, Exit, 2002.
Supplementary references	<p>Webpages:</p> <ol style="list-style-type: none"> 1. https://automatykab2b.pl/ 2. https://iautomatyka.pl/ 3. https://strefainzyniera.pl/ 4. https://www.multiprojekt.pl/ 5. https://www.profibus.com/ <p>Libraries:</p> <ol style="list-style-type: none"> 6. https://www.biblioteka.siemens.academy/materials 7. https://support.industry.siemens.com/cs/products?mf=ps&lc=en-PT
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