

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Roboty w procesach przemysłowych**
 Name in English: **Robots in industrial processes**
 Main field of study (if applicable): **Control Engineering and Robotics**
 Specialization (if applicable): **Automation of Machines, Vehicles and Apparatus**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **obligatory**
 Subject code: **ARR043220**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	15		30		
Number of hours of total student workload (CNPS):	60		60		
Form of crediting:	crediting with grade		crediting with grade		
For group of courses mark (X) final course:					
Number of ECTS points:	2		2		
including number of ECTS points for practical (P) classes :			2		
including number of ECTS points for direct teacher-student contact (BK) classes:	1.40		1.40		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has a basic knowledge on the robots construction, programming and applications
2. Has a basic knowledge in the field of industrial process automation.
3. Has a basic on kinematics and dynamics of robots.
4. Is able to use the obtained knowledge on construction and operation of electrical drives of robots.
5. Is able to use the obtained knowledge on distributed control and industrial process automation using PLC.

SUBJECT OBJECTIVES

- C1. Familiarizing students with the issues of construction and operation of modern drives applied in robots and machine tools.
 C2. Familiarize students with the basics of designing robotic workstations.
 C3. Gaining the skills of selection of industrial robots and manipulators for various industrial applications
 C4. The acquisition of practical knowledge regarding the construction, operation, picking and robotic programming used in basic industrial processes.

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 Has knowledge on basic robot control methods.
 PEK_W02 Has matured knowledge on construction and applications of robots in industrial processes.
 PEK_W03 Has knowledge on basic programming methods for industrial robots.

relating to skills:

- PEK_U01 It has the basic skills related to designing robotic workstations.
 PEK_U02 Can choose the robot type and its equipment, define its functional requirements depending on specific industrial process.

relating to social competences:

- PEK_K01 Understands the needs for team work on finding and improving the methods of problem solving.

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	The development of industrial robotics. Factors stimulating the development of robotics.	2
Lec 2	Definitions and classification of industrial robots	2
Lec 3	Construction of industrial robots	2
Lec 4	Control of industrial robots	2
Lec 5	Programming of industrial robots.	2
Lec 6	Effectors and sensors of industrial robots.	2
Lec 7	Applications industrial robots	2
Lec 8	Final test	1
Total hours:		15

Form of classes - laboratory		Number of hours:
Lab 1	Introduction to the construction and programming of Mitsubishi robots.	2
Lab 2	Application of the arm robot RV-3SB in a simple electrical device assembling process. Part1	2
Lab 3	Application of the arm robot RV-3SB in a simple electrical device assembling process. Part2	2
Lab 4	Application of the arm robots RV-2AJ and RV-3SB in a palletizing process. Part 1	2
Lab 5	Application of the arm robots RV-2AJ and RV-3SB in a palletizing process. Part 2	2
Lab 6	Application of the SCARA RP-1AH robot in a simple mechanical process. Part1	2
Lab 7	Application of the SCARA RP-1AH robot in a simple mechanical process. Part2	2
Lab 8	Application of Motion Control MPL laboratory set-up for multi-axes drive control in chosen technological processes. part1	2
Lab 9	Application of Motion Control MPL laboratory set-up for multi-axes drive control in chosen technological processes. part2	2
Lab 10	Programming of mobil robot working. part1	2
Lab 11	Programming of mobil robot working. part2	2
Lab 12	Application of Cartesian robot RCM-4M as x-y plotter. Part1	2
Lab 13	Application of cartesian robot RCM-4M as x-y plotter. Part2	2
Lab 14	Application of the numerical machine tools CNC in chosen simple technological processes. part1	2
Lab 15	Application of the numerical machine tools CNC in chosen simple technological processes. part2	2
Total hours:		30

TEACHING TOOLS USED
N1. Lecture with multimedia tools combined with classical lecture (problem oriented)
N2. Consultation and final test
N3. Preparation to the laboratory exercises and testing of student knowledge
N4. Implementation reports of the exercises

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation <i>F - forming (during semester) P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(w)	PEK_W01 PEK_W02 PEK_W03	Participation in lectures
F2(w)	PEK_W01 PEK_W02 PEK_W03	Final test
P(w)	$P=0,1 \cdot F1 + 0,9 \cdot F2$	
F1(L)	PEK_U01 PEK_U02 PEK_K01	Activity during laboratory exercises (including grades obtaining during short tests).
F2(L)	PEK_U01 PEK_U02 PEK_K01	Preparation of the report
P(L)	$P=0,3 \cdot F1 + 0,7 \cdot F2$	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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| <p>[1] Honczarenko J., Roboty przemysłowe. Budowa i zastosowanie, WNT Warszawa 2010
[2] Zdanowicz R., Podstawy robotyki, Wydawnictwo Politechniki Śląskiej, Gliwice 2012
[3] Tomasz Buratowski, Podstawy robotyki, Uczelniane Wydawnictwo Naukowo-Dydaktyczne AGH, Kraków 2006</p> |
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SECONDARY LITERATURE:

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| <p>[1] Szkodny T., Podstawy robotyki, Wydawnictwo Politechniki Śląskiej, Gliwice 2012</p> |
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SUBJECT SUPERVISOR

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT ARR043220 - Robots in industrial processes AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY Control Engineering and Robotics AND SPECIALIZATION Automation of Machines, Vehicles and Apparatus				
Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	S2AMPU_W05	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8	N.1 N.2
PEK_W02	S2AMPU_W05	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8	N.1 N.2
PEK_W03	S2AMPU_W05	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8	N.1 N.2
PEK_U01	S2AMPU_U04	C.3 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14 Lab15	N.3 N.4
PEK_U02	S2AMPU_U04	C.3 C.4	Lab1 Lab2 Lab3 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab14 Lab15	N.3 N.4
PEK_K01	K2AiR_K07	C.3 C.4	Lab1 Lab2 Lab4 Lab5 Lab6 Lab7 Lab8 Lab9 Lab10 Lab11 Lab12 Lab13 Lab14 Lab15	N.1 N.3 N.4