

FACULTY of Electronics / DEPARTMENT K29

SUBJECT CARD**Name in Polish Podstawy robotyki****Name in English Introduction to Robotics****Main field of study: Electronic and Computer Engineering (ECE)****Level and form of studies: 1st level, full-time****Kind of subject: obligatory****Subject code ECEA00020****Group of courses YES**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	75		30		
Form of crediting	Crediting with grade *		Crediting with grade*		
For group of courses mark (X) final course	X				
Number of ECTS points	3				
including number of ECTS points for practical (P) classes			2		
including number of ECTS points for direct teacher-student contact (BK) classes	1		1		

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

K1ECE_W01, K1ECE_W02, K1ECE_W03, K1ECE_W04

K1ECE_U01, K1ECE_U02, K1ECE_U03, K1ECE_U04

SUBJECT OBJECTIVES

C1 Knowledge of robotic terminology and basic tasks of robotics.

C2 Acquisition of knowledge on modeling robots and their environment and basic techniques used to solve tasks of kinematics and motion planning for the robots

C3 Developing skills to implement, test and analyze selected robotic algorithms for manipulators and mobile robots.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 can classify robots according to different criteria.

PEK_W02 are able to formulate algorithms for forward and inverse kinematics and dynamics.

PEK_W03 can characterize sensors of robotics.

PEK_W04 knows basic methods of motion planning for mobile robots and interpolation techniques for manipulators.

PEK_W05 – acquires knowledge on modeling robots and their environment.

relating to skills:

PEK_U01 can define basic robotic tasks and discuss their ingredients.

PEK_U02 are able to calculate kinematic tasks for manipulators and mobile robots.

PEK_U03 can simulate a motion of selected mobile robots.

PEK_U04 are able to select purposefully parameters for basic interpolation and motion planning tasks.

relating to social competences:

PEK_K01 Students are aware of necessity to search and collect technical information permanently and to analyze the data critically.

PEK_K02 Students understand and can apply the principles of health and safety at work with devices of robotics in the laboratory and beyond.

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours
Lec1-2	Terminology, an overview, and classifications of robotic tasks.	4
Lec3-4	Coordinate frame transformations and their compositions. Uniform coordinates.	4
Lec5-6	Forward and inverse kinematics for manipulators.	4
Lec7-8	Kinematics of mobile robots: from constraints to driftless systems.	4
Lec9	Jacobian and Newton algorithm for manipulators.	2
Lec10	Forward and inverse task of robot dynamics.	2
Lec11	Sensors of robotics: modeling obstacles and a robot itself.	2
Lec12	Interpolation methods of motion planning for manipulators.	2
Lec13	Methods of motion planning for mobile robots.	2
Lec14	Action planning for robots.	2
Lec15	Summary of lectures.	2
	Total hours	30

Form of classes - laboratory		Number of hours
Lab1	Transformations of coordinate frames.	3
Lab2	Forward kinematics.	3
Lab3	Inverse kinematics.	3
Lab4	Modelling mobile robots.	3

Lab5	Dynamics and control.	3
	Total hours	15

TEACHING TOOLS USED
N1. Traditional lecture using video projector N2. Laboratory classes N3. Consultations. N4. Independent work – preparation for laboratory classes. N5. Independent work – self study.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT		
Evaluation (F – forming (during semester), P – concluding (at semester end))	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01 ÷ PEK_W05	written test
F2	PEK_U01 ÷ PEK_U04	evaluation of laboratory reports
P = 0,5*F1 + 0,5*F2 (in order to pass the course, both F1 and F2 must be positive)		

PRIMARY AND SECONDARY LITERATURE
<u>PRIMARY LITERATURE:</u> [1] M. Spong, M. Vidyasagar, <i>Dynamics and robot control</i> , WNT, 1997 [2] J.J. Craig, „ <i>Introduction to robotics</i> ”, WNT, 1995. [3] P.J. McKerrow, <i>Introduction to robotics</i> , Adisson-Wesley Publ, 1991
<u>SECONDARY LITERATURE:</u> [1] lecture notes [2] internet resources [3] S. LaValle, <i>Planning Algorithms</i> , Cambridge Univ. Press., 2006
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)
Ignacy Duleba, ignacy.duleba@pwr.edu.pl