Zał. nr 5 do ZW 16/2020

FACULTY ELECTRONICS

SUBJECT CARD

Name of subject in Polish:	**Podstawy robotyki**
Name of subject in English:	**Introduction to Robotics**
Main field of study (if applicable):	**Electronic and Computer Engineering**
Specialization (if applicable):	**……..**
Profile:	**academic**
Level and form of studies:	**1 st 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)	30		60		
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 corresponding to classes that require direct participation of lecturers and other academics (BU)	1		1		

*delete as applicable

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

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:

PEU_W01 can classify robots according to different criteria.

PEU_W02 are able to formulate algorithms for forward and inverse kinematics and dynamics.

PEU_W03 can characterize sensors of robotics.

PEU_W04 knows basic methods of motion planning for mobile robots and interpolation techniques for manipulators.

PEU_W05 – acquires knowledge on modeling robots and their environment.

relating to skills:

PEU_U01 can define basic robotic tasks and discuss their ingredients.

PEU_U02 are able to calculate kinematic tasks for manipulators and mobile robots.

PEU_U03 can simulate a motion of selected mobile robots.

PEU_U04 are able to select purposefully parameters for basic interpolation and motion planning tasks.

relating to social competences:

PEU_K01 Students are aware of necessity to search and collect technical information permanently and to analyze the data critically.

PEU_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		
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

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 LEARNING OUTCOMES ACHIEVEMENT		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating learning outcomes achievement
F1	PEU_W01 – PEU_W05	written test
F2	PEU_U01 – PEU_U04, PEU_K01 – PEU_K02	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
PRIMARY LITERATURE: [1] M. Spong, M. Vidyasagar, *Dynamics and robot control*, WNT, 1997 [2] J.J. Craig, „*Introduction to robotics*", WNT, 1995. [3] P.J. McKerrow, *Introduction to robotics*, Adisson-Wesley Publ, 1991 **SECONDARY LITERATURE:** [1] lecture notes [2] internet resources [3] S. LaValle, Planning Algorithms, Cambridge Univ. Press., 2006
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)
Ignacy Duleba, ignacy.duleba@pwr.edu.pl