Bialystok University of Technology, Faculty of Mechanical Engineering									
Field of study	*Mechatronics*							**Degree level and programme type**	*second-cycle (MSc, Eng) full-time studies*
Specialization/ diploma path	*Common course*							**Study profile**	*academic*
Course name	*Programming of industrial robots*							**Course code**	*IS-FME-00265S*
								Course type	
Forms and number of hours of tuition	**L**	**C**	**LC**	**P**	**SW**	**FW**	**S**	**Semester**	*summer*
	15		*45*					**No. of ECTS credits**	*3*
Entry requirements	-								
Course objectives	*Getting acquainted with methods of programming industrial robots. Getting to know on-line and off-line robot programming environments. Learning programming languages and acquiring programming skills. Planning and programming movements of manipulators.*								
Course content	*Lecture: task planning, offline and online programming, Mikro V+ and AS programming languages; description of RobWork and ROS environments, communication between ROS nodes, Rviz module, URDF model. Laboratory: robot task planning (pick and play), programming of an Adept Cobra robot, programming of a Kawasaki robot, compiling and running programs in the ROS environment;*								
Teaching methods	*Information and problem lecture; Laboratory classes;*								
Assessment method	*Lecture: one test, Laboratory: evaluation of: self-preparation tests on specified issues before they are discussed during the course, students' reports, students' participation in discussions and their activity during classes.*								

Symbol of learning outcome	**Learning outcomes Students who successfully complete the course:**	**Reference to the learning outcomes for the field of study**
LO1	*know and understand methods of programming industrial robots*	*MK2_W02*
LO2	*know and understand the concept of programming in the ROS system*	*MK2_W03*
LO3	*can compile and run a program in the ROS environment*	*MK2_U04, MK2_U06*
LO4	*can write programmes controlling manipulator movements*	*MK2_U06*

Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	*Lecture: one test;*	*L*
LO2	*Lecture: one test;*	*L*
LO3	*Laboratory classes: evaluation of: self-preparation tests on specified issues before they are discussed during the course, students' reports, students' participation in discussions and their activity during classes;*	*LC*
LO4	*Laboratory classes: evaluation of: self-preparation tests on specified issues before they are discussed during the course, students' reports, students' participation in discussions and their activity during classes;*	*LC*

Student workload (in hours)	**No. of hours**
Participation in lectures	*15*
Participation in laboratory classes	*45*

Calculation	*Preparation for passing the lecture*	*25*
	Preparation for laboratory classes	*20*
	Preparation for passing the laboratory classes	*5*
	Participation in consultations	*5*
	TOTAL:	*115*

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	*65*	*2.6*
Student workload – practical activities	*73*	*2.9*

Basic references	*1. Kaczmarek W., Panasiuk J., Programowanie robotów przemysłowych. PWN , Warszawa, 2017* *2. Kaczmarek W., Panasiuk J., Borys S., Środowiska programowania robotów. PWN , Warszawa, 2017* *3. O'Kane J.M., A Gentle Introduction to ROS, online access: https://cse.sc.edu/~jokane/agitr/, 2018* *4. Martinez A., Fernandez E., Learning ROS for Robotics Programming. A practical, instructive, and comprehensive guide to introduce yourself to ROS, the top-notch, leading robotics framework*
Supplementary references	*1. Honczarenko J., Roboty przemysłowe: budowa i zastosowanie. WNT, Warszawa, 2010*

Organisational unit conducting the course	*Department of Automatic Control and Robotics*	**Date of issuing the programme**
Author of the programme	*Waldemar Kołodziejczyk, PhD, MSc, Eng*	*24.04.2019*

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work, S – seminar