RTU Course "Industrial robot control systems"

33000 Faculty of Computer Science, Information Technology and Energy

General data

Code	DDI701
Course title	Industrial robot control systems
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Dmitrijs Bļizņuks
Volume of the course: parts and credits points	1 part, 3.0 credits
Language of instruction	LV
Annotation	In the case of the study course, basic knowledge about the robotics sphere is given. At the beginning of the study course student receives information about different robot control mechanisms (technical realization, manipulator kinematics, direct and inverted kinematic task) and principles (discreet, adaptive and intellectual control). Further, technical implementation and adaptive control mechanism principles are discussed. At the end of the study course, students are informed about the existing adaptive robotic system.
Goals and objectives of the course in terms of competences and skills	The main aim of the study course is to acquaint students with different robot control systems. The tasks of the study course: - to develop the ability to detect and describe existing robot control systems; - to provide knowledge in robotics control algorithms and structure schemes; - to develop the ability to select and collect all knowledge to construct own robotic system.
Structure and tasks of independent studies	Students independently solve test tasks related to the simplified individual solution of a direct kinematic problem.
Recommended literature	Obligātā/Obligatory: Matricu teorijas pielietojumi robottehnikā. RPI, Rīga, 1988. Robottehniskās sistēmas un tehnoloģiskie kompleksi. Laboratorijas darbu apraksti. RPI, Rīga, 1987. Papildu/Additional: Adaptive Control of Robot Manipulators, An-Chyan Huang and Ming-Chih Chien. ISBN: 978-981-4307-41-3, 226. lpp, 2010. Unmanned Electrical Vehicles and Autonomous System Simulation, Agris Nikitenko, Anastasija Ziravedska, Karlis Berkolds, Kristaps Vitols [un vēl 8 autori] . ISBN 9789934226670, 212.pp, 2021.
Course prerequisites	Mathematics, ETP.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
1.History of robotics, structure schemes, industrial robot structure and elements, robot generations and comparison;	2	2	0	0
2.Industrial robot (IR) discreet cyclic control;	2	2	0	0
3.IR discreet positional control;	2	2	0	0
4.IR contour control;	2	2	0	0
5.Kinematics of manipulator;	2	2	0	0
6.Manipulator coordinate system;	2	2	0	0
7.Detection of original position;	2	2	0	0
8.Manipulator movement, direct task;	2	2	0	0
9.Inverted kinematical task (simplified);	2	2	0	0
10.Inverted kinematical task (full version);	2	2	0	0
11.Classification of external sensors, position sensors, pressure and power transducer;	2	2	0	0
12.Direction, anti glide and location transducers;	2	2	0	0
13.Adaptive IR principles, adaptation for separate position;	4	4	0	0
14.External adaptation for whole manipulator;	4	4	0	0
15.Adaptive assembling robot technical complex for non oriented object seizing;	4	4	0	0
16.Welding robot adaptive control	4	4	0	0
Total:	40	40	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Is able to navigate the diversity of robot control principles and is able to define control system types and usage	Exam.

Can choose industrial robot control algorithm and structural elements.	Exam.
Is able to create a robot control platform.	Test works during semester.
Is able to create a robotic system as a whole.	Test works during semester.

Evaluation criteria of study results

Criterion	%
Exam	50
Test works during semester	50
Total:	100

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	2.0	0.0	0.0		*	