RĪGAS TEHNISKĀ UNIVERSITĀTE

RTU Course "Electric Drive of Robots"

27101 null

General data

Code	EEP352
Course title	Electric Drive of Robots
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Leonīds Ribickis
Academic staff	Pēteris Apse-Apsītis Agris Treimanis
Volume of the course: parts and credits points	1 part, 3.0 credits
Language of instruction	LV, EN
Annotation	Acquisition of study course provides a comprehension about composition of electric robots, their history and classification. The construction knowledge of electric drive robot system, control methods and electromechanical characteristics provides with a possibility to develop, produce and exploit direct current and alternating current electrical drive in different steady state robotized appliances, as well as in mobile robots. Robot direct current and alternating current electric drive systems are analysed together with power electronics converters, as well as parameter influence on electric drive system operation is diagnosed. A comprehension is developed about robot electrical drive motor dynamics and their choice. A comprehension is also developed about electrical drive control method formation and their usage in free-standing and steady state robots.
Goals and objectives of the course in terms of competences and skills	The aim of the study course is to introduce students with the mechanics of robot electric drive system and electro mechanics; also, the aim is to introduce students with parameter influence on robot electric drive characteristics, introduce them with speed control methods, with control methods, with transition process calculations and the choice of motor. The objectives of the study course is to develop such student skills: to calculate robot electric drive elements; to choose rational power electronic converter for different direct current and alternating current motor for robot production and in free-standing robots; to calculate transition process influence on electric drive operation and to evaluate their energy efficiency; to describe and analyse robot electrical drive systems; to choose robot electrical drive speed regulation scheme and to calculate scheme elements; to calculate transition process influence on robot electrical drive operation.
Structure and tasks of independent studies	Self-dependent work for mastering of the lectures material. Preparation for tests. Before each practical work the students are expected to complete report on the theoretical basics.
Recommended literature	Obligātā/Obligatory: 1. D.V.Novotnijs, T.A.Lipo, T.A.Džans, Ievads elektriskajās mašīnās un elektropiedziņā, L.Ribickis - tulkojuma zinātniskais redaktors, RTU Izdevniecība - 2019.g. - 324 lpp. 2. L. Ribickis, J. Valeinis. Elektriskā piedziņa mehatronikas sistēmās. RTU izdevniecība, 2008. 286 lpp. 3. I.Yamamoto, Practical Robotics and Mechatronics- Marine, Space and Medical Applications, London - 2016, 158 pp. 4. T.Braunl, Embedded Robotics, Second Edition, Springer 2006, 458 pp. Papildu/Additional: 1. M.H.Lee, How to grow a robot, London, England - 2020, 365 pp.
Course prerequisites	Basics of electric drives, electrical machines, theoretical basics of electrical engineering, mechanics, kinematics, power electronics.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Introduction and history of robots electric drive development.	2	2	1	3
Mechanics of drives of robots.	2	2	1	3
Electric drive in robot systems, its characteristics.	2	2	2	3
Speed control of DC drives of robots.	2	2	2	3
Speed control of AC drives in robot systems.	2	2	1	2
Linear drives in robot systems.	2	2	2	3
Dynamics of robot DC drives.	2	2	1	2
Dynamics of robot AC drives.	2	2	1	2
Dynamics of robot special drives.	2	2	2	3
Methods of robots electric drives control.	2	2	1	2
1.Pract.w. Static and dynamic characteristics of DC drive.	4	4	2	6
2.Pract.w. Static and dynamic characteristics of asynchronous drive.	4	4	2	6
3.Pract.w. Investigation and calculation of parameters of industrial robot operation.	4	4	2	6
Practical work report approval and evaluation.	4	4	2	6

Exam.	4	4	2	6
Total:	40	40	24	56

Learning outcomes and assessment

Learning outcomes	Assessment methods
Is able to describe types of electric drives in robot systems, influence of parameters on its mechanic and electro-mechanic characteristics	Successfully passed test.
Is able to describe methods of speed control in AC and DC robot driving systems.	Successfully passed test.
Is able to select electric motors for different regimes of drives operation in robotic systems.	Successfully passed test.
Is able to develop and defend practical works of the course.	Successfully passed practical work.
Is able to develop and defend robot electrical drive systems.	Exam where student knowledge in the study course is tested.

Evaluation criteria of study results

Criterion	%
Tests	20
Practical works	20
Exam	60
Total:	100

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	1.0	1.0	0.0		*	