RTU Course "Industrial Electronic Equipment"

33000 Faculty of Computer Science, Information Technology and Energy

General data

Code	EEP579
Course title	Industrial Electronic Equipment
Course status in the programme	Compulsory/Courses of Limited Choice; Courses of Free Choice
Responsible instructor	Leonīds Ribickis
Academic staff	Oskars Krievs Genadijs Zaļeskis Ingars Steiks
Volume of the course: parts and credits points	1 part, 3.0 credits
Language of instruction	LV, EN
Annotation	Classification of manufacturing systems, technology pyramid and tree. Discrete control input and output devices – control switches, relays, actuators and indicators. Solid-state devices in industrial applications – transistor and thyristor switches, solid state relays, AC and DC voltage regulators. Discrete industrial sensors – inductive and capacitive proximity sensors, photoelectric sensors, their operational principles and typical implementation. Output interfaces of discrete sensors. Analog industrial sensors and transducers – temperature, pressure, flow, level, position and speed sensors, their operational principles and typical implementation. Analog signal conditioning with operational amplifiers. Electromagnetic noise and relevant noise suppression methods. Logic gates, synthesis and minimization of logic functions. Industrial power supply topologies. Programmable logic controller systems, their structure and typical components. Ladder diagrams. Classification and structure of industrial communication networks.
Goals and objectives of the course in terms of competences and skills	Provide knowledge in fundamentals of industrial electronics. Develop the ability to recognize and design basic electronic equipment applicable in industrial environment.
Structure and tasks of independent studies	Students independently have to describe and design a simple process control system.
Recommended literature	J.Greivulis, I.Raņķis. Iekārtu vadības elektroniskie elementi un mezgli. Rīga: Avots, 1997, 288 lpp; I. Raņķis, A. Žiravecka, Industriālās elektronikas pamati. Rīga: Avots, 2007, 212 lpp; A.R. James, G.J. Sartori, Industrial Electronics. Pearson Education Inc., Prentice Hall, 2006. 862.p; Прянишников В.А. Электроника. Полный курс лекций. Корона-Принт, 2004. – 416с. Волович Г. И. Схемотехника аналоговых и аналого-цифровых электронных устройств / Г.И. Волович. - Москва : Додэка-XXI, 2005. - 528с.
Course prerequisites	Basic knowledge of fundamentals of electrical engineering theory and in solid-state devices.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Introduction to topics to be covered, literature and requirements.	1	0	0	0
Classification of manufacturing systems, technology pyramid and tree.	1	0	0	0
Mechanically activated control switches, relays, actuators.	2	0	0	0
Solid-state devices – transistor and thyristor switches, solid state relays AC and DC voltage regulators.	2	0	0	0
Discrete sensors – inductive, capacitive, photoelectric sensors, operational principles and typical implementation.	2	0	0	0
Analog industrial sensors and transducers, their operational principles and typical implementation.	4	0	0	0
The structure and basic properties of operational amplifiers.	2	0	0	0
Analog signal conditioning with operational amplifiers. Active filters.	4	0	0	0
Typical operational amplifier integrated circuits and their parameters. Instrumental operational amplifier.	4	0	0	0
Electromagnetic noise in industrial equipment and relevant noise suppression methods.	2	0	0	0
Logic gates, manipulation, integrated logic circuit families.	2	0	0	0
Industrial power supply topologies. Popular integrated voltage regulator circuits.	2	0	0	0
Introduction to programmable logic controller (PLC) systems. The structure and modules of PLCs.	2	0	0	0
Classification and structure of industrial communication networks.	2	0	0	0
Total:	32	0	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Ability to recognize and apply typical discrete and analog sensors.	Test on relevant subjects covered in lectures.

Ability to recognize and apply typical analog signal conditioning modes with operational amplifiers.	Test on relevant subjects covered in lectures.
Ability to synthesize and optimize logic functions according with given automation tasks.	Test on relevant subjects covered in lectures.
Ability to design simple process control systems.	Executed, completed, defended home task.

Study subject structure

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