RTU Course "Electronic Equipment"

11103 Industriālās elektronikas un elektrotehnol.katedra

General data

Code	EEP475
Course title	Electronic Equipment
Course status in the programme	Compulsory/Courses of Limited Choice
Course level	Undergraduate Studies
Course type	Professional
Field of study	Power and Electrical Engineering
Responsible instructor	Ivars Raņķis
Academic staff	Oskars Krievs Igors Ščukins Andrejs Stepanovs Juris Egle
Volume of the course: parts and credits points	1 part, 4.0 Credit Points, 6.0 ECTS credits
Language of instruction	LV, EN, RU
Possibility of distance learning	Not planned
Abstract	Typical power supply unit topologies of electronic equipment. Linear and switching mode voltage regulators - principles of operation and common integrated circuits. Overcurrent protection circuits. Power amplifiers, their classification and the main characteristics. The structure and basic properties of operational amplifiers. Typical operational amplifier circuits, signal generators and active filters. Logic gates and their manipulation. Typical combinational logic – decoders, encoders, multiplexers, adders, programmable logic devices. Typical sequential logic – triggers, binary counters, parallel and shift registers. Semiconductor ROM and RAM memories, their structure and parameters. Integrated logic circuit families - DTL, TTL, CMOS, BiCMOS, ECL, GaAs devices, their structure and parameters. ADCs and DACs. Converters „voltage – frequency” and „frequency – voltage”. Timer circuits and applications.
Goals and objectives of the course in terms of competences and skills	Provide knowledge in fundamentals of analogue and digital electronics. Develop an ability to recognize and design simple electronic equipment, applicable in industrial environment.
Structure and tasks of independent studies	Students have to carry out 6 practical laboratory exercises as well as design and test an active filter circuit according to an individual task.
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 outline

Theme	Hours
Introduction to topics to be covered, literature and requirements.	1
Typical industrial power supply unit topologies.	1
Linear voltage and current regulators. Popular integrated circuits of linear regulators and their parameters.	2
Switching mode voltage regulators, classification, popular integrated circuits and their parameters.	2
Power amplifiers, classification and the main characteristics.	2
The structure and basic properties of operational amplifiers.	2
Typical operational amplifier circuits, signal generators.	2
Popular integrated circuits of operational amplifiers. Instrumental amplifier.	2
Active filters with operational amplifiers, Bode plots of active filters.	2
Computer aided design of active filters.	2
Logic gates, manipulation with logic functions.	2
Typical combinational logic – decoders, encoders, multiplexers, adders, programmable logic devices.	2
Typical sequential logic – triggers, binary counters, parallel and shift registers.	2
Semiconductor ROM and RAM memories, their structure and parameters.	2
Integrated logic circuit families - DTL, TTL, CMOS, BiCMOS, ECL, GaAs devices, their structure and parameters.	2
ADCs and DACs. Converters „voltage – frequency” and „frequency – voltage”.	2
Timer circuits and applications. 555 timer.	2
Laboratory work No.1. Investigation of a bipolar power supply unit.	4
Laboratory work No.2. Investigation of linear and switching mode voltage regulators.	4

Laboratory work No.3. Investigation of typical power amplifier circuits.	4
Laboratory work No.4. Investigation of typical operational amplifier circuits.	8
Laboratory work No.5. Investigation of logic circuit families.	4
Laboratory work No.6. Investigation of timer 555.	4
Laboratory work No.7. Design and testing of an active filter.	4

Learning outcomes and assessment

Learning outcomes	Assessment methods
Ability to recognize typical power supply unit structures and apply typical voltage regulator circuits.	Accomplished and defended lab. works No.1. and No.2.
Ability to recognize and analyze typical power amplifier topologies.	Accomplished and defended lab. work No.3.
Understanding of basic properties of operational amplifiers. Ability to recognize, analyze and apply typical operational amplifier circuits.	Accomplished and defended lab. work No.4.
Comprehension of discrepancies among different logic circuit families and ability to apply them in practice.	Accomplished and defended lab. work No.5.
Ability to design and apply typical timer circuits.	Accomplished and defended lab. work No.6.
Ability to recognize and synthesize active filters with operational amplifiers.	Accomplished and defended course project.

Study subject structure

Part	CP	ECTS	Hours per Week			Tests		
			Lectures	Practical	Lab.	Test	Exam	Work
1.	4.0	6.0	2.0	0.0	2.0		*	