RĪGAS TEHNISKĀ UNIVERSITĀTE

RTU Course "Semiconductor Devices"

13107 null

General data

Code	TRT203
Course title	Semiconductor Devices
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Nikolajs Bogdanovs
Academic staff	Aleksandrs Ipatovs
Volume of the course: parts and credits points	1 part, 3.0 Credit Points, 4.5 ECTS credits
Language of instruction	LV, EN
Annotation	The study course provides a basic understanding of the principles of operation of a semiconductor device. The basic mechanisms of electrical conduction and parameters for semiconductors are considered. Students are introduced to the principles of semiconductors and sensors.
Goals and objectives of the course in terms of competences and skills	The aim of the study course is to give and develop knowledge and provide the student to gain an in-depth understanding of the design features and operating principles of semiconductor devices and sensors. Tasks of the study course: • to provide basic knowledge about the basic mechanisms of electrical conduction in semiconductors and sensors; • to explain the principles of operation of semiconductors and sensors; • to develop skills to use a simulation tool for circuit design and analysis.
Structure and tasks of independent studies	Independent literature survey. Preparation for the exam and laboratory works. The following independent work is expected from students of the study course: 1. Research on diode and stabilitron. 2. Investigation of bipolar transistors in passive/static mode. 3. Investigation of bipolar transistors in active/dynamic mode. 4. Investigation of field-effect transistors. 5. Research sensor operation principles. Laboratory work will be organized in the form of individual work, where students will solve the tasks set by the lecturer based on knowledge gained during lectures and independent survey on the study and scientific literature, as well as skills of using the simulation tool EasyEDA.
Recommended literature	Obligātā/Obligatory: 1. Raņķis I. Energoelektronika.-R.:RTU Izdevniecība, 2002. 2. Simon M., Kwok K. Physics of Semiconductor Devices. - Wiley-Interscience, 2006. 3. P. Leščevics, A. Galiņš. Elektronika un sakaru tehnika. – Jelgava, 2008. 4. Antanovičs U., Hramcovs V., Zītars U. Elektronikas laboratorijas darbi. -R.:RTU,2009. 5. E.Pētersons, N.Bogdanovs, L.Anspoka, A.Āriņš. "Sensoru sistēmu tehniskie līdzekļi un izveidošanas principi: mācību līdzeklis" Rīga: RTU, 2013. – 69. lpp. Papildu/Additional: 1. J. M. Fiore. "Semiconductor Devices: Theory and Application" Version 1.1.7, 18 April 2020. – 407p. 2. J. S. Wilson. "Sensor Technology Handbook" Elsevier, 2005, 691p. Citi informācijas avoti/ Other sources of information: https://www.electronics-tutorials.ws
Course prerequisites	Physics.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Classification of semiconductor devices.	10	10	0	0
Semiconductor diode. Voltage-current relationship of a diode. Manufacturing semiconductor diode.	12	13	0	0
Impulse diode. High-frequency diode. Stabilitron. Varicap.	12	13	0	0
Light emitting diode. Photo diode. Bipolar transistor. Classification of bipolar transistors.	13	12	0	0
Sensors and their operation principles, pressure measurement, flow measurement, temperature measurement.	13	12	0	0
Total:	60	60	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Is able to orientate in the characteristics, technical parameters and application possibilities of semiconductor functional elements.	Laboratory work reports, exercises. Test.
Can study electronic devices in laboratory, can calculate and analyse the operating modes of semiconductor components and their indicators.	Laboratory work reports, exercises. Test.

Is able to solve the tasks set by the lecturer based on the knowledge gained during the lectures. Can create a diode circuit in EasyEDA simulator and is able to design circuits and analyse the obtained results.	Laboratory work reports, exercises. Test.
Knows the operation principles and applications of electrical and electronic equipment.	Exam.

Evaluation criteria of study results

Criterion	%
Tests	30
Laboratory works	30
Exam	40
Total:	100

Study subject structure

Part	CP	Hours per Week			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	3.0	2.0	0.0	1.0		*	