

**RTU Course "Electron Devices"**

13212 null

General data

Code	REA204
Course title	Electron Devices
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Sergejs Tjukovs
Volume of the course: parts and credits points	1 part, 3.0 Credit Points, 4.5 ECTS credits
Language of instruction	LV, EN
Annotation	<p>During the study course, students learn about electronic devices widely used in modern electronic circuits, such as semiconductor diodes, bipolar transistors, and various types of field-effect transistors. Information on their structure, operating principles, parameters, and mathematical models is provided. Special attention is paid to simplified analysis methods and computer simulation of nonlinear circuits.</p> <p>Within the framework of laboratory work, students learn the possibilities of using measuring equipment to measure electronic device parameters and the research of circuits used in practice. Acquired knowledge and skills are the basis for successful work in the field of electronics and communication hardware design.</p>
Goals and objectives of the course in terms of competences and skills	<p>The goal of the study course is to provide knowledge about the theoretical foundations of electronic devices, electronic circuit analysis methods, and practical applications.</p> <p>Objectives of the study course:</p> <ol style="list-style-type: none"> 1. To acquaint the student with the structure, operating principles, parameters, and mathematical models of semiconductor devices. 2. To teach to perform calculations and analysis of electronic circuits. 3. To develop skills to independently study new devices or circuits using computer simulations. 4. To improve skills in working with laboratory multifunctional measuring equipment and to apply the acquired knowledge to the exploration of real circuits. 5. To teach to prepare easy-to-understand, well-structured and meaningful reports.
Structure and tasks of independent studies	Students independently analyse the study course literature, prepare for laboratory work and tests, draw up laboratory work reports, perform calculation and computer simulation tasks.
Recommended literature	<p>Obligātā. / Obligatory: Robert L. Boylestad, Louis Nashelsky. Electronic devices and circuit theory 11th ed. Pearson Education, Inc., 2013</p> <p>Papildu. / Additional: A. Gulbis. ELEKTRONU IERĪCES Lekciju kursa konspekts Rīga, 2006 Floyd, Thomas L.. Electronic devices : electron flow version /Thomas L. Floyd. Boston : Prentice Hall, c2012., xv, 958 lpp. : il. ; 29 cm.</p> <p>Sedra, Adel S.. Microelectronic Circuits / Adel S. Sedra, Kenneth C. Smith., Tony Chan Carusone, Vincent Gaudet., xxviii, 1212, [20] lpp. : ilustrācijas ; 25 cm.</p> <p>David A. Bell. Electronic devices and circuits. 2nd ed. Reston Publishing Company, Inc., 1980 S. O. Kasap. Principles of electronic materials and devices 3rd ed. McGraw-Hill, 2006</p>
Course prerequisites	Basic knowledge of DC and AC circuit analysis (Ohm's law, Kirchoff's current and voltage laws), good skills in working with computer and MS Office software, basic skills in working with a digital oscilloscope, signal generator, and multimeter.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Introduction to physics of semiconductor materials. p-n junction.	2	2	0	0
Semiconductor diode and it's applications.	6	6	0	0
Diode circuit analysis.	6	6	0	0
Bipolar junction transistors (BJTs) - their structure and principles of operation.	4	4	0	0
DC analysis of BJTs circuits.	6	6	0	0
Mathematical models and AC analysis of BJTs.	6	6	0	0
Applications of BJTs.	8	8	0	0
Field-effect transistors (FETs) - types and construction.	6	6	0	0

DC analysis of circuits with FETs.	6	6	0	0
Applications of FETs.	8	8	0	0
Wide bandgap semiconductor materials.	2	2	0	0
Total:	60	60	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Is competent in the basics of semiconductor physics, understands the structure and properties of the p-n junction. Understands the structure, operating principles, and main parameters of semiconductor devices. Knows the terminology of the field and is ready to study scientific literature.	Exam.
Is able to calculate voltages and currents of simple electronic circuits (containing semiconductor devices).	Laboratory works, computer simulation projects.
Is able to explore semiconductor devices and circuits with the help of computer simulation.	Computer simulation projects.
Can perform measurements of semiconductor device characteristics in the laboratory, as well as perform independent circuit research. Is able to prepare well-structured reports.	Laboratory works.
Knows the symbols of semiconductor devices in schematic diagrams.	Laboratory works, computer simulation projects, exam.

Evaluation criteria of study results

Criterion	%
Laboratory works	40
Computer simulation projects	40
Exam	20
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		*	