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RĪGAS TEHNISKĀ
UNIVERSITĀTE

RTU Course "Fundamentals of Circuit Theory"

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General data

Code	TRT215
Course title	Fundamentals of Circuit Theory
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Elans Grabs
Academic staff	Aleksandrs Ipatovs Janeks Ahrems Alberts Kristiņš
Volume of the course: parts and credits points	1 part, 3.0 Credit Points, 4.5 ECTS credits
Language of instruction	LV, EN
Annotation	This basic course provides foundation knowledge of circuits theory. It aims to master methods for calculating and analysing linear electrical circuits by using Ohm's and Kirschoff's laws. The course also includes application of complex numbers and vector diagrams for calculating linear alternate current circuits. Finally, students are familiarized with concept of two-port networks, their parameters and calculation/transform methods.
Goals and objectives of the course in terms of competences and skills	The main goal of the study course is to master basics of electrical circuits. Become familiar with analysis techniques for DC and AC electrical circuits. Obtain knowledge on analysis of two-port networks and multi-phase systems. The tasks of the study course are: to provide general knowledge on main characteristics of devices, electric current and most important laws; master various techniques for analysis of electrical circuits; master complex numbers for AC electrical circuits analysis; master various techniques for two-port networks parameters assessment.
Structure and tasks of independent studies	Over the course duration there are two calculation-graphical works to be solved: "Electrical circuit DC analysis with different techniques" and "AC analysis of electrical circuit". Tests during consulting and final exam.
Recommended literature	Pamatliteratūra / Basic literature: 1.J.Briedis, I.Dūmiņš, U.Lasis, U.Ratnieks, K.Tabaks. Elektrotehnikas teorētiskie pamati. Stacionāri procesi lineārās ķēdēs. Zvaigzne ABC. 1999. 2.J.Zolbergs. Vispārīgā elektrotehnika. Zvaigzne. 1974. 3.John Bird. Electrical Circuit Theory and Technology. Newnes. Revised second edition 2003. (Fifth edition 2014. g.) Papildliteratūra / Additional literature: 1.Бессонов Л.А. Теоретические основы электротехники: Электрические цепи. Учеб. для студентов электротехнических, энергетических и приборостроительных специальностей вузов. –7-е изд., перераб. и доп. –М.: Высш. шк., 2013. 2.Атабеков Г.И. Теоретические основы электротехники. Линейные электрические цепи. Изд.6 2010. 3.Демирчян К. С., Нейман Л. Р., Коровкин Н. В. Теоретические основы электротехники. Учебник для вузов. 5-е изд. Том 1,2009. 4.Основы теории цепей: Учеб. для вузов /Г.В.Зевеке, П.А.Ионкин, А.В.Нетушил, С.В.Страхов. –5-е изд., перераб. –М.: Энергоатомиздат, 1989.
Course prerequisites	Knowledge of physics and mathematics (secondary school level)

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
The main characteristics of devices. Electric current. Ohm's law.	6	6	0	0
Series and parallel connection of electric circuit elements. Kirchhoff's laws in branched circuits.	6	6	0	0
Electric sources: voltage and current sources. Mesh current method.	6	6	0	0
Node-voltage analysis method. Superposition principle and method. Equivalent generator method. Power balance.	8	8	0	0
AC linear electrical circuits. Graphical visualization of sine waves. Vector diagrams.	6	6	0	0
Electrical circuit laws for sine current. Complex amplitude technique. Ohm's law for circuit section.	6	6	0	0
The first and the second Kirchhoff's law. Passive components in sine current circuits.	6	6	0	0
Sine current in series connection circuits of R, L and C components.	6	6	0	0
Two-port networks. Combined two-port networks.	6	6	0	0
Multi-phase systems.	4	4	0	0
Total:	60	60	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Can analyze DC electrical circuit, is aware of its specifics, main characteristics and applications.	Report on laboratory work. Test.
Can analyze AC electrical circuit, is aware of its specifics, main characteristics and applications.	Report on laboratory work. Test.
Can determine parameters of two-port networks.	Report on laboratory work.
Can apply techniques for analysis of DC and AC electrical circuits. Can visualize vector diagram, determine and analyze parameters of two-port networks.	Exam.

Evaluation criteria of study results

Criterion	%
Tests	40
Laboratory and practical works	20
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		*	