Circuit theory II - course description

General information

Course name	Circuit theory II
Course ID	06.2-WE-ELEKTP-CT02-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Electrical Engineering
Education profile	academic
Level of studies	First-cycle Erasmus programme
Beginning semester	winter term 2021/2022

Course information

Semester	4
ECTS credits to win	4
Course type	obligatory
Teaching language	english
Author of syllabus	• prof. dr hab. inż. Igor Korotyeyev

Classes forms

The class form	Hours per semester (full-time)	Hours per week (full-time)	Hours per semester (part-time)	Hours per week (part-time)	Form of assignment
Lecture	30	2	-	-	Exam
Class	15	1	-	-	Credit with grade

Aim of the course

- familiarize students with the electrical circuit topology basis and circuit equations generation by using matrix of graph

- familiarize with classical approach for finding solutions of differential equations for analyze transient behaviour

- familiarize students with operator method for describe signals and circuits

- ability formation to analyze transient behaviour by classical and operator methods

Prerequisites

Basis of electrical engineering, Circuit theory I, Mathematical analyses, Algebra, Physics

Scope

Electrical circuit topology basis. Electrical circuit structure. Incidence. Cycles and trees. Cycles and trees algorithms. Circuit cycles set – combination algorithms. Independent cycle set. Marking cycles. Sections – generalized junctions. Algorithms for finding sections, independent sections set. Marking sections. Cuts for independent loops and making current equations for circuit. Cuts for independent sections and making voltage equations for circuit. Thévenin's theorem and its application.

Transient analyses, classical approach. Steady-state and transient behavior in electrical circuit. Differential equations for linear circuits. Algorithm for forming normalized differential equations of SLS circuit. State space method. Matrix exponentials. Aigenvalues and stability problem.

Transient analyses, symbolic method. Signals and circuits. Complex functions. Isomorphism of causal exponent functions and measurable complex functions. Connection with Laplace transform. Applications for transient analyses: commutation continuity and perturbation theories.

Teaching methods

Lecture, exercises

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form
Knows basic issues in the field of electrical circuit topology and formulation of equations		• an exam - oral, descriptive, test and other	• Lecture
Can analyze transient states and established in electrical circuits, knows the basics of stability		• a quiz	• Lecture
Knows the classical method and the operator method for transient states analysis in electrical circuits		• an exam - oral, descriptive, test and other	• Lecture
Is aware of the limitations and benefits of using various analytical methods		• a quiz	• Class

Assignment conditions

Lecture – the main condition to get a pass are sufficient marks in written Exam.

Practical training – the main condition to get a pass is scoring sufficient marks for all exercices.

Calculation of the final Grade: lecture 50% + laboratory 50%

Recommended reading

1. Bakshi U.A., A.V.Bakshi A.V. Circuit theory, Technical Publications, 2009

2. Mayergoyz Isaak, Lawson W. Basic Electric Circuit Theory. Academic press, 2012

3. Robert L. Boylestad. Introductory Circuit Analysis, Pearson, 2011

Further reading

1. David K. ChengForeword By. Analysis of Linear Systems 01 Edition. Narosa Publishing House, 2002

Notes

Modified by dr hab. inż. Paweł Szcześniak, prof. UZ (last modification: 08-07-2021 21:49)