Selected issues of circuit theory I - course description

General information

Course name	Selected issues of circuit theory I
Course ID	06.2-WE-ELEKTD-WybZagTObw I-Er
Faculty	Faculty of Computer Science, Electrical Engineering and Automatics
Field of study	Electrical Engineering
Education profile	academic
Level of studies	Second-cycle Erasmus programme
Beginning semester	winter term 2017/2018

Course information

Semester	1
ECTS credits to win	7
Course type	obligatory
Teaching language	english
Author of syllabus	• dr hab. inż. Radosław Kłosiński, prof. UZ

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
Laboratory	30	2	-	-	Credit with grade

Aim of the course

- to familiarize students with basic concepts, methods, description and analysis of linear time-invariant analog and discrete systems;

- to familiarize with methods of description and analysis of circuits and signals in the time and frequency domains;

- to mastery by students ability to apply theory of linear time-invariant systems for the analysis of transient and steady states in electrical circuits;

- introduction to theory and mastery of the basic methods of discrete simulation of analog circuits;

- to give basic skills of observation of the behavior and take of characteristics of electric circuits;

- to give basic skills in the design of simple passive filters;

Prerequisites

Mathematical analysis, Linear algebra, Electrical engineering principles, Circuit theory.

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Scope

Flow diagrams of circuits. Mason's signal flow diagrams. Flow diagram for electrical circuit construction. Flow diagram transformations. Mason's rules.

Continuous linear time-invariant systems. Circuit treated as an input output system. Differential equations of circuit. Linearity, causality, time-invariance. Transfer function, circuit operator. Impulse response, convolution. Stability. Periodic excitation, circular convolution, circular impulse response.

Discrete time signals and systems. Sampling of continuous signals. Z transformation. Digital signals filtering, Recursive and nonrecursive filters (IIR and FIR filters). Discrete systems impulse response and linear convolution. Digital filters stability. Periodic steady state of digital filters, circular convolution. Discrete simulation of continuous systems. Introductory discrete linear time-varying systems theory.

Spectral analysis. Continuous Fourier transformation. Time and frequency domain sampling. Other versions of Fourier transformation: Fourier series, discrete Fourier transformation. Frequency response of linear time-invariant continuous and digital filters.

Teaching methods

Lecture: conventional lecture, problem lecture, discussion.
Exercises: consultation, project method, accounting exercises.
Laboratory: working with source document, group work, laboratory exercises.

Learning outcomes and methods of theirs verification

Outcome description	Outcome symbols	Methods of verification	The class form

Outcome description	Outcome symbols	Methods of verification	The class form
Knows basic concepts in description and analysis of time independent linear systems of continuous and discrete time.		• an evaluation test • an exam - oral, descriptive, test and other	• Lecture • Laboratory
Formulates equations and operator description of linear time-independent circuits.		• an evaluation test • an exam - oral, descriptive, test and other	• Lecture
Creates discrete circuit models and performs their discrete simulation		• an evaluation test • an exam - oral, descriptive, test and other	• Lecture
Is able to design simple passive filters.		• a quiz • an ongoing monitoring during classes • carrying out laboratory reports	• Laboratory
Uses equipment to measure signals, parameters and characteristics of electrical circuits.		• a quiz • an ongoing monitoring during classes • carrying out laboratory reports	• Laboratory

Assignment conditions

Lecture: The condition of pass is to obtain a positive assessment from the written examination.
Laboratory: a conditional of pass is to obtain positive grades from all laboratory exercises that are expected to be performed within the laboratory program.

Components of the final grade: lecture: 60% + laboratory: 40%

Recommended reading

1. Blackwell W.A., Grigsby L.L.: Introductory network theory, PWS Publishers, 1985
2. Zieliński T.P.: „From theory to digital signal processing". Dep. EAIiE AGH, Kraków 2002. (in Polish)
3. Oppenheim A.V., Willsky A.S., Nawab S.H.: „Signal & Systems". Prentice Hall 1997.
4. Papoulis A.: Circuits and Systems. A modern Approach. Holt, Rinehart and Winston, Inc. 1980.
5. Lyons R.G.: „Understanding Digital Signal Processing". Addison Wesley Longan, Inc. 2004.
6. Dąbrowski A.: Signal processing by means of signal processors. WPP, Poznań, 2000 (in Polish)
7. Krakowski M.: Theoretical electrical engineering, Vol. I, Linear and non-linear circuits. PWN, Warszawa, 1983. (in Polish)
8. Osiowski J., Szabatin J.: Circuit theory principles, WNT Warszawa 1998. (in Polish).

Further reading

1. Siwczyński M.: Circuits and signals theory, part I Linear electric circuits, RWNT, Zielona Góra 2002. (in Polish)

Notes

Modified by dr hab. inż. Radosław Kłosiński, prof. UZ (last modification: 24-04-2017 18:34)