COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fundamentals of electronic circuits [S1MiKC1E>POE]

Course

Field of study
Microelectronics and Digital Communication

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
24

Laboratory classes
0

Other
0

Tutorials
24

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

A student starting this course should have a structured understanding of mathematical analysis, algebra, and physics. They should also be able to obtain information from designated sources and recognize the necessity of continuous learning.

Course objective

The objective of this course is to introduce students to the fundamental principles of circuit analysis and design. This includes Kirchhoff's laws, steady-state and transient circuit analysis, complex number methods, and the Laplace transform. The course also covers the characteristics of basic electronic components, resonant and coupled circuits, and the theory of two-port networks. These topics provide the foundation for solving engineering problems in analog circuits.

Course-related learning outcomes

Knowledge:
1. Knows the fundamental principles of circuit theory, including Kirchhoff's laws and the superposition principle.
2. Can distinguish between a real circuit and its theoretical model.

3. Has knowledge of steady-state and transient circuit analysis.
4. Understands the characteristics of passive and active components and their application in analog circuits.
5. Knows the principles of resonance and coupling in electrical circuits.
6. Possesses knowledge of the Laplace transform and its application in circuit analysis.

Skills:
1. Can analyze electrical circuits using Kirchhoff's laws and mathematical methods such as complex numbers and the Laplace transform.
2. Is able to perform steady-state and transient circuit analysis.
3. Can solve problems related to resonant and coupled circuits.
4. Is able to gather information from literature and other sources in Polish or English, integrate the obtained information, interpret it, draw conclusions, and justify opinions.

Social competences:
1. Is capable of independent learning (using textbooks, software tools).
2. Actively participates in classes, asks questions, and consciously engages with the instructor (e.g., during office hours).
3. Demonstrates responsibility in applying acquired knowledge to solve engineering problems.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified on the basis of a written, oral, or online exam. A form of the exam is set with the students. Passing threshold: 50% of points.
Skills acquired as a part of tutorials are verified by one or more tests. Exact date of each test is set with the students. Additional activities to improve the grade: activity/solving tasks at the blackboard. Passing threshold: 50% of points.
For lecture and laboratory credits, the following percentage thresholds apply to individual grades: 2.0 (< 50%), 3.0 (50%-59%), 3.5 (60%-69%), 4.0 (70%-79%), 4.5 (80%-89%), 5.0 (90% and more). The thresholds
may be changed in favor of students.

Programme content

The Fundamentals of electronic circuits lecture covers the rules and methods for analyzing electrical circuits. It presents the principles of circuit analysis for both AC and DC circuits.

Course topics

1. Basic Circuit Theory Laws - Kirchhoff's voltage and current laws, real circuits and their mathematical models.
2. Analog Circuit Elements - characteristics of linear and nonlinear passive and active components.
3. Steady-State AC Circuits Analysis - complex number method, phasor diagrams.
4. Key Theorems and Circuit Analysis Methods - including Thevenin's and Norton's theorems, superposition method, mesh and nodal analysis.
5. Resonant and Coupled Circuits.
6. Linear Circuits with Periodic Signals.
7. Analysis of Circuits with Nonlinear Elements.
8. Transient States - time- and frequency-domain analysis methods, Laplace transform.
9. Two-Port Networks.

Teaching methods

Lecture: traditional lecture (in a hybrid form), problem lecture
Turorials: individual solving of tasks given by the teacher, homeworks

Bibliography

Basic:

1. Teoria obwodów elektrycznych. S. Bolkowski, WNT, 2012;
2. Teoria obwodów elektrycznych - zadania. S.Bolkowski, W. Brociek, H. Rawa:, WNT 2015;

Additional:
1. Podstawy teorii obwodów. Tom 1,2,3, J.Osiowski, J.Szabatin, WNT, Warszawa, 1992, 1995, 2000;
2. Teoria obwodów, cz. I i II. M. Tadeusiewicz, Wydawnictwo PŁ, Łódź, 2003, 2002;
3. Teoria obwodów w zadaniach. Andrzej Hildebrandt, Henryk Sołtysik, Andrzej Zieliński, 1977;
4. Zadania z teorii obwodów, Z. Filipowicz: OW PW 2010;
5. Zbiór Zadań z Teorii Obwodów. Część 1/2. , J. Szabatin, E. Śliwa , Wyd. PW, Warszawa, 2003;

Breakdown of average student's workload

	Hours	ECTS
Total workload	103	4,00
Classes requiring direct contact with the teacher	48	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	55	2,50