GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|
| Subject name and code | Electric Circuits, PG_00045972 | | |
| Field of study | Electrical Engineering | | |
| Date of commencement of studies | February 2024 | Academic year of realisation of subject | 2023/2024 |
| Education level | second-cycle studies | Subject group | |
| Mode of study | Full-time studies | Mode of delivery | at the university |
| Year of study | 1 | Language of instruction | Polish |
| Semester of study | 1 | ECTS credits | 2.0 |
| Learning profile | general academic profile | Assessment form | exam |
| Conducting unit | Faculty of Electrical and Control Engineering | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr hab. inż. Jacek Horiszny | |
| | Teachers | dr hab. inż. Jacek Horiszny | |

**Lesson types and methods of instruction**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 15.0 | 0.0 | 15.0 | 0.0 | 0.0 | 30 |

E-learning hours included: 0.0

**Learning activity and number of study hours**

| Learning activity | Participation in didactic classes included in study plan | Participation in consultation hours | Self-study | SUM |
|---|---|---|---|---|
| Number of study hours | 30 | 10.0 | 10.0 | 50 |

**Subject objectives**

Obtaining skills in the use of integral transformations in the theory of electrical circuits: Laplace transforms for the analysis of circuits in the transition state, Fourier transforms in the frequency analysis of circuits, as well as skills in the use of the PSPICE simulation program for the analysis of electrical circuits.

**Learning outcomes**

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| K7_W01 | knows the basics of the Lapalce transform and Fourier transform, is able to describe an electric circuit in the domain of the operator variable and calculate inverse transforms, is able to calculate frequency spectra of electrical signals | [SW3] Assessment of knowledge contained in written work and projects |
| K7_K02 | understands the importance of transient processes in electrical systems, their causes and effects | [SK4] Assessment of communication skills, including language correctness |
| K7_U06 | is able to build a model of an electrical system in mathematical form and in a computer simulation environment, is able to set boundary conditions, simulate the system, verify and interpret the results | [SU1] Assessment of task fulfilment<br>[SU4] Assessment of ability to use methods and tools<br>[SU3] Assessment of ability to use knowledge gained from the subject<br>[SU5] Assessment of ability to present the results of task |

**Subject contents**

Analysis of transient states using the operator method: basics of the Laplace transform, transform of a differential equation, calculation of free and forced response for first and second order equations, inverse transform, operator impedance, Kirchhoff's laws in the operator form, initial conditions in the operator method. Frequency analysis: Fourier series, basics of Fourier transform, spectrum of aperiodic signal, discrete Fourier series, discrete Fourier transform.

**Prerequisites and co-requisites**

Knowledge of electrical circuits at the first degree level course.

**Assessment methods and criteria**

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| tasks for the laboratory | 55.0% | 30.0% |
| written exam | 55.0% | 70.0% |

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|---|---|---|
| Recommended reading | Basic literature | 1. Bolkowski S.: Teoria obwodów elektrycznych. WNT Warszawa 2012.<br>2. Osiowski J., Szbatin J.: Podstawy teorii obwodów elektrycznych. WNT warszawa 1998.<br>3. Papoulis A.: Obwody i układy. WKiŁ Warszawa 1988 |
| | Supplementary literature | 1. Chua L.O., Pen-Min Lin: Komputerowa analiza układów elektronicznych. WNT Warszawa 1981. |
| | eResources addresses | Adresy na platformie eNauczanie:<br>OBWODY ELEKTRYCZNE [ET][2023/24] - Moodle ID: 35963<br>https://enauczanie.pg.edu.pl/moodle/course/view.php?id=35963 |
| Example issues/ example questions/ tasks being completed | 1. Calculate the transient current in a given RC, RL or RLC circuit powered by direct or sinusoidal voltage based on the solution of the differential equation using the operator method.<br>2. Calculate the transient current in a given RC, RL or RLC circuit powered by direct or sinusoidal voltage based on the Laplace equivalent diagram.<br>3. Expand the periodic current (voltage) waveform into a Fourier trigonometric series.<br>4. Expand the periodic current (voltage) waveform into a complex Fourier series.<br>5. Calculate the amplitude and phase spectrum of a continuous signal.<br>6. Calculate the amplitude and phase spectrum of a discrete signal. | |
| Work placement | Not applicable | |