



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Fundamentals of electrical engineering

Course

Field of study

Year/Semester

Mathematics in technology

2/3

Area of study (specialization)

Profile of study

-

general academic

Level of study

Course offered in

First-cycle studies

polish

Form of study

Requirements

full-time

compulsory

Number of hours

Lecture

Laboratory classes

Other (e.g. online)

30

15

Tutorials

Projects/seminars

15

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

Responsible for the course/lecturer:

dr hab. inż. Leszek Kasprzyk

Prerequisites

Knowledge of mathematics and physics at the high school level. Ability to understand and interpret the transmitted messages and effective self-education in the field related to the chosen field of study.

Course objective

Introduction to physical quantities and basic laws and theorems in the field of theory of direct current electric circuits and sinusoidal alternating 1- and 3-phase current. Knowledge of analytical methods for calculating electrical circuits.

Course-related learning outcomes

Knowledge

The student has knowledge about electrical components and systems.

Knows the basic quantities and laws regarding electric and magnetic fields.

He knows the methods of electrical circuits analysis (DC circuits, single and three-phase alternating current and magnetically coupled circuits).



Skills

Is able to apply knowledge of the theory of electrical circuits necessary to determine the parameters and signals of electrical circuits such as voltages, currents, impedances, powers, energies etc.

He can obtain information from literature and the Internet, work individually, solve problems in the field of electrical circuit theory.

Social competences

Is able to think and work in an entrepreneurial manner in the area of the basics of electrical engineering

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired during the lecture is verified during an exam consisting of 5-10 (open) equally scored questions. Passing threshold: 50% of points. Final issues on the basis of which questions are prepared will be sent to students by e-mail using the university e-mail system or through the Moodle system.

The skills acquired during the classes are verified on the basis of the final test, consisting of 3-4 equally scored tasks and on the basis of activity during the classes. The pass threshold: 50% points.

The skills acquired during the laboratory classes are verified on the basis of a colloquium consisting of 3-4 equally scored tasks and on the basis of activity during the classes. The pass threshold: 50% points.

Programme content

The lecture: Basic quantities and laws of electric and magnetic field (Lorentz force, flow law, Biot-Savart law, Faraday electromagnetic induction phenomenon, Maxwell equations), environment and electrical signals and their classification, basic concepts of concentrated and distributed electrical circuits, circuit elements, principles of determination the voltage and current directions, laws of electrical circuits, methods of analysis of DC and sinusoidal alternating current circuits (Kirchhoff's law method, mesh currents, nodal potentials), peripheral theorems (including Thevenin and Norton), active, reactive and apparent power, reactive power compensation, energy in electrical circuits, matching the receiver to the source for maximum power, magnetically coupled circuits, voltage and current resonance, power and energy measurements in electrical circuits. Methods of analysis of DC and 1- and 3-phase alternating sinusoidal current circuits. Power measurements in 3-phase circuits

Exercises: determination of total resistance and impedance, Kirchhoff's law method, superposition principle / method, matching the receiver to the source for maximum power, method of mesh currents and nodal potentials, Thevenin and Norton theorem / method, determination of active, reactive and apparent power, compensation of reactive power, voltage and current resonance, magnetically coupled circuits.

Laboratories: Testing DC circuits containing linear and nonlinear elements. Elements R, L, C in sinusoidal alternating current circuits. Study of branched DC circuits. Measurement of power and energy in single-



phase systems. Single phase transformer test. Determination of the current-voltage characteristics of the photovoltaic module.

Teaching methods

Lecture: multimedia presentation, illustrated with examples given on the board, initiating discussions during the lecture. Additional materials are placed in the Moodle system.

Auditorium exercises: solving tasks related to the basics of electrical engineering on the board, discussions and comments on how to solve tasks, and self-performance of tasks in the Moodle system.

Laboratory: work in teams, connecting given circuits and making measurements, detailed review of reports by the laboratory leader and discussion, demonstrations.

Bibliography

Basic

1. Bolkowski S., Teoria obwodów elektrycznych, WNT, Warszawa 2015 (any issued)
2. Krakowski M., Obwody liniowe i nieliniowe, PWN, Warszawa 1999
3. Kurdziel R., Podstawy elektrotechniki, WNT, Warszawa 1973

Additional

1. Bolkowski S., Brociek W., Rawa H., Teoria obwodów elektrycznych. Zadania., WNT, 2015
2. Czarnywojtek P., Kozłowski J., Machczyński W., Zbiór zadań z podstaw elektrotechniki. Obwody liniowe prądu stałego i sinusoidalnego, WPWSZ, 2007
3. Szabatin J., Śliwa E., Zbiór zadań z teorii obwodów, WPW, 2008
4. Cichocki A., Zbiór zadań z teorii obwodów, WPW, 1978
5. Cichocki A., Mikołajuk K., Osowski S., Trzaska Z., Zbiór zadań z teorii obwodów, WPW, 1981

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	75	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	50	2,0

¹ delete or add other activities as appropriate