# COURSE DESCRIPTION CARD - SYLLABUS

Course name
Fundamentals of electrical engineering [S1MNT1>PEt]

## Course

Field of study
Mathematics of Modern Technologies

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

## Number of hours

Lecture
30

Laboratory classes
15

Other
0

Tutorials
15

Projects/seminars
0

## Number of credit points

4,00

## Coordinators

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## Lecturers

## Prerequisites

Knowledge of mathematics and physics at the high school level. Ability to understand and interpret the trans- mitted 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:
• has knowledge of electrical components and systems [K_W04(P6S_WG)];
• understands the principle of operation of simple electrical systems and the basic safety rules during their operation [K_W04(P6S_WG), K_W09(P6S_WG)];
• the basic quantities and laws of electric and magnetic fields [K_W04(P6S_WG)];
• the methods of analysis of electrical circuits - DC circuits, single- and three-phase alternating current and magnetically coupled circuits [K_W04(P6S_WG), K_W03(P6S_WG)].

Skills:
• can acquire and 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. [K_U08(P6S_UW), K_U11(P6S_UW)];
• can use the acquired knowledge and appropriate methods and tools to solve basic tasks related to electrical engineering [K_U12(P6S_UW)];
• can analyze the operation of a simple electrical device [K_U13(P6S_UW)].

Social competences:
• can think and act in an entrepreneurial way in the area of electrical engineering [K_K03(P6S_KO)].

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: Knowledgeacquiredduringthelectureisverifiedduringanexamconsistingof5-10(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.
Tutorials: 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.
Laboratory classes: 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

Basic laws of electrical engineering, in the area of field theory and circuit theory - steady states for direct and alternating current circuits (1- and 3-phase systems).

## Course topics

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

Lectures: multimedia presentation, illustrated with examples given on the board, initiating discussions during the lecture; additional materials are placed in the Moodle system;
Tutorials: 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 classes: work in teams, connecting given circuits and making measurements, detailed review of reports by the laboratory leader and discussion, demonstrations.

## Bibliography

Basic:
• Bolkowski S., Teoria obwodów elektrycznych, WNT, Warszawa 2015 (dowolne wydane);
• Krakowski M., Obwody liniowe i nieliniowe, PWN, Warszawa 1999;
• Kurdziel R., Podstawy elektrotechniki, WNT, Warszawa 1973.

Additional:
• Bolkowski S., Brociek W., Rawa H., Teoria obwodów elektrycznych. Zadania., WNT, 2015;
• Czarnywojtek P., Kozłowski J., Machczyński W., Zbiór zadań z podstaw elektrotechniki. Obwody liniowe prądu stałego i sinusoidalnego, WPWSZ, 2007;
• Szabatin J., Śliwa E., Zbiór zadań z teorii obwodów, WPW, 2008;
• Cichocki A., Zbiór zadań z teorii obwodów, WPW, 1978;
• 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 | 100 | 4,00 |
| Classes requiring direct contact with the teacher | 60 | 2,50 |
| Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation) | 40 | 1,50 |