



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Electrical devices [S1Eltech1P>UE1]

### Course

Field of study

Electrical Engineering

Year/Semester

3/5

Area of study (specialization)

–

Profile of study

practical

Level of study

first-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

2,00

### Coordinators

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### Lecturers

### Prerequisites

Basic knowledge on electrical engineering, mathematics, physics and electrical metrology. Able to perform mathematical analysis of simple electrical circuits, knows how to read electrical scheme. A sense of the need to broaden the competence and willingness to work together in a team.

### Course objective

Knowledge of phenomena occurring in electrical devices and systems as well as their mathematical and physical descriptions. Purchase of skills in the application of phenomena description to design of power supply and hazard assessment that can occurs in these systems. Experiment planning, selection of measurement instrument, realization of test set-up, researches performing and results analyzing.

### Course-related learning outcomes

Knowledge:

Student knows how to characterize the phenomena occurring in power equipment and systems.  
Student is able to formulate a mathematical and physical description of phenomena.

Skills:

Student is able to analyze the mathematical and physical description of phenomena for various states and conditions occurring in devices. Student is able to perform calculations and assess the hazards occurring in devices and systems supplying electricity to consumers. Student is able to plan and carry out the experiment.

Social competences:

Student is aware of the impact of the correct selection of devices and analysis of phenomena to ensure the continuity of supplying electricity to various consumers. The student is aware of the impact of phenomena and devices on the environment and people working on and using power equipment and the resulting need for extensive cooperation at the design and operational stages.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture:

- knowledge acquired as part of the lecture is verified by a written final test consisting of open or test questions with different points. Passing threshold: 50% of points,
- current grading in each lecture (rewarding activities).

Laboratory classes:

- current check and rewarding knowledge necessary for the accomplishment of the problems in the area of laboratory tasks,
- evaluation of reports performed on laboratory classes,
- rewarding activities related to the implementation of laboratory classes.

### Programme content

The module program covers the following topics:

1. Classification of electrical power equipment.
2. Thermal effects of operating and overload currents.
3. Dynamic effects of short-circuit currents.
4. Electric arc.

### Course topics

Lecture:

1. Classification of power equipment and selected definitions
2. Climatic, environmental and voltage exposures of power equipment
3. Operating conditions of power equipment
4. Thermal effects of operating and overload currents - heat sources in equipment, heating of wires and conductors under the influence of operating currents, thermal effects of overload currents, determination of the heating and cooling curve.
5. Dynamic effects of short-circuit currents - analysis of some characteristic conductor systems, electrodynamic forces in alternating current circuits, resistance of electrical equipment and busbars to mechanical exposures.
6. Electric arc - basic information, structure, extinguishing, arc model, characteristics of direct current and alternating current arcs, arc extinguishing conditions, arc extinguishing techniques.

Laboratories:

1. Discussion of classes: topics, literature, requirements, reports, health and safety
2. Long-term operation of current circuits
3. Examination of time-current characteristics of circuit breakers
4. Examination of current transformer errors
5. Occasional operation of current circuits
6. Technical method of measuring short-circuit loop impedance
7. Determination of the safety factor FS, current transformer
8. Summary of classes, reports and assessment

### Teaching methods

Lecture:

- multimedia or object-oriented presentations supported by illustrated examples presented on the board,
- interactive lecture with questions and initiating discussions.

#### Laboratory classes:

- object-oriented presentations supported by illustrated examples presented on the board,
- presentations of selected experiments,
- initiating teamwork.

## Bibliography

### Basic

1. Markiewicz, H. Urządzenia elektroenergetyczne, WNT, Warszawa, 2006.
2. Markiewicz, H. Bezpieczeństwo w elektroenergetyce, WNT, Warszawa, 2017.
3. Kamińska, A. Urządzenia i stacje elektroenergetyczne, Wydawnictwo Politechniki Poznańskiej, 2000.
4. Maksymiuk, J., Nowicki, J. Aparaty elektryczne i rozdzielnice wysokich i średnich napięć, Wydawnictwo Politechniki Warszawskiej, Warszawa, 2014.
5. Żmuda, K. Elektroenergetyczne układy przesyłowe i rozdzielcze. Wybrane zagadnienia z przykładami, Wydawnictwo Politechniki Śląskiej, 2014.

### Additional

1. Glover, J. D., Sarma, M.S., Overbye, T.J. Power System Analysis and Design, cengage Learning, Inc, Florence, KY, US, 2011
2. Wasiak, I. Elektroenergetyka w zakresie Przesył i rozdział energii elektrycznej, Politechnika Łódzka, 2010.
3. Królikowski, C., Boruta, Z., Kamińska, A. Technika łączenia obwodów elektroenergetycznych. Przykłady obliczeń, PWN, Warszawa, 1992.
4. Maksymiuk, J. Aparaty elektryczne. Podstawy doboru i eksploatacji. WNT, Warszawa, 1977.
5. Au, A., Maksymiuk, J., Pochanke, Z. Podstawy obliczeń aparatów elektroenergetycznych. WNT, Warszawa, 1982.

## Breakdown of average student's workload

	Hours	ECTS
Total workload	0	0,00
Classes requiring direct contact with the teacher	0	0,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	0	0,00