



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Computer-aided design of power devices and installations

### Course

Field of study

Electrical Engineering

Area of study (specialization)

Insulation systems, devices and electric power installations

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

4/7

Profile of study

general academic

Course offered in

polish

Requirements

elective

### Number of hours

Lecture

0

Laboratory classes

0

Other (e.g. online)

0

Tutorials

0

Projects/seminars

45

### Number of credit points

4

### Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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### Prerequisites

Knowledge of the basics of electrical engineering, electrical power engineering, basic numerical methods.

### Course objective

Acquaintance with selected numerical methods and computer programs supporting the process of modeling physical phenomena and design of power devices and installations. Student is able to independently solve simple tasks in the field of electrical engineering, power engineering and use the available computer programs. Student has the ability to work in a team.



## Course-related learning outcomes

### Knowledge

Student has knowledge in the field of design, construction and operation principles of power devices and installations. Student has structured and theoretically founded knowledge about the construction and operation of distribution and power devices as well as electrical installations.

### Skills

Student is able to use computer applications to analyze and evaluate the operation of electrical components and systems in the design of power devices and installations. Student is able to use properly selected programming environments, simulators and IT tools to support design.

### Social competences

Student is aware of the need for continuous education and raising professional competences. Student is aware that in technology knowledge and skills quickly become obsolete.

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

### Projects:

- the preparation of materials for the project is evaluated,
- substantive preparation for the implementation of the assigned project is evaluationed,
- project and its defense are evaluated.

## Programme content

### Projects:

The assigned projects in the field of computer-aided design of power devices and installations, taking into account output data, design diagrams, substitute diagrams and technical calculations performed with the use of IT techniques, are to be implemented.

Introduction to the operation of the artificial neural network (ANN) simulator. Exercises on entering learning data into ANN and describing this data. Design of ANN to identify defects of the selected insulation system.

Introduction to the use of microcontrollers to build devices. Building and programming simple systems based on the Arduino microcontroller.

Preparation of a power device model in order to apply the Finite Element Method. Determination of the emissivity coefficients and convection coefficients for natural and forced convection. Application of the Finite Element Method in the analysis of thermal problems occurring in power devices. Estimating the error of the result obtained using the Finite Element Method.

## Teaching methods



Projects:

- use of dedicated or developed computer applications, graphic programs and catalogs of manufacturers of electrical installation equipment.

**Bibliography**

Basic

1. Osowski S., Sieci neuronowe do przetwarzania informacji, Wydawnictwo OWPW, 2013.
2. Kosiński R. A., Sztuczne sieci neuronowe Dynamika nieliniowa i chaos, WNT, 2014.
3. Migdał K., Najman K., Samouczące się sztuczne sieci neuronowe w grupowaniu i klasyfikacji danych. Teoria i zastosowanie w ekonomii., Wydawnictwo Uniwersytetu Gdańskiego, 2013.
4. Markiewicz H.: Instalacje elektryczne, WNT, Warszawa, 2012.
5. Niestępski S., Parol M., Pasternakiewicz J., Wiśniewski T.: Instalacje elektryczne. Budowa projektowanie i eksploatacja, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2011.
6. Wprowadzenie do Arduino, <https://libra.ibuk.pl/reader/wprowadzenie-do-arduino-banzi-massimo-159361>

Additional

1. Bernat J., Gielniak J., Morańda H., Program komputerowy wykorzystujący sztuczne sieci neuronowe do interpretacji wyników badań przy użyciu metody RVM w celu oceny zawilgocenia izolacji papierowej transformatorów, Przegląd Elektrotechniczny, 2008, Tom 84, Nr 10, ss. 5-7.
2. Normy i rozporządzenia związane z instalacjami elektrycznymi.
3. Katalogi producentów przewodowania i aparatów instalacyjnych.

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	50	2,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	50	2,0

<sup>1</sup> delete or add other activities as appropriate