



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Low voltage installations and building automation

### 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

30

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

15

### Number of credit points

6

### Lecturers

Responsible for the course/lecturer:

Grzegorz Dombek, Ph. D., Eng.

Responsible for the course/lecturer:

Faculty of Environmental Engineering and  
Energy

Institute of Electric Power Engineering

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### Prerequisites

Basic knowledge of electrical devices as well as ergonomics and safety of their use, electrical engineering, mathematics, physics, automation and computer science. Ability to perform mathematical analysis of simple electrical circuits and reading electrical diagrams. Awareness of the need to expand their competences, readiness to cooperate within a team.

### Course objective

Understanding the operation of electrical installations and their implementation. Acquiring skills in the scope of installation design: design calculations, selection of protections and cables, meeting the conditions of electric shock and surge protection, selective protection and drawing of installation



diagrams. Planning the experiment, selection of measuring instruments and implementation of the testing system as well as carrying out tests and processing the results. Understanding the principles and possibilities of controlling building installations, aimed at saving energy and achieving comfort in using the facility. Acquiring skills in the design of simple installations controlled by PLCs and dedicated building automation systems. Acquiring software skills and testing simple building installations.

### Course-related learning outcomes

#### Knowledge

Knows the principles of operation and implementation of electrical installations and building automation systems, and basic phenomena occurring in low-voltage installations. Knows the rules for the selection of installation and control apparatus for selected algorithms controlling lighting, heating and blinds.

#### Skills

Student is able to develop electrical diagrams of receiving installations, carry out calculations necessary for the selection of wires and protections, and choose the installation apparatus. Student is able to critically analyze the available data for technical and non-technical assessment of the designed electrical system.

#### 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:

#### Lecture:

- knowledge acquired as part of the lecture is verified by a written final exam 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.

#### Projects:

- the preparation of materials for the project is evaluated,
- substantive preparation for the implementation of the assigned project is evaluated,



- project and its defense are evaluated.

## Programme content

Lecture:

Types of electrical installations in buildings. Electrical receiving installations. Installation accessories. Determination of the required power, division of the installation into receiving circuits, electrical diagram of the switchgear. Calculations of short-circuit currents in electrical installations. Selection of wires due to long-term current carrying capacity and checking for voltage drop, thermal resistance at overcurrents. Automatic power supply shutdown. Selection of safeguards and their selective operation. Installation requirements from the point of view of protection against electric shock, fire and surge. Simple receiver control systems using contactors. Selected safety automation systems. General rules for controlling lighting, heating and blinds in buildings. The principle of construction, operation and programming of PLC controllers. Basic functions implemented by PLC controllers. Examples of using PLC controllers to control building installations. General information about building automation systems.

Laboratory classes:

Classes discussing the regulations of the laboratory, topics of laboratory classes and OHS training related to the operation of laboratory positions. To perform 6 two-hour laboratory classes in the field of lecture.

Projects:

Assigned project to be implemented in the field of low voltage installations and/or building automation including output data, design diagrams, replacement diagrams and technical calculations.

## 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.

Projects:

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



## Bibliography

### Basic

1. H. Markiewicz, Instalacje elektryczne, Wydawnictwo Naukowo-Techniczne, Warszawa 2012
2. A. Kamińska A, L. Muszyński, Z. Boruta, R. Radajewski, Nowoczesne techniki w projektowaniu energooszczędnych instalacji budynkowych w systemie KNX, Warszawa, 2011.
3. J. Wiatr, M. Orzechowski, Poradnik projektanta elektryka wydanie V rozszerzone, Dom wydawniczy Medium, Warszawa, 2012.
4. E. Niezabitowska, J. Sowa, Z. Staniszewski, D. Winnicka-Jasłowska, W. Badroń, A. Niezabitowski. Budynek inteligentny. Potrzeby użytkownika a standard budynku inteligentnego. Wydawnictwo Politechniki Śląskiej, Gliwice, 2000.
5. J. Kasprzyk, Programowanie sterowników przemysłowych WNT, Warszawa, 2012.
6. A. Ruda, R. Olesiński, Sterowniki programowalne PLC, COSiW SEP, Warszawa, 2008.

### Additional

1. Technical Guide ABB, Electrical Installation Handbook, Protection, control and electrical devices, 6th edition 2010.
2. J. Mikulik. Budynek inteligentny. Podstawowe systemy bezpieczeństwa w budynkach inteligentnych. Wydawnictwo Politechniki Śląskiej, Gliwice, 2000.
3. Standard PN-HD 60364-4-414. Instalacje elektryczne niskiego napięcia.
4. Standard IEC 61131 - 3: Standardy programowania sterowników PLC.

## Breakdown of average student's workload

	Hours	ECTS
Total workload	160	6,0
Classes requiring direct contact with the teacher	100	4,0
Student's own work (literature studies, preparation for laboratory classes, preparation for exam, preparation of reports, project preparation) <sup>1</sup>	60	2,0

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