COURSE DESCRIPTION CARD - SYLLABUS

Course name
Low voltage installations and building automation [N1Eltech1>D-INiAB]

Course

Field of study
Electrical Engineering

Year/Semester
5/9

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
20

Laboratory classes
10

Other
0

Tutorials
0

Projects/seminars
10

Number of credit points

5,00

Coordinators

dr inż. Grzegorz Dombek
grzegorz.dombek@put.poznan.pl

Lecturers

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:

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 laboratoy classes.
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

The module program includes the following topics:
1. Electrical installations - legal status.
2. Construction and types of electrical installations.
3. Power cables and wires.
4. Low-voltage power switches.
5. Protection against electric shock, fire and surges in electrical installations.
6. Power demand of buildings.
7. Electric shock protection
8. Building automation systems.

Course topics

The lecture program includes the following topics:
1. Basic legal and standardization acts concerning the design and implementation of electrical installations.
2. Low-voltage network systems, power supply systems in low-voltage power networks, classification and parameters of electrical installations, components of electrical installations. Power supply for municipal and industrial recipients.
3. Power cables, power and signal cables, busbars, criteria for the selection of wires and cables in electrical installations, long-term current-carrying capacity of cables and wires.
4. Circuit breakers (installation, motor, residual current), switches, disconnectors and fuses in low-voltage electrical installations.
5. Electric shock hazards. Methods and means of protection against electric shock - basic protection, in the event of damage, supplementary. Fire protection in low-voltage electrical installations. Requirements for planning and installation of electrical systems and means of surge protection. Types of surge protection.

Surge arresters for protection against surges.
6. Power demand of residential buildings – COBR Elektromontaż method and method according to the N-SEP-E-002 standard. Power demand of public utility buildings. Planning of power demand of industrial buildings.
7. Protection against electric shock in low-voltage electrical installations
8. Intelligent installations in modern utility buildings – intelligent building installations. Wired and wireless building automation systems – structure, topology, communication, devices used, possibilities.

The laboratory program includes the following topics:
1. Introductory classes
2. Using relays and installation contactors to control electrical energy receivers
3. Determining voltage drops in low-voltage electrical wires
4. Permissible long-term load capacity of wires
5. Construction and operating principle of selected low-voltage electrical devices

The project covers the following topics:
A project to be completed (in a selected program enabling the programming of a building automation system) in the scope of building automation systems discussed during the classes, covering various aspects of controlling building installations.

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-orientedpresentations 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	125	5,00
Classes requiring direct contact with the teacher	70	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	55	2,00