COURSE DESCRIPTION CARD - SYLLABUS

Course name
Distribution systems and electrical installations [S1Energ2>SDiIE]

Course

Field of study
Power Engineering

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

3,00

Coordinators

dr inż. Krzysztof Łowczowski
krzysztof.lowczowski@put.poznan.pl

Lecturers

Prerequisites

The basic information regarding electric devices and their utilization as well as substations. The knowledge about calculation of one - and three-phase AC systems as well as the structure of distribution system network. Ability to find information in literature and different sources and ability to perform ritical analysis of the information sources. Ability to use analytical, simulation and experimental tools. Understand aspects and reliability resulting from engineering work. Is able to work in team.

Course objective

Familiarization with power system sources and distribution system networks on medium and low voltage levels, as well as elements of low voltage installations. Familarization with construction, methods and programs for distribution network development, electrical instalations. Familiarization with applicable legal requirements related to their implementation.

Course-related learning outcomes

Knowledge:
Has advanced and well-established knowledge regarding the construction, operation and diagnostics of devices, machines, installations and energy networks, as well as complex methods, technologies,

conditions of their assembly, commissioning and disassembly - including for non-standard solutions, knows and understands methods of measuring basic quantities characterizing devices and energy, mechanical and electrical systems, knows computational methods and IT tools necessary to analyze experimental results.
Has advanced knowledge of selected facts, objects and phenomena as well as their methods and theories explaining the complex relationships between them, constituting basic knowledge of the basics of electricity, and knows and understands the functioning of the national energy system, including the principles of developing applicable energy tariffs and price lists.

Skills:
Is able to verify the correctness of technical documentation of devices, installations and energy networks, critically analyze the functioning and evaluation, as well as develop procedures, regulations and company standards regarding solutions and processes related to the generation, storage and supply of energy.
Is able, in accordance with given specifications, to design and plan the process of implementing simple power and mechanical devices and installations, as well as to execute them, is able to initially estimate the costs of designed devices and installations using appropriately selected techniques, methods, tools and materials.

Social competences:
Is aware of the importance and understands the non-technical aspects and effects of an energy engineer's activity, including its impact on the environment and the related responsibility for decisions made; is ready to fulfill social obligations, co-organize activities for the social environment and initiate activities for the public interest, as well as promote pro-ecological attitudes in society and in the industry environment

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: assessment of knowledge and skills at the written exam of a problem nature, continuous assessment at each class (rewarding activity and quality of perception). Passing above 50%
Laboratory exercises: test and rewarding knowledge necessary to implement the problems posed in the area of laboratory tasks, assessment of knowledge and skills related to the implementation of the exercise task, assessment of the report of the exercise.
Designing: test and rewarding of knowledge necessary for the implementation of a given project, assessment of knowledge and skills related to the implementation of the project task.
Getting extra points for activity during classes, especially for:
- effectiveness of applying the acquired knowledge when solving a given problem;
- ability to cooperate within a team carrying out a specific task in a laboratory;
- comments related to the improvement of teaching materials;
- aesthetic care of prepared reports and projects.

Programme content

Power supply and distribution systems in the MV and LV power grid.
Components, construction solutions
and principles of building and designing distribution networks.
Electrical installations - legal status. Construction and types of electrical installations. Power cables and wires. Low-voltage power switches.
Protection against electric shock, fire and surges in electrical installations.Power demand of buildings. Electric shock protection

Course topics

Lecture:
Determining power flow, voltage levels, energy losses and other parameters of the MV network. Elements of the MV distribution network.
Basic legal and standardization acts concerning the design and implementation of electrical installations.
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.
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.
Circuit breakers (installation, motor, residual current), switches, disconnectors and fuses in low-voltage electrical installations.
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.
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.
Protection against electric shock in low-voltage electrical installations

Laboratories: Modeling of medium and low voltage power grid. Familiarization with the programs supporting the design and operation of the network.
Use of relays and contactors to power single- and three-phase receivers
Testing power quality using a power quality analyzer for receivers with different characteristics
Elements of electrical equipment used in electrical installations

Projects: designing the supply line for customers. A project to be completed from electrical installations, including input and output data, design diagrams, substitute diagrams and technical calculations

Teaching methods

Lecture: multimedia presentation, illustrated with examples on the board
Laboratory: exercises carried out on digital models, multimedia presentation instructing performed some laboratory exercises
Project: blackboard classes, explaining problems in developed projects

Bibliography

Basic:
1. Markiewicz H.: Urządzenia elektroenergetyczne, WNT, Warszawa, 2014
2. Markiewicz H.: Instalacje elektryczne, WNT, Warszawa, 2018.
3. Prawo Energetyczne, Prawo Budowlane.

Additional:
1. Periodyki: Elektroinstalator, Elektroinfo.
Connection of PV Sources Into Transmission Grid vs. Thermal Overload Risk of Wires and Cables / Krzysztof Łowczowski (WIŚiE), Magdalena Czerniak (WIŚiE), Józef Jacek Zawodniak // Automatyka, Elektryka, Zakłócenia - 2021, vol. 12, nr 2 (44), s. 48-56
Connection of photovoltaic sources to the low voltage distribution network vs. risk of overloading the transformer station. Part 1: Characteristics of the existing state / Magdalena Udzik (WIŚiE), Krzysztof Łowczowski (WIŚiE), Józef Jacek Zawodniak // Przegląd Elektrotechniczny - 2023, R. 99, nr 8, s. 175-179
2. Normy przedmiotowe.
3. Katalogi firmowe.
4. Publikacje internetowe.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00