COURSE DESCRIPTION CARD - SYLLABUS

Course name

Design of electric power networks and devices

Course

Field of study

Electrical power engineering

Year/Semester

1/1

Area of study (specialization)

-

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

polish

Form of study

part-time

Requirements

compulsory

Number of hours

Lecture

20

Laboratory classes

0

Other (e.g. online)

0

Tutorials

0

Projects/seminars

20

Number of credit points

4

Lecturers

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Prerequisites

Basic knowledge in the field of materials engineering, power engineering, high voltage techniques, construction of high voltage power devices.

Course objective

Acquiring the ability to design devices and complex power systems based on the acquired knowledge of applicable standards, regulations, guidelines and regulations.

Course-related learning outcomes

Knowledge

Has knowledge of the construction and operation of the power grid, in particular of overhead and cable high-voltage lines, knows the structure and principles of operation of such power equipment as transformers, capacitors, insulators, and transformers

Has knowledge of the selection and design of power devices as well as the design of cable and overhead power lines

Skills

Can design an electrical system with specific parameters, using appropriate methods, techniques and tools, and develop documentation of such a project

He can use his knowledge and using literature sources, specialized catalogs and technical descriptions of devices, available in printed and electronic versions, integrate the obtained information in order to design such components of power networks as: overhead cable line, energy capacitor, bushing

Can divide tasks between people cooperating in the project and assess the effects of colleagues' work

Social competences

Can think and act in an entrepreneurial way in the field of power engineering, taking into account the impact of the designed systems on the natural environment

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Multiple-choice credit test

Project: Ongoing progress evaluation during the design classes, final evaluation of the prepared project

Programme content

Lectures:

Standards, regulations and good practices for the design of cable lines, overhead lines, insulators and power capacitors, rules for the selection of transformers to work in networks with low and high charmonic content and the selection of filters will be presented.

Projects:
Designing of high voltage power cable and cable line supplying the customer. Designing of substation

distributing equipment, cable terminations and joints, bus bars, insulators, transformer, switching and measurement devices. Calculation of maximum ampacity of power line taking into consideration power cable construction, route requirements, transmission loses limitation. Correct selection of conducting and insulating materials according to voltage value, demanded power, terrain conditions.

Design of a high-voltage overhead line, taking into account the calculation of tension and sags in overhead line, current-carrying capacity, the route of the line and the selection of insulators.

Designing a condenser-type transformer bushing, taking into account the current carrying capacity, selection of the hollow insulator, calculation of the electrical strength at alternating and impulse voltage, designing the electric field control in the bushing and calculating the distribution of the electric field inside the insulator.

Designing a three-phase power capacitor, taking into account the selection of materials, defining the appropriate configuration of the bundles, calculating the electrical and heat resistance, selection of discharge resistors

Teaching methods

Lectures: multimedia presentation (including: drawings, photos) supplemented with examples given on the board and a presentation of examples of projects

Project: multimedia presentation with calculation examples on the board, problem methods, solving project tasks individually and in groups

Bibliography

Basic

1. IEC 287: Calculation of the continuous current rating of cables, International Electrotechnical Commission Publication, 2014
2. Włodarski R., Bucholc J., Linie kablowe bardzo wysokich napięć. Projektowanie i budowa. WNT Warszawa
3. Mościcka-Grzesiak H., Inżynieria wysokich napięć w elektroenergetyce, tom I/II, Wydawnictwo Politechniki Poznańskiej 1996/99
4. Gacek Z. Kształtowanie wysokonapięciowych układów izolacyjnych stosowanych w elektroenergetyce, Wydawnictwo Politechniki Śląskiej, Gliwice 2002

Additional

1. Babij J., Kutzner J., Zasady doboru urządzeń elektrycznych rozdzielni i stacji, Wydawnictwo Politechniki Poznańskiej
2. Pohl Z. (redaktor), Gielniak J. i inni, Napowietrzana izolacja wysokonapięciowa w elektroenergetyce, Oficyna Wydawnicza Politechniki Wrocławskiej, 2003

3. PN-EN 50341-1:2013-03, Elektroenergetyczne linie napowietrzne prądu przemiennego powyżej 1 kV - Część 1: Wymagania ogólne - Specyfikacje wspólne
4. PN-EN 50341-2-22:2016-04, Elektroenergetyczne linie napowietrzne prądu przemiennego powyżej 1 kV - Część 2-22: Krajowe Warunki Normatywne (NNA) dla Polski (oparte na EN 50341-1:2012)
5. A. Rakowska, K. Siodła, E. Gulski, R. Jongen, J. Parciak, Piętnaście lat doświadczeń z badań i diagnostyki elektroenergetycznych linii kablowych tłumionym AC w miejscu zainstalowania, Wiadomości Elektrotechniczne - 2019, nr 9, s. 39-45
6. W. Hoppel, B. Olejnik., A. Schött, Czy słup betonowy jest słupem z materiału izolacyjnego? Wiadomości Elektrotechniczne - 2015, nr 3, s. 14-19
7. K. Szubert, Harmoniczne prądu i napięcia w sieciach dystrybucyjnych, Zeszyty Naukowe Wydziału Elektrotechniki i Automatyki Politechniki Gdańskiej nr 50/2016 str. 85-88

Breakdown of average student's workload

	Hours	ECTS
Total workload	105	4,0
Classes requiring direct contact with the teacher	40	1,5
Student's own work (literature studies, preparation for projects classes, preparation of the final project, preparation for test) [1]	65	2,5

[1] delete or add other activities as appropriate