COURSE DESCRIPTION CARD - SYLLABUS

Course name
Energy Security [S1Eltech1P>PO-E-BE]

Course

Field of study
Electrical Engineering

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
practical

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

2,00

Coordinators

dr hab. inż. Krzysztof Walczak prof. PP
krzysztof.walczak@put.poznan.pl

Lecturers

Prerequisites

Basic knowledge in mathematics, physics, electrical circuits, electrical power engineering and electricity transmission and distribution. Basic knowledge in terms of design, construction and operation principles of power equipment. Ability to self-study effectively topics related to the chosen field of study and combine knowledge acquired in previous courses. Awareness of the need to extend competences, readiness to cooperate within a team.

Course objective

Gaining knowledge on shaping security of complex energy systems and familiarizing with the forecasts of changes in the energy sector concerning reliability of energy supply. Acquainting with issues related to reliability of electricity supply, generation adequacy in the power system and system failures. Understanding indicators determining the reliability and adequacy of electricity supply. Getting to know types of back-up power supply systems and methods of their selection. Practicing calculation methods for the symmetrical and asymmetrical short-circuits in the power system. Acquainting with different types of earthing used in electrical networks and related constructions, earthing requirements, methods of their design and typical construction solutions.

Course-related learning outcomes

Knowledge:
1. Student has knowledge in the field of safety of energy generation, reliability of electricity supply and related problems.
2. Student has knowledge in the field of short-circuit calculations and electric shock protection in electrical networks, as well as methods of providing backup power supply for consumers.
3. Student is able to define new development directions in the area of increasing reliability and adequacy of power systems.

Skills:
1. Student is able to integrate data from various literature sources and assess energy security and reliability of electricity supply for the considered power system.
2. Student is able to prepare and deliver a presentation on security issues and power networks.

Social competences:
1. Student is aware of the need to search for new solutions to improve reliability of electricity supply and power system"s safety.
2. Student is aware of the need to take actions to increase energy security.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture:
- knowledge and skills assessment through a problem-based written test,
- continuous assessment of student"s skills and competences during each class (rewarding attendance and active participation in the classes).
Laboratory:
- assessing and rewarding student"s preparation for classes and knowledge necessary to carry out laboratory exercises,
- assessment of reports on carried out laboratory exercises,
- assessment of knowledge and skills acquired in class by written test.
Project:
- assessment knowledge and skills concerning the project tasks, evaluation of the reports and presenations on completed tasks,
- additional points for active paritcipation during classes, in particular for the ability to cooperate within a team that handles that project task.

Programme content

The subject will cover issues related to the broadly understood energy security of Poland and the world. The program content includes the issues of energy potential, modern technologies for generating energy based on conventional and renewable resources, as well as the assessment of threats to energy supplies resulting from various factors. Current strategies and goals of sustainable energy policy of Poland and the European Union will also be presented.

Course topics

Lecture:
The lectures will cover in detail such issues as: fuel resources and modern technologies for energy generation and transmission, sustainable EU energy policy in the field of reducing harmful emissions, supporting renewable sources and improving energy security and the corresponding Polish Energy Policy, diversification of energy sources taking into account various generation technologies, clean coal technologies, threats to the security of energy supplies using various energy carriers and methods of their assessment and reduction, system failures as a feature of large complex systems and basic principles of defense and reconstruction of power systems during emergency states and after failures.
Tutorial:
The exercises will analyze threats to the security of energy supplies using different energy carriers and methods of their assessment and reduction. Possible scenarios for the structure of generation and selection of sources will also be presented.

Teaching methods

Lecture: multimedia presentation, illustrated with examples given on the board, discussion elements
Tutorial: solving tasks on the board

Bibliography

Basic
1. Gryz J., Podraza A., Ruszel M., Bezpieczeństwo energetyczne. Koncepcje, wyzwania, interesy. Wydawnictwo Naukowe PWN, Warszawa 2018
2. Hoppel W., Sieci średnich napięć, Wydawnictwo Naukowe PWN, Warszawa 2017
3. Kacejko P., Machowski J., Zwarcia w systemach elektroenergetycznych, WNT, Warszawa 2002
4. Kremens Z. , Sobierajski M., Analiza systemów elektroenergetycznych, WNT, Warszawa 1996
5. Markiewicz H., Bezpieczeństwo w elektroenergetyce, WNT, Warszawa 2009
6. Paska J., Niezawodność systemów elektroenergetycznych, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005
7. Wiatr J., Orzechowski M., Poradnik projektanta elektryka: podstawy zasilania budynków mieszkalnych, użyteczności publicznej i innych obiektów nieprzemysłowych w energię elektryczną z przykładowymi projektami oraz przepisami prawnymi na płycie CD, Dom Wydawniczy Medium, Warszawa 2012
8. Żmuda K., Elektroenergetyczne układy przesyłowe i rozdzielcze. Wybrane zagadnienia z przykładami, Wydawnictwo Politechniki Śląskiej, Gliwice 2016
Additional
1. Dobrzyński K., Klucznik J., Malkowski R., Szczerba Z., Automatyka systemowa a bezpieczeństwo energetyczne kraju. Zabezpieczenia. Tom 2, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2013
2. Handke A., Mitkowski E., Stiller J., Sieci elektroenergetyczne, Wydawnictwo Politechniki Poznańskiej, Poznań 1982
3. Janusz P., Szczerbowski R., Zaleski P., Istotne aspekty bezpieczeństwa energetycznego Polski, Texter, Warszawa 2017
4. Kaszowska B., Kucharska B., Zbiór zadań z sieci i systemów elektroenergetycznych. Część II, Politechnika Opolska, Opole 2004
5. Kowalak R., Malkowski R., Szczerba Z., Zajczyk R., Automatyka systemowa a bezpieczeństwo energetyczne kraju. Węzły sieci przesyłowej i rozdzielczej. Tom 3, Wydawnictwo Politechniki Gdańskiej, Gdańsk 2013

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,00
Classes requiring direct contact with the teacher	35	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	25	1,00