COURSE DESCRIPTION CARD - SYLLABUS

Course name
Electricity transmission [S1Energ2>PEE]

Course

Field of study
Power Engineering

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

5,00

Coordinators

dr inż. Krzysztof Szubert
krzysztof.szubert@put.poznan.pl

Lecturers

Prerequisites

Knowledge: Has basic knowledge of the theory of electric circuits, electromagnetic field, electric machines, high voltage techniques, power engineering and electricity generation Skills: Has the ability to effectively self-study in a field related to the chosen field of study, combining knowledge acquired in the course of previously completed subjects. Competences: Is aware of the need to expand their knowledge and competences, readiness to cooperate and cooperate in a group

Course objective

Acquaintance with the parameters and tasks of modern power systems, electricity transmission and distribution subsystems. Construction of AC transmission systems. Impact of alternating current lines on the environment. Transmission of electricity by alternating current over long and short distances. The role of direct current transmission systems.

Course-related learning outcomes

Knowledge:
Is able to explain the basic parameters and tasks of modern power systems.
Is able to determine limitations in energy transmission resulting from stability, thermal and wave

phenomena
Is able to characterize the basic principles of transmission of electricity over short and long distances, construction and construction of transmission lines, and possibilities of controlling energy transmission.

Skills:
Explains the basic principles of functioning of modern power systems.
Is able to apply knowledge of the theory of electrical circuits and electrical machines to explain the basic phenomena associated with the transmission of electricity over short and long distances, make basic calculations related to the transmission of electricity.

Social competences:
He understands the need and knows the possibilities of continuous training (second and third degree studies, postgraduate studies, courses), raising professional, personal and social competences.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures: assessment of knowledge and skills demonstrated in the written and oral exam, continuous assessment in class (rewarding activity and quality of perception).
Exercises: continuous assessment during classes and a written test after completing the exercises.
Laboratory: assessment of knowledge and skills related to the exercise task during each class, evaluation of the report on the exercise performed, and a test summarizing the knowledge acquired in the laboratory.

Programme content

Tasks and parameters of the power system. Electricity transmission and distribution subsystems. Hierarchical structure of the power grid. Construction of alternating current transmission systems, contemporary development trends. Theoretical foundations of long-distance transmission with alternating current and direct current. Basics of designing alternating current transmission systems.

Course topics

Basic information reminder:
- Where does electricity come from?
- Transmission and distribution networks
- Formula for electricity transmission
- Change of transmission characteristics (Eq=const, Eq'=const, Us=const)
- Static, dynamic and voltage stability
- Self-balancing in the active and reactive power system (at what cost)

Building diagrams for symmetrical components to calculate short-circuit currents:
- how the generator, line and transformer affect the negative sequence and especially the zero sequence
- why and how we calculate individual short-circuit current parameters

Construction of wires (high-temperature, low-sag) and cables
Parameters determining energy quality - requirements
Control in the power system
- reason for the disturbance, type of disturbance and required response
- EAZ automation in a nutshell
- FACTS drivers
- direct current transmission

Transmission via long lines:
- wave phenomena, natural power.
- measures to increase the transmission capacity of HV lines.

Exercises: Determining flows and short circuits in transmission networks. Assessment of the impact of reactive power compensation

Laboratory: includes exercises in the field of analyzing phenomena occurring in transmission and distribution networks under normal and interference conditions using physical models.

Teaching methods

Lecture: multimedia presentation supplemented with examples given on the board; an attempt to activate students to make thematic statements
Exercises: solving tasks at the blackboard with the teacher's support, introducing multimedia if necessary
Laboratories: performing research on physical or digital models under the supervision of a teacher; materials made available at research stations; materials (e.g. videos) for some exercises are available on eKursy

Bibliography

Basic:
Kujszczyk Sz. (pod red.): Elektroenergetyczne układy przesyłowe, WNT, Warszawa 1997.
Kordus A. (pod red.): Sieci elektroenergetyczne - przykłady wybranych zagadnień, WPP, Poznań 1990 r.
Poradnik Inżyniera Elektryka . t.3. WNT, Warszawa 2011

Additional:
Żmuda K.: Elektroenergetyczne układy przesyłowe i rozdzielcze. Wybrane zagadnienia z przykładami. Wydawnictwo Politechniki Śląskiej, Gliwice 2016
Popczyk J.: Elektroenergetyczne układy przesyłowe, WPŚ, Gliwice 1984
Kończykowski S.: Obliczanie sieci elektroenergetycznych, t.II, PWN, Warszawa 1958

Breakdown of average student's workload

	Hours	ECTS
Total workload	132	5,00
Classes requiring direct contact with the teacher	62	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	70	2,50