COURSE DESCRIPTION CARD - SYLLABUS

Course name

Generation and transfer of electric energy3

Course

Field of study

Electrical Engineering

Year/Semester

3/6

Area of study (specialization)

Power Systems and Electric Power Protection

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

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Prerequisites

Basic knowledge in the field of technical thermodynamics, the theory of electrical circuits, electrical machines and power engineering. The ability to effectively self-study in a field related to the chosen field of study. Awareness of the need to expand their competences, readiness to cooperate within a team.

Course objective

Understanding the technology of generating electricity in various types of power plants as well as the construction and operation principles of basic energy devices. Acquainting with the parameters and tasks of modern power systems, electricity transmission and distribution subsystems. Construction of AC

transmission systems. Getting to know the issues of transmission of electricity over short and long distances. Control of power transmission in AC transmission systems. Application of direct current transmission systems.

Course-related learning outcomes

Knowledge

1. Student has ordered and theoretically founded knowledge of the theory of electrical circuits, knows the basic laws of electrical engineering and thermodynamics.

2. Student has structured knowledge in the field of electricity generation technology. He knows the structure of the manufacturing sector of the National Power System.

Skills

1. Student can make calculations of the energy balance of the power plant's steam cycle and carry out design calculations of the basic devices included in the power plant's technological system.

2. Student is able to use known methods and mathematical models to analyze the transmission line.

Social competences

1. Is aware of the impact of electricity generation technology on the environment.

2. Understands the need to improve their professional, personal and social competences.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture

- checking knowledge in the form of passing a written exam.

Laboratory classes

- assessment of knowledge and skills related to the implementation of the exercise task, assessment of the report of the exercise.

Programme content

Lecture

Construction and operation of the basic equipment of a steam power plant: boiler, turbine, carburizing system, condenser, heat exchangers, degasser, pumps, fans. Steam, gas and gas-steam CHP plants. Hydroelectric power stations.

Parameters of the power system. Electricity transmission and distribution subsystems. Hierarchical structure of the power network. Construction of HV and LV AC transmission systems, contemporary development trends. Power transmission over long distances, wave phenomena, natural power. Measures to increase LV transmission capacity. Power flow control in HV and LV transmission networks. Calculations of symmetrical and asymmetrical steady-state short-circuits in the power system.

Laboratory classes

Modeling and analysis of the power block's work. Examination of the impact of the working factor parameter value on the efficiency of the electricity generation process.

Practical operation of simulation software for the analysis of steady-state and transient states in the power system at the high and highest voltage levels (e.g. power dissipation, emergency states, operational problems).

Teaching methods

Lecture

Lecture with multimedia presentation supplemented with examples given on the board.

Laboratory classes

Research on the quality of fuels used in the power industry. Research on distributed generation technologies.

Measurements of electrical parameters in didactic stands.

Bibliography

Basic

1. Elektrownie, D. Laudyn, M. Pawlik, F. Strzelczyk, WNT W-wa 2000

2. Maszyny i urządzenia energetyczne, W. Szuman, WSiP W-wa 1985

3. Kotły parowe. Konstrukcja i obliczenia, P. Orłowski, W. Dobrzański, E. Szwarc, WNT W-wa 1979

4. Turbiny cieplne. Zagadnienia termodynamiczne i przepływowe, E. Tuliszka WNT W-wa 1973

5. Wytwarzanie rozproszone energii elektrycznej i ciepła, J. Paska, Oficyna Wydawnicza Politechniki Warszawskiej. 2010

6. Sz. Kujszczyk (pod red.): Elektroenergetyczne układy przesyłowe, WNT, Warszawa 1997.

7. Sz. Kujszczyk (pod red.): Elektroenergetyczne sieci rozdzielcze, tom 1 i 2, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2004 r.

9. P. Kacejko, J. Machowski: Zwarcia w systemach elektroenergetycznych, WN-T, Warszawa 2013

10. Poradnik Inżyniera Elektryka . t.3. WN-T, Warszawa 2011

11. Z. Kremens, M. Sobierajski: Analiza systemów elektroenergetycznych. WNT, Warszawa, 1996.

12. P. Kacejko, J. Machowski: Zwarcia w systemach elektroenergetycznych. WNT, Warszawa, 2002

Additional

1. Układy i urządzenia potrzeb własnych, M. Pawlik, J. Skierski, WNT W-wa 1986

2. Gazowe układy kogeneracyjne, J. Skorek, J. Kalina, WNT, 2005

3. Technologie energetyczne, T. J.Chmielniak, Wydawnictwo Politechniki Śląskiej, 2004

4. Wytwarzanie i użytkowanie energii w przemyśle, J. Górzyński, K. Urbaniec, Oficyna Wydawnicza Politechniki Warszawskiej, 2000

5. T. Kahl: Sieci elektroenergetyczne. WNT, Warszawa 1984

6. J. Popczyk: Elektroenergetyczne układy przesyłowe, WPŚ, Gliwice 1984

7. M. Cegielski: Sieci i systemy elektroenergetyczne. PWN, Warszawa, 1979.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	70	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	30	1,0

[1] delete or add other activities as appropriate