STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Generation of electric energy		**1010312331010311584**
Field of study: **Electrical Engineering**	Profile of study (general academic, practical): **(brak)**	Year /Semester: **2 / 3**
Elective path/specialty: **Electric Power Systems**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **15** Classes: **-** Laboratory: **15** Project/seminars: **15**		No. of credits: **5**
Status of the course in the study program (Basic, major, other): **(brak)**	(university-wide, from another field): **(brak)**	
Education areas and fields of science and art: **technical sciences** **Technical sciences**		ECTS distribution (number and %): **5 100%** **5 100%**

Responsible for subject / lecturer:

Radosław Szczerbowski
email: radoslaw.szczerbowski@put.poznan.pl
tel. 61 665 20 30
Elektryczny
ul. Piotrowo 3A, 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	It has a basic knowledge of the basics of energy conversion and energy machine and equipment. He knows the basics of electrical engineering and power engineering.
2	**Skills**	Understand the basic principles of operation of the machines and know the basic construction of conventional energy equipment.
3	**Social competencies**	Is aware of the need to expand their skills and readiness to work together as a team.

Assumptions and objectives of the course:

Obtaining skills in the knowledge of methods of generating electricity in power plants and knowledge of the principles of the use of different types of primary energy to produce electricity.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student knows the primary form of energy available in nature and presents the possibility of their use in the energy sector. Able to classify and evaluate the types of power plants. Able to identify and assess the impact of generation sources on the environment - [K_W05++]

2. Student has an extended knowledge of the structure and operation of various types of power plants and their role in the power system - [K_W16+++]

Skills:

1. Able to use mathematical methods to energy analyzis of technological systems of power plants. - [K_U06++]

2. Can design a basic technological systems of power plant and CHP power plants, and evaluate them in terms of the efficiency of electricity and heat - [K_U19++]

Social competencies:

1. Understand the complexity of many aspects of electrical engineering and can present them in an understandable way - [K_K02+++]

Assessment methods of study outcomes

Written exam - problem questions.

The project is classified on the basis of self-made design task.

The laboratory is classified based on the reports of laboratory exercises and current responses of students.

Course description

Lecture: Characteristc of national power plants. Influence of diurnal variation on the work load power plants. Generation of electricity in thermal power plants. Methods of improve the efficiency of steam power plants. Gas and combined gas-steam power plants. Combined heat and power. Use of nuclear energy for producing electricity. Types of nuclear reactors used in nuclear power plants. The use of water power to generate electricity. Types of hydroelectric power plants and their role in the power system. Principles for the use of wind energy. Power plants and wind farms. The use of solar energy. Photovoltaics. Methods of use of geothermal energy. Electricity generation using fuel cells. Distributed generation and its impact on power system operation. The influence of the environment and methods of its reduction.

Laboratory and design: theme and design laboratory corresponds to the lectures.

Basic bibliography:

1. Chmielniak T., Technologie energetyczne, Wydawnictwo Politechniki Śląskiej, 2004.
2. Nehrebecki L., Elektrownie cieplne, WNT, 1974.
3. Laudyn D., Pawlik M., Strzelczyk F., Elektrownie, WNT, 1990.
4. Paska J., Wytwarzanie rozproszone energii elektrycznej i ciepła. Oficyna Wydawnicza Politechniki Warszawskiej. 2010.
5. Marecki J.: Podstawy przemian energetycznych. WNT, Warszawa 2007
6. Kotowicz J., Elektrownie gazowo-parowe, Kaprint, 2008

Additional bibliography:

1. Skorek J., Kalina J., Gazowe układy kogeneracyjne, WNT, 2005.
2. Bartnik R., Elektrownie i elektrociepłownie gazowo-parowe. Efektywność energetyczna i ekonomiczna, WNT, 2009.
3. Szargut J., Ziębik A., Skojarzone wytwarzanie ciepła i elektryczności ? elektrociepłownie, Wydawnictwo Pracowni Komputerowej Jacka Skalmierskiego, 2007.
4. Kowalska A., Wilczyński A., Źródła rozproszone w systemie elektroenergetycznym. Kaprint. 2007.
5. Miller A., Maszyny i urządzenia cieplne i energetyczne. WSiP. 1994.

Result of average student's workload

Activity	Time (working hours)
1. participation in lectures	15
2. exam preparation	12
3. presence on the exam	5
4. the consultation of lectures	5
5. participation in laboratory	15
6. preparation to laboratory exercises	10
7. development of laboratory reports	15
8. the consultation of the laboratory	5
9. participation in project activities	15
10. participating in consultations for the design	5
11. independent execution of the project	25

Student's workload

Source of workload	hours	ECTS
Total workload	127	5
Contact hours	65	2
Practical activities	85	3