		STUDY MODULE D	ESCRIPTION FORM			
	the module/subject ration of electri	c energy		^{ode} 010312331010311584		
Field of s		_	Profile of study (general academic, practical)	Year /Semester		
	rical Engineerin	9	(brak)	2/3		
Elective p	bath/specialty Electr	ic Power Systems	Subject offered in: Polish	Course (compulsory, elective) obligatory		
Cycle of s	study:		Form of study (full-time,part-time)			
Second-cycle studies			full-time			
No. of ho	urs			No. of credits		
Lecture	e: 15 Classes	s: - Laboratory: 15	Project/seminars: 15	5		
Status of	the course in the study	program (Basic, major, other)	(university-wide, from another field	i)		
		(brak)	(b	rak)		
Education	n areas and fields of sci	ence and art		ECTS distribution (number and %)		
techni	ical sciences			5 100%		
	Technical scie	ences		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 t	heir skills and readiness to work t	ogether as a team.		
Assur	-	ectives 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.						
	lifferent types of prim					
use of d	Study outco					
	Study outco	ary energy to produce electricity.				
use of d Know 1. Stude Able to o	Study outco ledge: ent knows the primary	ary energy to produce electricity.	educational results for a	field of study		
Use of d Know 1. Stude Able to d environr 2. Stude	Study outco ledge: ent knows the primary classify and evaluate ment - [K_W05++]	ary energy to produce electricity. mes and reference to the / form of energy available in natur	educational results for a e and presents the possibility of th identify and assess the impact o	field of study heir use in the energy sector. f generation sources on the		
Use of d Know 1. Stude Able to d environr 2. Stude	Study outco ledge: ent knows the primary classify and evaluate ment - [K_W05++] ent has an extended l ystem - [K_W16+++]	ary energy to produce electricity. mes and reference to the / form of energy available in natur the types of power plants. Able to	educational results for a e and presents the possibility of th identify and assess the impact o	field of study heir use in the energy sector. f generation sources on the		
use of d Know 1. Stude Able to d environr 2. Stude power s Skills:	Study outco ledge: ent knows the primary classify and evaluate ment - [K_W05++] ent has an extended I ystem - [K_W16+++]	ary energy to produce electricity. mes and reference to the / form of energy available in natur the types of power plants. Able to knowledge of the structure and op	educational results for a e and presents the possibility of the identify and assess the impact of eration of various types of power	field of study heir use in the energy sector. f generation sources on the plants and their role in the		
Use of d Know 1. Stude Able to a environr 2. Stude power s Skills: 1. Able to 2. Can o	Study outco ledge: ent knows the primary classify and evaluate ment - [K_W05++] ent has an extended I ystem - [K_W16+++] to use mathematical design a basic technol	ary energy to produce electricity. mes and reference to the / form of energy available in natur the types of power plants. Able to knowledge of the structure and op methods to energy analyzis of tec plogical systems of power plant an	educational results for a e and presents the possibility of th identify and assess the impact o eration of various types of power hnological systems of power plan	field of study heir use in the energy sector. f generation sources on the plants and their role in the ts [K_U06++]		
use of d Know 1. Stude Able to environr 2. Stude power s Skills: 1. Able to 2. Can c efficience	Study outco ledge: ent knows the primary classify and evaluate ment - [K_W05++] ent has an extended l ystem - [K_W16+++] to use mathematical design a basic technol cy of electricity and here	ary energy to produce electricity. mes and reference to the / form of energy available in natur the types of power plants. Able to knowledge of the structure and op methods to energy analyzis of tec plogical systems of power plant an eat - [K_U19++]	educational results for a e and presents the possibility of th identify and assess the impact o eration of various types of power hnological systems of power plan	field of study heir use in the energy sector. f generation sources on the plants and their role in the ts [K_U06++]		
 use of d Know 1. Stude Able to a environ 2. Stude power s Skills: 1. Able to efficience Social 	Study outco ledge: ent knows the primary classify and evaluate ment - [K_W05++] ent has an extended I ystem - [K_W16+++] to use mathematical design a basic technol cy of electricity and he competencies: rstand the complexity	ary energy to produce electricity. mes and reference to the / form of energy available in natur the types of power plants. Able to knowledge of the structure and op methods to energy analyzis of tec plogical systems of power plant an eat - [K_U19++]	educational results for a e and presents the possibility of th o identify and assess the impact o eration of various types of power hnological systems of power plan d CHP power plants, and evaluat	field of study heir use in the energy sector. f generation sources on the plants and their role in the ts [K_U06++] e them in terms of the		

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 wo	rkload			
Source of workload	hours	ECTS		
Total workload	127	5		

Result of average student's workload

Source of workloadhoursECTSTotal workload1275Contact hours652Practical activities853