

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Wytwarzanie energii elektrycznej**
 Name in English: **Electric energy generation**
 Main field of study (if applicable): **Electrical Engineering**
 Specialization (if applicable):
 Level and form of studies: **1st level, full-time**
 Kind of subject: **obligatory**
 Subject code: **ELR052503**
 Group of courses: **NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU):	30				
Number of hours of total student workload (CNPS):	60				
Form of crediting:	crediting with grade				
For group of courses mark (X) final course:					
Number of ECTS points:	2				
including number of ECTS points for practical (P) classes :					
including number of ECTS points for direct teacher-student contact (BK) classes:	1.40				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has basic knowledge of classical mechanics and phenomenological thermodynamics
2. Is able to apply correctly and effectively physical laws and principles for qualitative and quantitative analysis of engineering related physical problems
3. Understands and knows the necessity and possibilities of long life learning, improving professional, personal and social competences

SUBJECT OBJECTIVES

- C1. Having basics knowledge of physical phenomena in electric energy generation
 C2. Having basics knowledge of electricity generation technologies
 C3. Having basics knowledge of electricity generation costs and protecting an environment in electricity generation

SUBJECT LEARNING OUTCOMES*relating to knowledge:*

- PEU_W01 Has basic knowledge of physical phenomena occurring in electric energy generation process
 PEU_W02 Has knowledge of basic electric energy generation technologies
 PEU_W03 Has knowledge on costs and impact of electricity production on environment

*relating to skills:**relating to social competences:*

- PEU_K01 Is aware of necessity of self-reliant information retrieval and creative using of obtained information

PROGRAMME CONTENT		
Form of classes - lecture		Number of hours:
Lec 1	Scope of the course. Conditions of passing. Introductory concepts. Characteristics of electrical energy. Forms and energy carriers. Energy conversion and methods of electricity generation. The structure of electricity generation in Poland and in the world. Consumption and forecast for electrical energy demand	2
Lec 2	Electromechanical energy conversion in electrical generators. Thermal cycles in energy conversion	2
Lec 3	Steam power plant thermal cycle and layout. The efficiency of the cycle and ways for improvement. Technological process of a steam power plant	2
Lec 4	Basic equipment of steam power plant. Directions for the development of steam power plants	2
Lec 5	Overview of combined heat and power (CHP) generation. Layout and efficiency of steam CHP-plants	2
Lec 6	Gas turbine and combined cycle power plants: thermodynamic cycle, construction, operation and applications	2
Lec 7	Generating sets with reciprocating engines: thermodynamic cycles, construction, operation and application	2
Lec 8	Hydro energy and hydro power plants: overview. Physical principles of hydro energy conversion. Pump-storage, run-off-river and pondage hydro power plants. Types of hydro turbines and its selection	2
Lec 9	Wind energy: characteristics. The physical principles of wind energy conversion. Estimation of energy produced in wind power plants. Construction and operation of wind turbines	2
Lec 10	Solar radiation energy. Electric energy production in photovoltaic cells and panels	2
Lec 11	Energy production in electrochemical and fuel cells. Methods of energy storage	2
Lec 12	Power plants based on Organic Rankine Cycle. Biomass and geothermal energy for electricity production	2
Lec 13	Nuclear power: overview. Physical principles of the energetic use of nuclear reactions. Construction and operation of nuclear reactors. Systems with a pressure and boiling reactor. Nuclear energy security and its development	2
Lec 14	Economic and social costs of electric energy production in conventional and renewable sources. Main problems of environment protection in electric energy generation	2
Lec 15	Final test	2
Total hours:		30

TEACHING TOOLS USED
N1. Information lecture in form of multimedia presentation

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation <i>F - forming (during semester)</i> <i>P - concluding (at semester end)</i>	Educational effect number	Way of evaluating educational effect achievement
F1(w)	PEU_W01 PEU_W02 PEU_W03 PEU_K01	Writing test
P(w)	P=F1	

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Paska J., Wytwarzanie energii elektrycznej, OWPW, Warszawa 2018. [2] Paska J., Rozproszone źródła energii, OWPW, Warszawa 2017. [4] Lewandowski W., Klugmann-Radziemska E., Proekologiczne odnawialne źródła energii. Kompendium, PWN, Warszawa 2017. [4] Marecki J., Podstawy przemian energetycznych, WNT, Warszawa 2013. [5] Pawlik M., Strzelczyk F., Elektrownie, WNT, Warszawa 2010. SECONDARY LITERATURE: [1] Chmielniak T., Technologie energetyczne, WNT, Warszawa 2008. [2] Kalinowski E., Termodynamika. OWPWr, Wrocław 1994. [3] Paska J., Wytwarzanie rozproszone energii elektrycznej i ciepła, OWPW, Warszawa 2010. [4] Skorek J., Kalina J., Gazowe układy kogeneracyjne. WNT, Warszawa 2005.

SUBJECT SUPERVISOR
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