

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: **ELR042503**
 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 EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 Has basic knowledge of physical phenomena occurring in electric energy generation process
 PEK_W02 Has knowledge of basic electric energy generation technologies
 PEK_W03 Has knowledge on costs and impact of electricity production on environment

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

- PEK_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	Introduction to lecture. Basic definitions. Forms and carriers of energy. Electrical energy generation methods. Energy resources and energy demand. Structure of energy generation in Poland and in the world	2
Lec 2	Physical principles of energy conversion. Thermodynamic principles, thermodynamic cycles and their efficiency. Heat engines. Thermodynamic properties of water steam	2
Lec 3	Conventional thermal power plants: overview, technological system. Thermodynamic cycle of thermal power plant and methods of efficiency improvement	2
Lec 4	Basic and auxiliary devices of thermal power plants. Future development of thermal power plants	2
Lec 5	Combined heat and power (CHP) production: overview. Layout and efficiency of CHP-plants	2
Lec 6	Electric energy generation in gas turbine plants and gas-steam plants	2
Lec 7	Electric energy generation in reciprocating engine based plants. Hydro energy: overview, hydro energy resources	2
Lec 8	Physical principles of hydro energy conversion. Water power plants: classification and layout. Basic types of hydro turbines. Small water power plants.	2
Lec 9	Wind energy: overview, wind energy resources. Wind turbine construction and operation. Development of wind energy	2
Lec 10	Solar energy. Electric energy production in PV -cells	2
Lec 11	Energy production in electrochemical and fuel cells. Methods of energy storage	2
Lec 12	Biomass for energy production. Organic Rankine Cycle based plants. Hybrid power plants. Microsources	2
Lec 13	Nuclear power plants: overview. Nuclear reactions. Nuclear reactors. Types of nuclear power plants. Thermodynamics and efficiency of nuclear power plants. Safety and development trends of nuclear energy	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 EDUCATIONAL EFFECTS 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)	PEK_W01 PEK_W02 PEK_W03 PEK_K01	Writing test
P(w)	P=F1	

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Paska J., Wytwarzanie energii elektrycznej, OWPW, Warszawa 2005. [2] Paska J., Wytwarzanie rozproszonej energii elektrycznej i ciepła, OWPW, Warszawa 2010. [3] Marecki J., Podstawy przemian energetycznych, WNT, Warszawa, 2013. [4] Pawlik M., Strzelczyk F., Elektrownie, WNT, Warszawa 2010. SECONDARY LITERATURE: [1] Chmielniak T., Technologie energetyczne, WNT, Warszawa 2008. [2] Kalinowski E., Termodynamika. OWPW, Wrocław 1994. [3] Skorek J., Kalina J., Gazowe układy kogeneracyjne. WNT, Warszawa 2005.

SUBJECT SUPERVISOR
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ELR042503 - Electric energy generation
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Electrical Engineering**

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1ETK_W11	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13	N.1
PEK_W02	K1ETK_W11	C.1 C.2	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13	N.1
PEK_W03	K1ETK_W11	C.3	Lec14	N.1
PEK_K01	K1ETK_K04	C.1 C.2 C.3	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N.1