

FACULTY OF ELECTRICAL
ENGINEERING**SUBJECT CARD**

Name in Polish: **Gospodarka energetyczna**
 Name in English: **Energy management in energy systems**
 Main field of study (if applicable): **Electrical Engineering**
 Specialization (if applicable): **Electrical Power Engineering**
 Level and form of studies: **2nd level, full-time**
 Kind of subject: **obligatory**
 Subject code: **ELR042517**
 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. Having basic knowledge of physical phenomena in electric energy generation and familiarity with basics electricity generation technologies
2. Having basic knowledge of economic and social costs of electricity production
3. Having basic knowledge of marketing and management in energy industry

SUBJECT OBJECTIVES

- C1. Familiarizing with energy management assessment according to sustainable development rules
 C2. Familiarizing with energy balance methods of energy technological systems and operation optimization of generating units
 C3. Familiarizing with methods of initial economic analyses of technological systems for energy generation, transmission and utilizing
 C4. Familiarizing with structure of energy system, its structural transformation and development trends

SUBJECT EDUCATIONAL EFFECTS*relating to knowledge:*

- PEK_W01 Has basic knowledge of energy balancing of technological systems for generation and utilizing of electricity, heat and cold and operation optimization of generation, transmission and distribution units
 PEK_W02 Has basic knowledge of cost of generation of electricity, heat and cold
 PEK_W03 Has basic knowledge of energy system, its structural transformation and development trends

*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	Scope of the course. Concept of energy. Energy conversion fundamentals. Efficiency of energy conversion processes	2
Lec 2	Role of energy in civilization development. Primary energy resources and demand in the world and Poland. Basic definitions in the scope of energy management	2
Lec 3	National energy system: description, structural transformations. Transport and storage of energy carriers	2
Lec 4	Ecological problems of energy sector development. Sustainable development of energy generatio, transmission and utilization	2
Lec 5	Availability of coal, crude oil and natural gas. National energy policy and energy security	2
Lec 6	Current trends in energy sector development: energy demand forecasts, changes in energy mix, distributed and dispersed generation, smart grids	2
Lec 7	Energy efficiency: law status. Methods and examples of energy efficiency improvement in buildings and industry	2
Lec 8	Principles of economic calculations in energy sector. Economic and environmental costs of energy utilization	2
Lec 9	Investment economic efficiency analysis in energy sector - principles	2
Lec 10	Economic efficiency analysis in energy sector - examples	2
Lec 11	Characteristics of energy conversion systems and their applications	2
Lec 12	Energy balance modeling of energy conversion systems - principles and examples	2
Lec 13	Models and methods of optimization in energy management	2
Lec 14	Optimization in energy management: example applications. Lecture final remarks	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] Charun H. Podstawy gospodarki energetycznej. Cz. 1-3, Wybrane zagadnienia dydaktyczne, Koszalin 2004. [2] Paska J., Ekonomika w elektroenergetyce, OWPW, Warszawa 2007. [3] Dyka E., Mróz-Radłowska I., Ekonomia w energetyce - wybrane zagadnienia, Wyd. PŁ, Łódź 2014. [4] Górzyński J., Efektywność energetyczna w działalności gospodarczej, PWN, Warszawa 2017. [5] Oung K., Zarządzanie energią w przedsiębiorstwie, PWN, Warszawa 2015 [6] Gosztowt W., Gospodarka energetyczna w przemyśle, WNT, Warszawa 1973. [7] Marecki J., Podstawy przemian energetycznych, WNT, Warszawa 2014. SECONDARY LITERATURE: [1] Vanek, F. Albright L., Energy systems engineering : evaluation and implementation, McGraw-Hill, New York 2012. [2] Nantka M. B., Techniczne aspekty gospodarki energetycznej w budownictwie, t. 1, 2, Wyd. PŚI., Gliwice 2014. [3] Chochoński A., Krawiec A. red.: , Zarządzanie w energetyce. Koncepcje, zasoby, strategie, struktury, procesy i technologie energetyki, Wydawnictwo Difin, Warszawa 2007.

SUBJECT SUPERVISOR
Robert Łukomski, robert.lukomski@pwr.edu.pl

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
ELR042517 - Energy management in energy systems
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **Electrical Engineering**
AND SPECIALIZATION **Electrical Power 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	S2EEN_W10	C.2	Lec11 Lec12 Lec13 Lec14	N.1
PEK_W02	S2EEN_W10	C.3	Lec8 Lec9 Lec10	N.1
PEK_W03	S2EEN_W10	C.1 C.4	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7	N.1
PEK_K01	K2ETK_K06	C.1 C.2 C.3 C.4	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N.1