FACULTY OF ELECTRICAL ENGINEERING

SUBJECT CARD

Name in Polish:	**Modelowanie elektrowni wiatrowych**
Name in English:	**Wind Power Station Modelling**
Main field of study (if applicable):	**Electrical Engineering**
Specialization (if applicable):	**Renewable Energy Sources**
Level and form of studies:	**2nd level, full-time**
Kind of subject:	**optional**
Subject code:	**ELR053223**
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. Knows the basic laws and phenomena of electrical engineering
2. It knows the rules of operation of electrical generators
3. Accept the need for education

SUBJECT OBJECTIVES

C1. Understanding the basic principles of construction and calculation of parameters of wind turbines
C2. Familiarize students with the basic knowledge apply to create and use models of wind stations

SUBJECT LEARNING OUTCOMES

relating to knowledge:

PEU_W01 It has a basic knowledge of the construction of wind turbines and phenomena occurring in them

PEU_W02 He knows the wind plant elements modeling

relating to skills:

relating to social competences:

PEU_K01 He is open to learning technical solutions and accepts responsibility for the results of his work

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours:**
Lec 1	Program and requirements. The principle of operation of wind power plants and methods of their construction	2
Lec 2	Wind energy, the shape of turbine blades, the formation of the lift	2
Lec 3	Power of wind flow, power acquired by the turbine	2
Lec 4	Calculation of aerodynamic forces	2
Lec 5	Turbine structures, types of generators, power plants with and without transmission	2
Lec 6	Work the power station on the system, wind farms	2
Lec 7	Regulatory and control systems	2
Lec 8	Low-power power stations, principles of low-speed generators operation	2
Lec 9	Description of low-speed generators construction	2
Lec 10	Wind and turbine modelling	2
Lec 11	Taking account vibrations of the transmission	2
Lec 12	Modelling of the generators work on the example of an induction generator	2
Lec 13	Comparison of induction machines models	2
Lec 14	Test	2
Lec 15	Interpretation of sample calculations results	2
	Total hours:	**30**

TEACHING TOOLS USED
N1. Lecture N2. Audio Visual Presentation

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT		
Evaluation *F – forming (during semester)* *P – concluding (at semester end)*	**Educational effect number**	**Way of evaluating educational effect achievement**
F1(W)	PEU_W01 PEU_W02 PEU_K01	Test
P(W)	C = F1	

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Burton T, Sharpe D, Jenkins N, Bossanyi E: Wind energy handbook. John Wiley & Sons, England, Chichester 2001
[2] Gumuła S, Knap T, Strzelczyk P, Szczerba Z: Energetyka wiatrowa. Wyd. AGH, Kraków 2006
[3] Karolewski B: Parametry modeli bezrdzeniowych prądnic tarczowych. Elektro.info 2011, no 6
[4] Karolewski B, Słapczyński P, Hala Z: Badanie modeli prądnic tarczowych rdzeniowych. Elektro.info 2011, no 7-8
[5] Karolewski B: Obliczanie parametrów małej elektrowni wiatrowej. Elektro.info 2014, nr 6
[6] Kulesza K, Krzemiński Z, Blecharz K: Modelowanie elektrowni wiatrowej pracującej na sieć sztywną. Przegląd Elektrotechniczny2004, no 11
[7] Lubośny Z: Elektrownie wiatrowe w systemie elektroenergetycznym. WNT, Warszawa 2006

SECONDARY LITERATURE:

[1] Bogalecka E: Zagadnienia sterowania maszyną dwustronnie zasilaną pracującą jako prądnica w systemie elektroenergetycznym. Prace Naukowe Wyższej Szkoły Morskiej w Gdyni, 1997
[2] Manwell J, Mcgowan J, Rogers A: Wind energy explained. Theory, design and application. John Wiley & Sons, Chichester 2002
[3] Petru T: Modeling of Wind Turbines for Power System Studies. Thesis of doctor work, Department of Electric Power Engineering Chalmers University of Technology Goteborg, Sweden 2003
[4] Uracz P, Karolewski B: Modelowanie turbin wiatrowych z wykorzystaniem charakterystyk współczynnika mocy. Pr. Nauk. Inst. Masz, Nap. i Pom. El. PWr 2006, nr 59, Studia i Materiały, no 26
[5] Uracz P, Karolewski B: Modelowanie turbiny wiatrowej z wykorzystaniem teorii elementu płata. Pr. Nauk. Inst. Masz, Nap. i Pom. El. PWr 2006, no 59, Studia i Materiały, no 26

SUBJECT SUPERVISOR
Piotr Gajewski, piotr.gajewski@pwr.edu.pl