

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject OZE Interaction with the Power System		Code 1010314391010326979
Field of study Power Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 5 / 9
Elective path/specialty Ecological Sources of Electric Energy	Subject offered in: polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) part-time	
No. of hours Lecture: 9 Classes: - Laboratory: - Project/seminars: 9		No. of credits 3
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art technical sciences Technical sciences		ECTS distribution (number and %) 3 100% 3 100%
Responsible for subject / lecturer: Dr inż. Andrzej Tomczewski email: andrzej.tomczewski@put.poznan.pl tel. 616652379 Elektryczny ul. Piotrowo 3A, 60-965 Poznań		Responsible for subject / lecturer: Dr inż. Arkadiusz Dobrzycki email: arkadiusz.dobrzycki@put.poznan.pl tel. 616652379 Elektryczny ul. Piotrowo 3A, 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of mathematics, computer science, electrical engineering and power engineering.
2	Skills	Ability to use a spreadsheet program in a high level language and the basic calculations of electrical and power engineering.
3	Social competencies	Broaden their awareness of the need for competence, willingness to work together as a team.
Assumptions and objectives of the course: Knowledge of both theoretical and practical issues related to the issues of cooperation plants using renewable energy sources. Understanding the problems associated with the integration of renewable energy into the power system. The acquisition of skills prepare technical documentation - associated with the inclusion of the economic sources of renewable energy to the power system.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. List and explain the problems posed by the integration of renewable energy into the power system. - [K_W09 ++] 2. Provide ways to minimize the negative impact of the renewable energy in the system, with particular emphasis on wind and solar. - [K_W09 +, K_W20 +]		
Skills:		
1. Be identified renewable energy cooperation issues with the power system and to identify possible methods to minimize these problems. - [K_U03+] 2. Develop basic project documentation associated with the connection of renewables to the electricity system. - [K_U03+]		
Social competencies:		
1. Is aware of the need for analysis of engineering problems from different points of view, and understand the need to acquire new knowledge in the area of the impact of renewable energy on the power system. - [K_K01 +]		
Assessment methods of study outcomes		

<p>Lecture: ?assess the knowledge and skills listed on the written exam with a combined: test (checking transferred knowledge) and problematic (check-solving skills discussion of basic issues in the field of renewable energy co-operation with the national power system).</p> <p>Class project: ?test preparation (knowledge) to the project activities, ?favoring systematic progress in the design, ?assessment of the form and content of the project.</p> <p>Get extra points for the activity in the classroom, and in particular for: ?ability to work within a team implementing virtually individual stages of the project, ?use of elements and techniques that go beyond the material in the field of the lecture and projects.</p>		
Course description		
<p>The requirements in the context of connecting renewable energy to the national power system. Quality of electricity generated by renewable energy sources. Problems with connecting renewable energy sources with low and high power to the national electricity system. Impact of renewable energy on the stiffness of the power system. Minimizing the risks of unstable operation of electricity sources in the power system. Formal and legal issues related to construction and connecting to a network of green energy sources. Completion and development of the technical documentation required when connecting renewables to the electricity system. Economic aspects of integration of renewable energy into the national electricity system on the medium and high voltage.</p>		
Basic bibliography:		
<ol style="list-style-type: none"> Lubośny Z. "Elektrownie wiatrowe w systemie elektroenergetycznym", WNT, Warszawa, 2006. Lubośny Z. "Farmy wiatrowe w systemie elektroenergetycznym", WNT, Warszawa, 2009. Praca zbiorowa, M. Gałuszak, J. Paruch, Odnawialne i niekonwencjonalne źródła energii. Poradnik, Wyd. TARBONUS, Tarnobrzeg, 2008. Klugmann - Radziemska E. "Fotowoltaika w teorii i praktyce", Wydawnictwo BTC, Legionowo, 2010. 		
Additional bibliography:		
<ol style="list-style-type: none"> Prawo energetyczne, Ustawa z dnia 10 kwietnia 1997 r. z późniejszymi zmianami, Dz. U. z 2012, poz. 1059 j.t. 		
Result of average student's workload		
Activity	Time (working hours)	
1. participation in class lectures	9	
2. participation in project activities	9	
3. participate in the consultations on the lecture	5	
4. part in the consultation on the design	5	
5. implementation of the project	10	
6. prepare for the exam	38	
7. completion of projects	2	
8. participation in the exam	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	80	3
Contact hours	32	1
Practical activities	26	1