

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>OZE Interaction with the Power System</b>		Code <b>1010314491010326979</b>
Field of study <b>Power Engineering</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>5 / 9</b>
Elective path/specialty <b>Ecological Source of Electrical Energy</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>First-cycle studies</b>	Form of study (full-time, part-time) <b>part-time</b>	
No. of hours Lecture: <b>9</b> Classes: <b>-</b> Laboratory: <b>-</b> Project/seminars: <b>9</b>		No. of credits <b>3</b>
Status of the course in the study program (Basic, major, other) <b>(brak)</b>		(university-wide, from another field) <b>(brak)</b>
Education areas and fields of science and art <b>technical sciences</b> <b>Technical sciences</b>		ECTS distribution (number and %) <b>3 100%</b> <b>3 100%</b>
<b>Responsible for subject / lecturer:</b> Dr hab. inż. Andrzej Tomczewski email: andrzej.tomczewski@put.poznan.pl tel. 616652379 Elektryczny ul. Piotrowo 3A, 60-965 Poznań		<b>Responsible for subject / lecturer:</b> Dr inż. Arkadiusz Dobrzycki email: arkadiusz.dobrzycki@put.poznan.pl tel. 616652685 Elektryczny ul. Piotrowo 3A, 60-965 Poznań
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	Basic knowledge of mathematics, computer science, electrical engineering and power engineering.
2	<b>Skills</b>	Ability to use a spreadsheet program in a high level language and the basic calculations of electrical and power engineering.
3	<b>Social competencies</b>	Broaden their awareness of the need for competence, willingness to work together as a team.
<b>Assumptions and objectives of the course:</b> 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.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
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 +]		
<b>Skills:</b>		
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+]		
<b>Social competencies:</b>		
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 +]		
<b>Assessment methods of study outcomes</b>		

<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>		
<b>Course description</b>		
<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>		
<b>Basic bibliography:</b>		
<ol style="list-style-type: none"> <li>1. Lubośny Z. Elekrownie wiatrowe w systemie elektroenergetycznym, WNT, Warszawa, 2006</li> <li>2. Odnawialne i niekonwencjonalne źródła energii. Poradnik. Praca zbiorowa pod red. M. Gałuszak, J. Paruch, , Wyd. TARBONUS, Tarnobrzeg, 2008.</li> <li>3. Praca zbiorowa, M. Gałuszak, J. Paruch, Odnawialne i niekonwencjonalne źródła energii. Poradnik, Wyd. TARBONUS, Tarnobrzeg, 2008.</li> <li>4. Lubośny Z., Farmy wiatrowe w systemie elektroenergetycznym, WNT, Warszawa, 2009.</li> <li>5. Klugmann-Radziemska E., Fotowoltaika w teorii i praktyce, Wydawnictwo BTC, Legionowo, 2010.</li> <li>6. Jastrzębska G., Odnawialne źródła energii i pojazdy proekologiczne, Wydanie 2., WNT, Warszawa, 2009.</li> </ol>		
<b>Additional bibliography:</b>		
<ol style="list-style-type: none"> <li>1. Prawo energetyczne, Ustawa z dnia 10 kwietnia 1997 r. z późniejszymi zmianami, Dz. U. z 2012, poz. 1059 j.t.</li> </ol>		
<b>Result of average student's workload</b>		
<b>Activity</b>	<b>Time (working hours)</b>	
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	
<b>Student's workload</b>		
<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	80	3
Contact hours	32	2
Practical activities	26	1