

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>(-)</b>		Code <b>1010311471010320003</b>
Field of study <b>Power Engineering</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>4 / 7</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>full-time</b>	
No. of hours Lecture: <b>15</b> Classes: <b>-</b> Laboratory: <b>15</b> Project/seminars: <b>15</b>		No. of credits <b>4</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>4 100%</b> <b>4 100%</b>
<b>Responsible for subject / lecturer:</b> dr hab. inż. Andrzej Tomczewski email: Andrzej.Tomczewski@put.poznan.pl tel. 61 665 2788 Faculty of Electrical Engineering 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 physics, chemistry, electrical engineering, power engineering, and construction and operation of common environmental sources of electricity.
2	<b>Skills</b>	Spreadsheet service. Ability to effectively self-study in a field related to the chosen field of study.
3	<b>Social competencies</b>	Is aware of the need to broaden their competence, willingness to work together as a team.
<b>Assumptions and objectives of the course:</b> Acquainted with the properties and characteristics of the typical electricity green energy sources and the principles of their operation.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
1. Has a basic and systematic knowledge of the construction and connection to the power system typical of organic sources of electricity. - [K_W11+]		
2. Knows design methodologies and operating systems and networks with common environmental sources of electricity - [K_W12+++]		
<b>Skills:</b>		
1. It can compare different variants of the concept of the construction and the installation of electricity supplied from the typical ecological sources of electricity. - [KU_07+,KU_11+]		
<b>Social competencies:</b>		
1. Is aware of the need to behave in a professional manner, and in particular the impact of energy engineer for safe operation of typical green sources of electricity and the electricity grid. - [K_K03+]		
<b>Assessment methods of study outcomes</b>		

<p>Lecture</p> <ul style="list-style-type: none"> <li>- Assess the knowledge and skills listed on the exam grading,</li> <li>- Continuous evaluation for each course (rewarding activity and quality perception).</li> </ul> <p>Embedded classes:</p> <ul style="list-style-type: none"> <li>- Final exam on topics related to plant and grid system for renewable electricity</li> <li>- Assessment of active participation in class</li> </ul> <p>Get extra points for the activity in the classroom, and in particular for:</p> <ul style="list-style-type: none"> <li>- To propose additional issues to discuss issues;</li> <li>- The effectiveness of the application of the knowledge gained during solving the given problem.</li> </ul>	
<b>Course description</b>	
<p>General principles of operation of electrical equipment. Qualification requirements for persons involved in the operation of power equipment. Technical and operational documentation and operating instructions. Taking the life of electrical equipment, its operation and control. The organization and execution of work on equipment, plants and distribution systems of electric cleaner energy sources. The command to perform the work. Preparation jobs, admission to work, quit. Principles of safe for work. Protective equipment and tools.</p> <p>Update 2017:          Optimization of hybrid power supply systems with RES and energy storage.</p> <p>Applied methods of education:          lectures - Lecture with multimedia presentations (including: drawings, photos, animations, videos) supplemented by examples given on the board; having regard to (taking into account) the various aspects of the presented issues, including: economic, environmental, legal and social; presenting a new topic preceded by a reminder of related content, known to students from other subjects,          laboratory - computational experiments, Use of tools which enabling students perform home tasks (eg. open source software),          project - case study, analysis / discussion of various methods (including nonconventional) solving problem; analysis / discussion of various aspects (including: economic, environmental, legal and social) of solving problems.</p>	
<b>Basic bibliography:</b>	
<ol style="list-style-type: none"> <li>1. Lubośny Z. &amp;#38;#38;#34;Elektrownie wiatrowe w systemie elektroenergetycznym&amp;#38;#38;#34;, WNT, Warszawa, 2006</li> <li>2. Majchrzak E., Mochnacki B. &amp;#38;#38;#34;Metody numeryczne. Podstawy teoretyczne, aspekty praktyczne i algorytmy&amp;#38;#38;#34;, Wyd. II, Wydawnictwo Politechniki Śląskiej, Gliwice, 1996.</li> <li>3. &amp;#38;#38;#34;Odnawialne i niekonwencjonalne źródła energii. Poradnik&amp;#38;#38;#34;, Praca zbiorowa pod red. M. Gałuszak, J. Paruch, , Wyd. TARBONUS, Tarnobrzeg, 2008.</li> <li>4. Jastrzębska G. &amp;#38;#38;#34;Odnawialne źródła energii i pojazdy proekologiczne&amp;#38;#38;#34;, Wydanie 2., WNT, Warszawa, 2009.</li> <li>5. Klugmann-Radziemska E. &amp;#38;#38;#34;Fotowoltaika w teorii i praktyce&amp;#38;#38;#34;, Wydawnictwo BTC, Legionowo, 2010.</li> </ol>	
<b>Additional bibliography:</b>	
<ol style="list-style-type: none"> <li>1. Dokumentacja programu NEPLAN - <a href="http://www.neplan.ch/html/e/e_video_tutorials.htm">http://www.neplan.ch/html/e/e_video_tutorials.htm</a></li> <li>2. Tomczewski A.: Techniczno-ekonomiczne aspekty optymalizacji wybranych układów elektrycznych. Rozprawy Nr 520, Wydawnictwo Politechniki Poznańskiej ,Poznan 2014.</li> <li>3. Perry S. C. &amp;#38;#38;#34;C# i .NET. Core&amp;#38;#38;#34;, Wyd. Helion, Gliwice 2006.</li> </ol>	
<b>Result of average student's workload</b>	
<b>Activity</b>	<b>Time (working hours)</b>
1. participation in lectures	15
2. participation in project	15
3. participation in laboratory	15
4. participate into consultations concerning the lecture	5
5. participate into consultations concerning the project	5
6. participate into consultations concerning the laboratory	5
7. prepare for the completion of the lecture	15
8. prepare for the completion of the auditory classes	15
9. participation in the completion of the auditory classes	2
10. participation in the completion of the lecture	2

<b>Student's workload</b>		
<b>Source of workload</b>	<b>hours</b>	<b>ECTS</b>
Total workload	104	4
Contact hours	62	2
Practical activities	55	2