

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Renewable Energy Sources</b>		Code <b>1010314471010326133</b>
Field of study <b>Power Engineering</b>	Profile of study (general academic, practical) <b>general academic</b>	Year /Semester <b>4 / 7</b>
Elective path/specialty <b>-</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>15</b> Classes: <b>-</b> Laboratory: <b>15</b> Project/seminars: <b>-</b>		No. of credits <b>3</b>
Status of the course in the study program (Basic, major, other) <b>other</b>		(university-wide, from another field) <b>university-wide</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. Grażyna Jastrzębska prof.nadzw. email: grazyna.jastrzebska@put.poznan.pl tel. 616652382 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 and Mathematics.
2	<b>Skills</b>	Ability to effective self education related to the chosen field of study.
3	<b>Social competencies</b>	Is aware of the need to expand own competences. Willingness to work in a team.
<b>Assumptions and objectives of the course:</b> 1. Introduce students to the construction principles of operation and possible application of renewables. 2. Justification of the need of replacing the conventional energy sources with the renewables ones due to the depletion of the former and increasing environmental pollution. 3. Presenting of new possibilities of gaining the electric energy.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b> 1. Student has a basic knowledge of renewable energy, including wind energy, water, sun, biomass and geothermal energy. He knows and understand the phenomena, processes and devices allowing the conversion of energy from renewable sources in electricity and heat - [K_W09+++] 2. Versed in the current state of review energy developmentand prospective trends in Poland and around the world - [K_W20++]		
<b>Skills:</b> 1. . Is able to aquire information from literature, databases and other sources, analyse it and interpret, chaw conclusions, justify opinions - [K_U01++] 2. Is able to work alone and in a team, use a properly chosen methods and devices for electrical parameters and characteristics, interperet the results, draw conclusions - [K_U02++, K_U10++ ] 3. Can use properly selected methods and devices in terms of parameters and electrical characteristics, interpret the obtained results, draw conclusions - [[K_U10++]		
<b>Social competencies:</b> 1. Is aware of the importance and understands the impact of non-technical aspects of engineer - [K_K02 ++] 2. Is aware of responsibility for the own work and ready to comply with the principles of teamwork and accountability of collaborative tasks - [K_K04 ++]		

<b>Assessment methods of study outcomes</b>	
<p>Lecture:</p> <ul style="list-style-type: none"> <li>- Evaluate the listed knowledge and skills on the written exam.</li> <li>- Continuous evaluation (rewarding the activity and the quality perception during classes).</li> </ul> <p>Lab. classes:</p> <ul style="list-style-type: none"> <li>- Test and rewarding of the knowledge necessary to carry out the fundamental problems in the area of laboratory tasks.</li> <li>- Continuous evaluation (during each classe) rewarding the skills gained to use newly learned principles and methods.</li> <li>-Evaluation of the knowledge and skills related to the laboratory task. Evaluation of the report of performed task.</li> </ul> <p>Additional points for the activity, during classes, especially by:</p> <ul style="list-style-type: none"> <li>-promoting discussion on the additional aspects of the subject.</li> <li>- effective use of the knowledge gained during solving the given task.</li> <li>- willingness to work in a team to solve the lab tasks.</li> <li>- comments/suggestions related to the improvement of the teaching materials.</li> <li>-esthetic accuracy of the reports and tasks-as a part of own study.</li> </ul>	
<b>Course description</b>	
<p>2017. Applied methods of teaching lecture and laboratory.</p> <p>Lecture with multimedia presentation (drawings, photographs, animations and illustrations of own research). Reference to content known to students from other subjects.</p> <ol style="list-style-type: none"> <li>1. The principle of introduction of renewable energy sources into the energy economy.</li> <li>2. Characteristics of renewable energy sources (wind, water, sun, biomass, geothermal).</li> <li>3. Characteristics of devices enabling the conversion of energy from RES to electricity. New Polish and foreign solutions.</li> <li>4. Application possibilities in various fields, correlation theory with practice.</li> <li>5. Advantages, disadvantages, limitations of such solutions, (energy supply instability, energy storage, source co-operation with the network, hybrid solutions).</li> <li>6. World trends, potentates, major investments.</li> <li>7. Economic, ecological and social aspects (also called ?external costs?).</li> </ol> <p>Laboratory: Detailed review of the report by the instructor, analysis of the results of the measurements and discussion of the comments and conclusions of the study, team work, references to practice outside the laboratory</p>	
<p><b>Basic bibliography:</b></p> <ol style="list-style-type: none"> <li>1. Jastrzębska G.: Energia ze źródeł odnawialnych i jej wykorzystanie, WKŁ, 2017</li> <li>2. Jastrzębska G.: Ogniwa słoneczne, WKŁ, 2013</li> <li>3. Lewandowski W.: Proekologiczne odnawialne źródła energii, WNT, Warszawa 2012.</li> <li>4. Tytko R.: Odnawialne źródła energii, OWG, 2017.</li> </ol>	
<p><b>Additional bibliography:</b></p> <ol style="list-style-type: none"> <li>1. Praca zbiorowa Odnawialne i niekonwencjonalne źródła energii, Poradnik, Tarbonus 2008.</li> <li>2. Jastrzębska G.: Odnawialne źródła energii i pojazdy proekologiczne, WNT 2009.</li> <li>3. Zestaw indywidualnie tematycznie dobranych artykułów naukowych na bazie bibliografii z literatury podstawowej [1].</li> </ol>	
<b>Result of average student's workload</b>	
Activity	Time (working hours)
1. participation in lectures	15
2. participation in laboratory classes	15
3. participation in consulting (lecture)	4
4. participation in consulting (laboratory)	5
5. preparation to test/exam	20
6. test/exam	2
7. preparation for the classes and preparation of the report	20
<b>Student's workload</b>	

Source of workload	hours	ECTS
Total workload	81	3
Contact hours	41	2
Practical activities	40	2