

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Biomass, biogas, water energy and geothermal		Code 1010311471010328880
Field of study Power Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 4 / 7
Elective path/specialty Ecological Source of Electrical Energy	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 15 Classes: - Laboratory: - Project/seminars: 15		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. Grzegorz Twardosz email: -grzegorz.twardosz@put.poznan.p. tel. -616652796 -Elektryczny -ul.Piotrowo 3A, 60-965		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of physics, chemistry, mathematics, electrical engineering, power engineering and computer science.
2	Skills	Skill take advantage of used knowledge to analysis various renewable energy sources conversion to electrical energy.
3	Social competencies	Is aware of the need to broaden their competence, is ready to work in team.
Assumptions and objectives of the course: -Recognize theoretical and practical problems be connected with design, construction and exploitation various renewable energy. Recognize to match various renewable sources to location.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Basic knowledge of chemistry and burn processes. - [-K_W03+]		
2. Basic knowledge of technology various renewable sources - [K_W06+]		
Skills:		
1. Ability to get information from literature and web and other sources in the field of renewable energy sources - [K_U01+]		
2. Ability to compare various solutions and tested other methods of work renewable energy sources - [K_U02+]		
Social competencies:		
1. Ability to think and act in the field of influence various renewable energy sources - [K_K02+]		
2. Is able to work alone and within a team - [K_K04+]		
Assessment methods of study outcomes		

<p>Lecture: Asses the knowledge and skills listed on the written form with basic and problematic tasks in the field on various renewable energy sources.</p> <p>Project: Assesment of the form and content of the project Favoring systematic progress in the project. Get additional points for the activiti in the classroom, particular abiliti to work in team.</p>		
Course description		
<p>The energised agriculture with take into consideration renewable energy sources. Used biomass to conversion on electrical energy and heating. Water power plant in polish power system. Make used of geothermal energy. Rules of design geothermal systems.</p>		
Basic bibliography:		
<ol style="list-style-type: none"> 1. Jędrzak A.: Biologiczne przetwarzanie odpadów. PWN, Warszawa 2008. 2. Chmielniak T.: Technologie energetyczne. WNT, Warszawa 2008. 3. Banach M., Kowalski Z., Kwaśny J.: Przegląd technologii produkcji biogazu różnego pochodzenia. Wyd. Politechniki Krakowskiej, Kraków 1013. 4. Praca zbiorowa pod red. Myczko A.: Budowa i eksploatacja biogazowni rolniczych. Wyd. Inst. Technologiczno-Przyrodniczy, Warszawa - Poznań 2011. 		
Additional bibliography:		
<ol style="list-style-type: none"> 1. Lewandowski W.: Proekologiczne odnawialne źródła enrgii. WNT, Warszawa 2012. 2. Popczyk J.: Energetyka alternatywna. Polkowice 2013 		
Result of average student's workload		
Activity	Time (working hours)	
1. Participation in lectures	15	
2. Paricipation in project activies	15	
3. Participation in the consultation on the lecture	5	
4. Take part in the consultation on the project	5	
5. Prepare on the project activiti	5	
6. Implementation of the project	10	
7. Prepare for thecompletion of the lecture	15	
8. Prepare for the completion of the project activiti	10	
9. Participation in the completion of the project	2	
10. Participation in the completion of the lecture	2	
Student's workload		
Source of workload	hours	ECTS
Total workload	84	3
Contact hours	48	2
Practical activities	30	1