

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject (-)		Code 1010314391010326977
Field of study Power Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 5 / 9
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) 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 Grzegorz Twardosz email: grzegorz.twardosz@put.poznan.pl tel. 616652796 Elektryczny ul. Piotrowo 3A, 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of mathematics, physics and chemistry.
2	Skills	Ability to effectively self-education in a field related to the chosen specialty.
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 design, testing, measurement and technology systems using biogas, biomass and geothermal energy to produce electricity and heat.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Has structured and theoretically founded knowledge of the basic technologies using biomass, biogas and geothermal energy to generate electricity and heat . - [K_W06+]		
2. It has a basic knowledge of chemistry, including combustion, gasification and co-combustion of fuels. - [K_W03++]		
3. It has a basic knowledge of renewable energy sources including biomass, biogas and geothermal allowing for conversion to electricity and heat. Knowledge of current technologies and trends versed in development. - [K_W09++ K_W20+]		
Skills:		
1. Able to obtain data and information from various sources and on this basis propose, formulate and justify opinions. - [K_U01+]		
2. Able to work independently and creatively as a team. - [K_U02+]		
Social competencies:		
1. Is aware of the importance of engineering and non-technical aspects understands and effects. - [K_K02+]		
Assessment methods of study outcomes		

<p>Lecture: - Assess the knowledge and skills demonstrated by the successful completion of a written test and a combined problem.</p> <p>Projects: - Continuous evaluation for all classes combined with bonus, - Final assessment of knowledge and skills related to the implementation of the project tasks.</p> <p>Getting extra points - The effectiveness of the application of the knowledge gained during solving the tasks of the project.</p>		
Course description		
<p>Research methodology geothermal energy efficiency. Technical and economic issues concerning the conversion of geothermal energy into heat and / or electricity. Design of systems using horizontal and vertical probe. Heat pumps. Legal, technical and economic feasibility of using biomass and biogas energy for conversion to electricity and heat. Modern technologies of incineration and co. Rules for the design of energy conversion of biomass and biogas for electricity and / or heat .</p>		
Basic bibliography:		
<p>1. Chmielniak T. "Technologie energetyczne", WNT. Warszawa. 2008 2. Wandrasz J., Wandrasz A. "Paliwa formowane. Biopaliwa i paliwa z odpadów w procesach termicznych", Wyd. Seidel=Przywecki. Warszawa. 2006</p>		
Additional bibliography:		
<p>1. Pr. zbiorowa pod. red. Gałaszak M. Paruch J. "Odnawialne i niekonwencjonalne źródła energii. Poradnik", Wyd. TARBONUS. Tarnobrzeg. 2008</p>		
Result of average student's workload		
Activity	Time (working hours)	
1. participation in lecture classes	15	
2. participation in laboratory classes	15	
3. participation in consultation concerning the lecture	3	
4. participation in consultation concerning the project	3	
5. preparation for the test/exam	20	
6. test/exam	2	
7. preparing the laboratory description	15	
Student's workload		
Source of workload	hours	ECTS
Total workload	78	3
Contact hours	38	1
Practical activities	33	1