

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Renewable energy sources		Code 1010402221010411159
Field of study TECHNICAL PHYSICS	Profile of study (general academic, practical) general academic	Year /Semester 1 / 2
Elective path/specialty -	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 2 Classes: - Laboratory: - Project/seminars: -		No. of credits 2
Status of the course in the study program (Basic, major, other) basic		(university-wide, from another field) university-wide
Education areas and fields of science and art technical sciences		ECTS distribution (number and %) 2 100%
Responsible for subject / lecturer: prof. dr hab. Danuta Wróbel email: danuta.wrobel@put.poznan.pl tel. 61 665 31 79 Faculty of Technical Physics ul. Nieszawska 13A 60-965 Poznań		Responsible for subject / lecturer: prof. dr hab. Danuta Wróbel email: danuta.wrobel@put.poznan.pl tel. 61 665 3179 Faculty of Technical Physics ul. Nieszawska 13A 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Basic knowledge of experimental physics, atomic physics, molecular physics, thermodynamics
2	Skills	Skills in solving of basic physical problems on the experimental physics, skills in getting information from the research data sources
3	Social competencies	Understanding of necessity to develop own competency, readiness for cooperation in a student team and other groups, and in taking decision in student community
Assumptions and objectives of the course:		
1. Getting knowledge of renewable energy sources 2. Acquaint students with basic topics concerning receiving of energy from renewable sources 3. Acquaint students with basic phenomena, processes and technologies needed to produce energy from renewable sources 4. Acquaint students with economical and ecological aspects of production energy from renewable sources 5. Practical and engineering aspects of lectures - faculty excursion to a solar power plant (or similar)		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. student posses knowledge of physical processes essential in the area of renewable energy sources and in taking advatage from solar energy. He is well oriented and has sufficient knowledge in field of energy conversion - [K_W08] 2. student is able to characterized materials and their material parameters essential in using them in technology of renewable energy sources and devises - [K_W04] 3. student knows the current state of the art and the new trends in developments in the field of renewable energy. He has the basic knowledge to understand needs of renewable energetics - [K_W02]		
Skills:		

1. student is able to draw simple conclusions on the basis of experimental measurements, obtained results, calculations, and to use literature data and to get new knowledge from another source - [K_U02] - [K_U02]
2. student can select molecular materials of the best physics-chemical properties for laboratorial and technical applications - [K_U17] - [K_U01, K_U17]]
3. student is able to determine physical processes and their mechanisms occurring in elements of devises of solar energy equipments and characterized their material parameters as well as how to take advantage from solar energy in conversion into other energy form - [K_U02]
4. student is able to appraise significance of renewable energy sources in development of the modern energetics and environmental protection - [K_U08] - [k]U01, K_U08]
5. student is able to determine physical processes and their mechanisms occurring in elements of devises to be used in solar energy equipments and characterized their material parameters as well as how to take advantage from solar energy in conversion into other energy form - [K_U01, K_U13] - [K_U13]
Social competencies:
1. student understands the meaning of renewable energy sources for development of contemporary civilization - [K_K06]

Assessment methods of study outcomes	
Writing exam: 3 - 51%-70.0% 4 - 70.1%-90.0% 5 ? from 90.1% Assessment of participation and activity during lectures	
Course description	
The Sun as an energy source. Thermal reaction on the Sun. Energy and energy transportation on the Sun. 2. Hydrogen as a renewable energy source. Methods of hydrogen production. 3. Fuel cells. 4. Thermofusion. Equipments and Tokamak systems. 5. Conventional non-organic solar cells. Organic photovoltaics systems. 6. Solar energy conversion into electric energy 7. Importance of molecular spectroscopy for photovoltaic processes 8. Photoactive dyes for photovoltaics - correlation between molecular dye structure and photovoltaic effectivity. The role of fullerenes and quantum dots in photoelectric processes. 9. Thermal photovoltaics (TVP) 10. Solar collectors 11. Wind energy 12. Hydroenergy. 13. Geothermal energy. 14. Other non-conventional energy sources. 15. Visit in a solar power plant	
Basic bibliography:	
1. W. M. Lewandowski, Proekologiczne źródła energii odnawialnej, Wydawnictwo Naukowo-Techniczne, Warszawa, 2002. 2. J. Cieśliński, J. Mikiewicz, Niekonwencjonalne źródła energii, Wydawnictwo Politechniki Gdańskiej, Gdańsk, 1996.	
Additional bibliography:	
1. Current articles in: Nature, Science, Materials Today, Świat Nauki i inne (website)	
Result of average student's workload	
Activity	Time (working hours)
1. Participation in lectures	30
2. Consult a lecturer	2
3. Preparation to an exam	26
4. Exam	2
Student's workload	

Source of workload	hours	ECTS
Total workload	60	2
Contact hours	34	1
Practical activities	10	1