STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Renewable energy sources		**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): **other**	(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

Oral 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. Current scientific publications and articles in: Nature, Science, Materials Today and other (website)

Additional bibliography:

1. Scientific articles in Nauka Polska

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