COURSE DESCRIPTION CARD - SYLLABUS

Course name
Renewable energy sources [S2FT2>OŹE]

Course

Field of study
Technical Physics

Year/Semester
2/3

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Basic knowldge in the field of molecular and solid state physics.

Course objective

Present basic issues related to renewable energy sources, taking into account their physical aspect.

Course-related learning outcomes

Knowledge:
Student possesses in-depth, theoretically grounded knowledge of mathematics, physics, and chemistry, useful for describing and analyzing processes and physical systems relevant to solving technical problems
Student possesses in-depth, theoretically grounded knowledge of the characterization and fabrication of functional materials at the nanoscale and their potential applications in modern technology

Skills:
Student is capable of applying his knowledge to model physical and technical processes, as well as to control and manage experimental devices in physics
Student is able to adapt the achievements described in the literature in physics to technical applications.

Social competences:
Student is ready to act in accordance with the principles of professional ethics, including responsibility for the reliability of the results obtained from his work and their interpretation, as well as the evaluation of others' work; Student is aware of the importance of behaving in a professional manner; Student is responsible for the safety of his own work and that of the team

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written-oral exam:
50,1-60% dst;
60,1-70% dst+;
70,1-80% db;
80,1-90% db+;
od 90,1% bdb.

Programme content

Solar energy, photosynthesis, hydrogen, fuel cells, heat pumps, wind energy, nuclear fusion, photovoltaic cells, solar collectors.

Course topics

1. Threats resulting from the use of non-renewable energy sources.
2. The Sun as a black body.
3. Thermonuclear transformations of hydrogen and helium, the energy of the Sun.
4. The role and functions of chlorophyll pigments in the photosynthesis process.
5. Charge transport pathways in the photosynthetic system of plants.
6. Natural and industrial methods of obtaining hydrogen.
7. Fuel cells. Construction, principle of operation. Type of fuel cells.
8. Types and principle of operation of heat pumps.
9. Design and aerodynamic requirements of wind turbines
10. Nuclear fusion - the physical foundations of the phenomenon, types, and operating principles of reactors.
11. Internal photovoltaic effect - description of the phenomenon and its application in photovoltaic cells.
12. Photovoltaic cells as energy sources - advantages and disadvantages of different generations of cells.
13. Physical description of the phenomenon responsible for energy generation in second- and third-generation photovoltaic cells.
14. Perovskite cells - structure, types, and potential risks of their application.
15. Thermal photovoltaics - types of cells, operating principles, and potential applications.
16. Solar collectors - operating principles, classification of technologies, and current challenges in the development of devices harnessing thermal energy from solar radiation.

Teaching methods

Lecture: multimedia presentation.

Bibliography

Basic:
• W. M. Lewandowski, „Proekologiczne źródła energii” PWN, Warszawa 2020
• R. Tytko, „Urządzenia i systemy energetyki odnawialnej” Wydane XIV Kraków 2021
• J. Cieśliński, J. Mikilewicz, „Niekonwencjonalne źródła energii” Wydawnictwo Politechniki

Gdańskiej 1996

Additional:
Scientific reports presented during lectures.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00