UNIWERSYTET IM. ADAMA MICKIEWICZA W POZNANIU

Biophotovoltaic materials

Educational subject description sheet

Basic information

Study programme
Fizyka (Physics of Advanced Materials for Energy Processing)

Speciality
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Organizational unit
Faculty of Physics and Astronomy

Study level
Second-cycle programme

Study form
Full-time

Education profile
General academic

Didactic cycle
2024/25

Subject code
04FENS.21S.03237.24

Lecture languages
English

Course type
Elective

Block
specialty subjects

Subject coordinator	Krzysztof Gibasiewicz
Lecturer	Krzysztof Gibasiewicz

Period	**Activities and hours**	**Number of ECTS points**
Semester 1	• Lecture: 30, Graded credit	3

Goals

Code	Goal
C1	The goal of the lecture is to introduce students to different aspects of biophotovoltaic material science including: a) basic principles of photosynthetic light conversion, b) basic theories of inter-molecular energy and electron transfer, c) optical spectroscopy and electrochemical techniques, and d) operation of biophotovoltaic systems.

Subject learning outcomes

Code	Outcomes in terms of	Learning outcomes	Examination methods
Knowledge – Student:			
W1	knows the principles of photosynthetic light conversion	FEN_K2_W01	Test
W2	is able to explain the relationship between the structure and function of selected light-converting proteins (purple bacterial reaction centers and Photosystem I)	FEN_K2_W01	Test
W3	knows the Förster and Dexter theories of intermolecular energy transport as well as Marcus theory of electron transport	FEN_K2_W01	Test
W4	knows the mode of operation of basic experimental instrumentation for optical electrochemical, and spectroelectrochemical measurements (for steady-state and time-resolved absorption and fluorescence, chronoamperometry, voltamperometry)	FEN_K2_W01	Test
W5	is familiar with photovoltaic cells containing biohybrid materials composed of photosynthetic proteins and inorganic components (conducting glass, semiconductors, conducting gels)	FEN_K2_W01, FEN_K2_W05	Test
Skills – Student:			
U1	learns specialized English language	FEN_K2_U05	Test

Study content

No.	Course content	Subject learning outcomes	Activities
1.	Principles of photosynthetic light conversion in photosynthetic proteins	W1, W2, U1	Lecture
2.	Förster and Dexter theories of intermolecular energy transport; Marcus theory of electron transport	W3, U1	Lecture
3.	Basic optical and electrochemical experimental techniques	W4, U1	Lecture
4.	Photovoltaic cells containing biohybrid materials composed of photosynthetic proteins and inorganic components	W5, U1	Lecture

Additional information

Activities	Teaching and learning methods and activities
Lecture	Lecture with a multimedia presentation of selected issues, Demonstration and observation

Activities	Credit conditions
Lecture	Positive mark of the student's test

Literature

Obligatory

1. Robert E. Blankenship, “Molecular Mechanisms of Photosynthesis. Second edition.” Wiley Blackwell, 2014
2. Wiliam W. Parson, “Modern Optical Spectroscopy”, Springer-Verlag Berlin Heidelberg 2007
3. Dale A. C. Brownson, Craig E. Banks, “The Handbook of Graphene Electrochemistry”, Springer-Verlag London Ltd. 2014

Calculation of ECTS points

Activities	**Activity hours***
Lecture	30
Preparation for the exam	45
Student workload	**Hours** 75
Number of ECTS points	**ECTS** 3

* academic hour = 45 minutes

Efekty uczenia się dla kierunku

Kod	Treść
FEN_K2_U05	The graduate can use English in accordance with the requirements set out for level B2+ of the Common European Framework of Reference for Languages, as well as specialist English terminology in the field of physical sciences
FEN_K2_W01	The graduate knows and understands in-depth selected facts, phenomena, concepts and theories specific to physics and complex relationships between them (constituting advanced general knowledge in the field of physical sciences and representing both key and other selected issues in the field of advanced detailed knowledge in this discipline)
FEN_K2_W05	The graduate knows and understands the role of physical sciences in the context of fundamental dilemmas and challenges of modern civilization