COURSE DESCRIPTION CARD - SYLLABUS

Course name
PHYSICAL METHODS FOR BIOLOGICAL MEMBRANES RESEARCH

Course

Proposed by Discipline
Materials Engineering
Type of studies
Doctoral School
Form of study
full-time

Year/Semester
II/3, III/5
Course offered in
English
Requirements
elective

Number of hours

Lecture
4

Tutorials

Projects/seminars

Number of credit points

1

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

Knowledge:

Basic knowledge of molecular physics, experimental, spectroscopic, and laser techniques. The student is characterised by the ability to think logically, to combine facts and to evaluate analytically the applicability of experimental techniques to a given scientific problem. The student is characterised by an understanding of the need to learn and acquire new knowledge and a broad perception of research problems.

Skills:

-

Social competencies:

-

Course objective

To gain an overview and understanding of the broad spectrum of physical experimental methods and how they relate to developments in biophysical research, with particular emphasis on technical aspects.

Course-related learning outcomes

Knowledge

A PhD student who graduated from doctoral school knows and understands:
1) global achievements, covering theoretical foundations as well as general and selected specific issues that are relevant to scientific disciplines studied at the Doctoral School, to the extent that enables revision of existing paradigms, [P8S_WG/SzD_W01]
2) key developmental trends of disciplines of science in which education at the Doctoral School takes place, [P8S_WG/SzD_W02]
3) scientific research methodology in disciplines represented at the Doctoral School. [P8S_WG/SzD_W03]

Skills

A PhD student who graduated from doctoral school can:
1) use knowledge from different branches of science to creatively identify, formulate and innovatively solve complex problems or to perform research tasks such as:
- define the aim and subject of scientific research, form a research hypothesis,
- develop research methods, techniques and tools and use them creatively,
- draw conclusions on the basis of research results, [P8S_UW/SzD_U01]
2) critically analyze and assess scientific research results, work of experts and other creative activities together with their contribution into knowledge development. [P8S_UW/SzD_U02]

Social competencies

A PhD student who graduated from doctoral school is ready to:
1) critically assess achievements within a given scientific discipline, [P8S_KK/SzD_K01]
2) critically evaluate their own contribution to development of a given scientific discipline, [P8S_KK/SzD_K02]
3) acknowledge the importance of knowledge in solving cognitive and practical problems. [P8S_KK/SzD_K03]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

PQF code	Methods for verification of learning outcomes	Assessment criteria
W01, W02, W03	Activity during lectures - discussions, short homework task.	50.1%-70% - 3 70.1%-970% - 4 90.1%-100% - 5
U01, U02	Activity during lectures - discussions, short homework task.	50.1%-70% - 3 70.1%-970% - 4 90.1%-100% - 5
K01, K02, K03	Activity during lectures - discussions, short homework task.	50.1%-70% - 3 70.1%-970% - 4 90.1%-100% - 5

Programme content

- Native and model cell membranes,
- advantages and disadvantages of selected experimental methods,
- single molecule detection,
- cryo-electron microscopy,
- multiphoton microscopy,
- imaging of chemical reactions,
- photothermal imaging,
- time-resolved methods.

Course topics

- Biomimetic cell membranes
- Experimental methods in cell membrane research – microscopy and spectroscopy
- Overview of the advanced experimental methods in biophysics

Teaching methods

Lecture - presentations supported by scientific material in the form of illustrations, films and scientific publications.

Bibliography

Basic

1. Peter Atkins, Julio de Paula, James Keeler; Physical Chemistry 11th Edition; Oxford University Press

2. Jay L. Nadeau; Introduction to experimental biophysics-biological methods for physical scientists 2nd edition; CRC Press

Additional

Internet sources, scientific publications.

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,0
Classes requiring direct contact with the teacher	4	0
Doctoral student's own work (literature studies, preparation for tutorials, project preparation) [1]	21	1,0

[1] delete or add other activities as appropriate