



COURSE DESCRIPTION CARD - SYLLABUS

Course name

PHYSICAL METHODS FOR BIOLOGICAL MEMBRANES RESEARCH [S5IMAT>MFBBB]

Course

Proposed by Discipline

–

Year/Semester

3/5

Level of study

Doctoral School

Course offered in

English

Form of study

full-time

Requirements

elective

Number of hours

Lecture

8

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

0

Number of credit points

2,00

Coordinators

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Lecturers

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Prerequisites

Knowledge: Basic knowledge of molecular physics and of experimental, spectroscopic and laser techniques. The student is characterised by their ability to think logically, combine facts, and evaluate the applicability of experimental techniques to a given scientific problem in an analytical manner. They have an understanding of the need to learn and acquire new knowledge, and a broad perception of research problems. Skills: - Social competencies: - ability to contribute to scientific discussions

Course objective

The aim is to develop an understanding of the wide range of physical experimental methods and their relationship to developments in biophysical research, paying particular attention to the technical aspects.

Course-related learning outcomes

Knowledge:

A PhD student who has graduated from the Doctoral School will have knowledge of and understanding of:
1) Global achievements, covering the theoretical foundations, as well as general and specific issues relevant to the scientific disciplines studied at the Doctoral School. This enables the revision of existing paradigms [P8S_WG/SzD_W01].

2) Key developmental trends in the scientific disciplines in which education at the Doctoral School takes place [P8S_WG/SzD_W02].

3) Scientific research methodology in the disciplines represented at the Doctoral School. [P8S_WG/SzD_W03].

Skills:

A PhD student who has graduated from a doctoral school can:

Use knowledge from different branches of science to creatively identify, formulate and solve complex problems, or 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 based on research results [P8S_UW/SzD_U01].

2) Critically analyse and assess scientific research results, the work of experts, and other creative activities, together with their contribution to knowledge development [P8S_UW/SzD_U02].

Social competences:

A PhD graduate is ready to:

Critically assess achievements within a given scientific discipline [P8S_KK/SzD_K01].

2) Critically evaluate their own contribution to the 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 verifying learning outcomes and assessment criteria:

W01, W02, W03

Activities during lectures: discussions and short homework task.

50.1%-70% - 3

70.1%-90% - 4

90.1%–100% – 5

U01, U02

Activity during lectures: discussions and short homework task.

50.1%-70% - 3

70.1%-970% - 4

90.1%-100% - 5

K01, K02, K03

Activity during lectures: discussions and short homework task.

50.1%-70% - 3

70.1%-970%: 4

90.1%-100%: 5

Programme content

Biomimetic cell membranes:

- Experimental methods in cell membrane research: microscopy and spectroscopy.
- Overview of advanced experimental methods in biophysics.

Course topics

- 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.

Teaching methods

Lectures supported by scientific material in the form of illustrations, films and 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	50	2,00
Classes requiring direct contact with the teacher	8	0,50
Doctoral student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation)	42	1,50