COURSE DESCRIPTION CARD - SYLLABUS

Course name

Biomimetic systems for biomedical applications

Course

Field of study

Bioinformatics

Area of study (specialization)

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

III/6

Profile of study

general academic

Course offered in

Polish

Requirements

elective

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	30	
Tutorials	Projects/seminars	

Number of credit points

4

Lecturers

Responsible for the course/lecturer:

Katarzyna Dopierała, PhD Eng.

e-mail: katarzyna.dopierała@put.poznan.pl

Faculty of Chemical Technology

Berdychowo 4, 60-965 Poznań

Phone 61 665 37 72

Responsible for the course/lecturer:

Prof. Krystyna Prochaska

e-mail: krystyna.prochaska@put.poznan.pl

Faculty of Chemical Technology

Berdychowo 4, 60-965 Poznań

Phone 61 665 36 01

Prerequisites

Basic knowledge of physics, organic chemistry, physical chemistry of physical and biochemical processes; knowledge of cell biology; general academic-level math skills, basic knowledge of laboratory equipment and safety rules in a chemical laboratory

Course objective

The aim of course is to gain the knowledge and skills in the field of biomimetic systems which allow to solve complex technical problems and manufacture products inspired by nature for applications in biomedicine.

Course-related learning outcomes

Knowledge

A graduate knows and understands:

- chemistry issues required to formulate and solve simple bioinformatic problems including basic definitions and laws of chemistry, organic chemistry and biochemistry (KW_04)

- selected groups of bioactives, their biochemical properties and impact on cells and living organisms (KW_08)

- modern analytical methods used for the evaluation of properties and structure of biomaterials and biomimetic materials (KW_016)

Skills

A graduate is able to:

- use basic techniques and laboratory tools to solve the problems in the field of bioinformatics, biotechnology and related fields and to evaluate their usability (KU_05);

- integrate and interpretate information gained, draw the conclusions and formulate and explain his/her own opinions (K_U02)

- use analytical, simulation and experimental tools under the supervision of scientific tutor to formulate and solve reserach tasks (KU_07);

Social competences

A graduate is ready to:

- cooperate and work in team taking various roles (K_K02);

- identify priorities in acomplishing the tasks set by him/herfself or by the other person (K_K03) ;

- take the responsibility for his/her and other person's safety and make the appropriate decisions responding on an emergency (K_K06)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture classes:

Written exam graded in the range 0-100 pts and the following scale is assumed:

3 50,1-60,0 %

3.5 60,1-70%

4 70,1-80,0 %

4.5 80,1-90 %

5 90,1-100 %

Laboratory classes:

current evaluatoin of student's knowledge before each class and grading the reports with the results of laboratory experiments.

Programme content

Lecture:

1. Biomimetics as effiecnet tool for solving current problems;

2. Physical chemistry of biomimetic systems and interfacial phenomena;

3. Fabrication and characterization of model biological membranes;

4. Design and manufacturing of the materials of potential biomedical applications

5. Physicochemical characterization and usability of materials and nanomaterials for biomedicine.

6. Ultrathin, biomimetic surface films in biomedical applications (methods of farbrication and morphological, thermodynamic and rheological characterization).

7. Applications of biomimetic systems in biosensors, tissue engineering, targeted drug delivery.

Laboratory classes are practical excersisces related to the content of the lecture.

Teaching methods

Lecture: Presentation and discussion

Laboratory classes: practical excercices made by students in physicochemical laboratory.

Bibliography

Basic

1. K. Konopka, Biomimetyczne metody wytwarzania materiałów, Wyd. Politechniki Warszawskiej 2013.

2. K. Dołowy, A. Szewczyk, S. Pikuła Błony biologiczne, Wyd. Śląsk, 2003.

3. J. Bar-Cohen, Biomimetics: Biologically Inspired Technologies, CRC Press, 2005.

4. G. F. Swiegers, Bioinspiration and Biomimicry in Chemistry: Reverse-Engineering Nature, John Wiley & Sons Ltd., 2012

Additional

1. A. UIman, Ultrathin organic films, Academic Press, 1991.

2. M. Petty, Langmuir-Blodgett films, Cambridge University Press, 2009.

3. Z. Xia, Biomimetic Principles and Design of Advanced Engineering Materials, John Wiley & Sons Ltd., 2016.

4. Dopierała K., Krajewska M., Weiss M., Physicochemical Characterization of Oleanolic Acid-Human Serum Albumin Complexes for Pharmaceutical and Biosensing Applications, Langmuir 36, 13, 2020, pp.3611–3623

5. M. Rojewska, M. Skrzypiec M., K. Prochaska, The wetting properties of Langmuir–Blodgett and Langmuir–Schaefer films formed by DPPC and POSS compounds, Chemistry and Physics of Lipids, 221, 158-166 (2019)

6. M. Skrzypiec M., M. Weiss, K. Dopierała, K. Prochaska, Langmuir-Blodgett films of membrane lipid in the presence of hybrid silsesquioxane, a promising component of biomaterials, Materials Science & Engineering C, 105 (2019) 110090;

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,0
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	40	1,5

[1] delete or add other activities as appropriate