COURSE DESCRIPTION CARD - SYLLABUS

Course name
Biomaterials [S2Bioinf1>BIOMAT]

Course

Field of study
Bioinformatics

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
30

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

The student should have basic knowledge of biology and chemistry. The student demonstrates knowledge of the English language sufficiently to enable the analysis of scientific literature.

Course objective

The course aims to familiarize students with the basic information on the field of biomaterials. Transfer of knowledge about the characteristics of individual groups of biomaterials, their production, methods of analyzing the properties of biomaterials and their practical application.

Course-related learning outcomes

Knowledge:
1. student knows complex physicochemical and biochemical processes, including the principles of appropriate selection of materials, raw materials, apparatus and equipment for their implementation and characterization of products - [K_W02].
2. student knows in-depth issues of selected sciences useful for modeling of biological processes - [K_W03].
3. student knows the basis of biocatalysts and biomaterials application in biochemical processes -

[K_W07].

Skills:
1. students can describe methods, basic laboratory techniques, tools used in solving problems related to the synthesis and study of bio-molecules and biomaterials - [K_U02, K_U03, K_U06].

Social competences:
1. student understands the need of lifelong learning, inspiring and organizing others learning process - [K_K01].
2. student cooperates in a group, taking various roles in it and establishes priorities in order to realize a task set by him/herself or others - [K_K02, K_K03].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
The knowledge acquired during the lecture is verified based on a final test covering the entire knowledge of the subject.
The skills acquired during the laboratory classes are verified based on an oral and written control of the knowledge on preparation for laboratory classes and a written report on the exercises performed.

Programme content

1. Lectures:
The subject covers issues including an introduction to the science of biomaterials, basic definitions and concepts, functions of biomaterials, classification of biomaterials. The types of biomaterials are discussed in detail, taking into account their chemical structure, properties, functions and applications - ceramic, metallic, polymer and composite materials. The methods and techniques used to determine mechanical parameters, surface characteristics and properties of biomaterials are presented. Issues related to the interaction between the biomaterial and the biological environment are discussed, including the characteristics of the phenomena occurring at the interface, e.g. protein adsorption.
2. Laboratory:
• Dental biomaterials - obtaining samples of commercial dental biomaterials and examining their properties, such as density, water sorption, solubility and hygroscopic expansion. Determination of the hardening depth.
• Preparation of ceramic / polymer scaffold and determination of its porosity.
• Biocomposites - synthesis, determination of surface properties.
• Infrared spectroscopy in the characteristics of biomaterials.
• Compressive strength testing of selected biomaterials.
• Determination of the surface free energy of biomaterials using inverse gas chromatgoraphy.
• Solubility parameters in characterization of biomaterials.

Teaching methods

Lecture with a multimedia presentation, discussion with students, laboratory classes.

Bibliography

Basic
1. J. Marciniak, Biomateriały, Wydaw. Politechniki Śląskiej, Gliwice 2002.
2. Biocybernetyka i Inżynieria Biomedyczna 2000. Tom 4. Biomateriały pod red. Nałęcz M, Błażewicz S., Stoch L. Akademicka Oficyna Wydawnicza EXIT. Warszawa 2003.
3. A. Voelkel, K. Adamska, Biomateriały, WPP, Poznań 2011.
4. B. Świeczko-Żurek, Biomateriały, Skrypt Politechniki Gdańskiej, Gdańsk 2009.
Additional
1. Nałęcz M. (red.): Biocybernetyka i inżynieria biomedyczna, t.1-9. Wydawnictwo Exit, Warszawa 2000-2004.
2. Bronzino J.D. (red.): The Biomedical Engineering Handbook. CRC Press & IEEE Press, 1995 (II wyd. 2000).

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50