# COURSE DESCRIPTION CARD - SYLLABUS

Course name

Materials for biomedical applications

## Course

Field of study

Bioinformatics

Year/Semester

1/2

Area of study (specialization)

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

Polish

Form of study

full-time

Requirements

elective

## Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

Tutorials

Projects/seminars

## Number of credit points

4

## Lecturers

Responsible for the course/lecturer:

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Faculty of Chemical Technology

Berdychowo 4, 60-965 Poznan

Responsible for the course/lecturer:

## 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 obtain knowledge about various groups of materials used in biomedical sciences - ceramic, metallic, polymer and composite materials. Characteristics of their chemical properties, methods of production, discussion of applications.

## 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:

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:

Discussion of issues including an introduction to the science of materials used in biomedical fields - basic definitions and concepts, functions of materials, classification. Detailed coverage of material types in specific applications, incl. in the cardiovascular system, orthopedics, dentistry, tissue engineering, drug delivery systems, materials that interact with soft tissue. Materials used in bioelectrodes and biosensors. Presentation of methods and techniques used to determine mechanical parameters, surface characteristics and material properties. Issues related to the impact of the biological environment after the implantation of biomedical material are discussed.

2. Laboratory:

• Materials used in dentistry - obtaining samples of dental composites and testing 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 biomedical materials.

• Mechanical tests of selected biomedical materials.

• Ability of the material to specific interactions - the use of inverse gas chromatography.

• Solubility parameters in the characteristics of biomedical materials.

## 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. 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 |
| Classes requiring direct contact with the teacher | 60 | 2,5 |
| Student's own work (literature studies, preparation for laboratory classes, preparation for tests) [1] | 40 | 1,5 |

[1] delete or add other activities as appropriate