



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Biomaterials [S1Bioinf1>BIOM]

### Course

Field of study

Bioinformatics

Year/Semester

3/5

Area of study (specialization)

–

Profile of study

general academic

Level of study

first-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

dr inż. Katarzyna Adamska

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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. The student has a basic knowledge enabling the description of chemical and biochemical processes [K\_W04].
2. The student knows the chemical structure, properties of bioactive compounds - [K\_W08].
3. The student characterizes the techniques used to analyze the structure and properties of materials used in biomedical fields - [K\_W16].
4. The student has a basic knowledge of the techniques and methods of biomolecules and bioactive

compounds identification - [K\_W19].

Skills:

1. The student can describe the methods, basic laboratory techniques, tools used in solving simple problems related to the synthesis and testing of biomaterials and biomaterials - [K\_U03, K\_U04].

Social competences:

1. The student understands the need for self-education and improving their professional competencies - [K\_K01].

2. The student collaborates in a group and sets priorities for the implementation of the tasks specified by himself or others - [K\_K03, K\_K04].

### 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 chromatography.
- 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, Błazewicz 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