COURSE DESCRIPTION CARD - SYLLABUS

Course name
Biomaterials

Course

Field of study
Chemical Technology
Area of study (specialization)
C&N
Level of study
Second-cycle studies
Form of study
full-time

Year/Semester
1/2
Profile of study
general academic
Course offered in
english
Requirements
compulsory

Number of hours

Lecture
15
Laboratory classes
15
Other (e.g. online)

Tutorials
Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
dr inż. Katarzyna Adamska

Responsible for the course/lecturer:

Prerequisites

Student has an organized knowledge of inorganic, organic and physical chemistry. Uses basic laboratory techniques in the synthesis, modification, isolation and purification of compounds and materials; knows how to use instrumental methods in the characterization of materials

Course objective

The aim of the course is to familiarize students with the basic information about modern materials used in medical sciences. Issues related to ceramic, metallic, polymer, composite and natural biomaterials will

be discussed. Students will gain knowledge related to the phenomena of biomaterial / environment interaction and factors influencing the biomaterial / tissue interaction. The aim of the course is to acquire knowledge in the field of practical application of modern materials used in orthopedics, cardiology, ophthalmology and dentistry. Additionally, the methods of producing selected groups of materials and the analysis of their properties will be discussed.

Course-related learning outcomes

Knowledge

1. has the knowledge on techniques and methods of characterization of biomaterials - [K_W03,K_W08]

2. can describe methods, techniques, tools and materials used in the solution of simple problems connected with manufacturing and examination of biomaterials - [K_W04, K_W06, K_W07]

Skills

1. can select methods for the basic ways of characterization of biomaterials - [K_U11, K_U16, K_U20]

2. can estimate usefulness and select the tools (methods) for the solution problem in the field of biomaterials application - [K_U09]

3. Student can discuss biomaterial problems in English - [K_U03]

Social competences

1. Student understands the need to supplement her/his education and increasing professional competences - [K_K01]

2. Student has the awareness to obey the engineer ethic rules. - [K_K02, K_K05]

3. Student can act and cooperate in the group accepting different roles. - [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 on the basis of a final test including the information presented in the lectures.

The skills acquired during the laboratory classes are verified on the basis of 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 course covers basic definitions and concepts, functions of biomaterials, and the 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.

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.

• Determination of the contact angle of selected biomaterials.

• Use of alginates in drug release.

Teaching methods

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

Bibliography

Basic

1. R. H. Doremus, Review Bioceramics, J. Mat. Sci., 27 (1992) 293-296

2. B.M. Culbertson, New polymeric materials for use in glass-ionomer cements, Journal of Dentistry 34 (2006) 556-565.

3. An Y. H., Friedman R. J., Concise review of mechanisms of bacterial adhesion to biomaterial surfaces, J. Biomed. Mater. Res., 43 (1998) 338-348.

4. D. Shi, Biomaterials and tissue engineering, Springer Berling Heidelberg, Niemcy, 2004.

Additional

1. Williams D.F., Biomedical and dental materials: introduction. w: Encyclopedia of materials—science and technology, vol 1., ed. K. H. Buschow, K. H. Jürgen, R. W. Cahn, M. C. Flemings, B. Ilschner, E. J. Kramer, S. Mahajan, Amsterdam, Elsevier 2001, s. 584-592.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	38	1,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	37	1,5

[1] delete or add other activities as appropriate