



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Biomaterials [S2TCh2E-KiN>Bio]

Course

Field of study

Chemical Technology

Year/Semester

1/2

Area of study (specialization)

Composites and Nanomaterials

Profile of study

general academic

Level of study

second-cycle

Course offered in

english

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

2,00

Coordinators

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Lecturers

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:

Lecture:

The knowledge acquired during the lectures is verified on the basis of the final test covering the knowledge presented during the lectures.

Passing in full-time mode:

The credit consists of 5 test questions (multiple choice test) and 8 open questions. Minimum number of points to pass: 51% of the points.

Online credit:

The credit consists of 5 test questions (multiple choice test) and 8 open questions and will be conducted on the eKursy platform. Minimum number of points to pass: 51% of the points.

Laboratory:

Passing in full-time mode:

The skills acquired during laboratory classes are verified by short tests on theoretical knowledge in the field of the performed exercise. In addition, knowledge of the course of the exercise and practical knowledge necessary for its safe performance will be verified during an oral statement.

The condition for obtaining credit is to perform the planned experiments, pass tests and prepare reports on the exercises performed.

Online credit:

Tests on theoretical knowledge in the field of the exercise, conducted on the eKursy platform.

The condition for passing the laboratory is passing the tests and preparing reports from the exercises based on the data sent by the teacher.

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 Berlin 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. Ilshner, E. J. Kramer, S. Mahajan, Amsterdam, Elsevier 2001, s. 584-592.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00