



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Biomaterials

Course

Field of study

Technologia Chemiczna

Area of study (specialization)

Composites and Nanomaterials

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

I/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:

prof. dr hab. inż. Adam Voelkel

Responsible for the course/lecturer:

Prerequisites

solid state chemistry, physical chemistry – properties of surface layer, instrumental chemistry; can use basic laboratory techniques in synthesis, modification, separation and cleaning of compounds and materials, can use instrumental methods in characterization of materials

Course objective

The aim of this course is to acquaint students with the biomaterials science as the fascinating field of modern engineering. This discipline from the boarder of several sciences including chemistry, physics, biology, medicine materials engineering, mechanics and ethics. Students should gain the skills in the range of modification of biomaterials as well as their characterization.

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:

final written control following lectures, permanent control during laboratory classes

Programme content

The following problems will be presented and discussed: general characteristic of biomaterials. Biomaterials as replacements of body parts or taking over its functions. Classification of biomaterials basing on chemical character and structure: metallic, polymers (biopolymers), composites and ceramics. Preparation of different groups of biomaterials. Criteria of the selection of biomaterials. Ceramic biomaterials including calcium phosphate based biomaterials. Methods of characterization of biomaterials. Mechanical properties of biomaterials. Physicochemical properties of biomaterials. Application of biomaterials.

Teaching methods

lecture, 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. 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	45	1,8
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	30	1,2

¹ delete or add other activities as appropriate