



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Surface engineering of biomaterials

### Course

Field of study

Biomedical engineering

Area of study (specialization)

-

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

Polish

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

### Lecturers

Responsible for the course/lecturer:

dr hab. inż. Piotr Siwak

Responsible for the course/lecturer:

e-mail: piotr.siwak@put.poznan.pl

Institute of Mechanical Technology

Poznan University of Technology

### Prerequisites

Knowledge and basic knowledge of biomaterials technology, surface engineering and material engineering.

### Course objective

The aim of the course is to acquire knowledge about surface engineering in the field of biomaterials, technology design as well as the construction, production and application of material surface layers.

### Course-related learning outcomes

Knowledge

1. The student has knowledge of the structure and technological properties of biomaterials and the creation of models in surface engineering.



2. The student knows the measurement methods and measurement-quantitative systems used in the construction of materials and surface technology.

3. The student has knowledge of the modeling, analysis of the operation of devices and measuring apparatus in the field of tribology, nanoindentation and X-ray fluorescence.

#### Skills

1. Student is able to calculate and develop equations and models for experimental data used in material surface engineering technology.

2. The student knows and is able to characterize the technological and operational properties of materials and biomaterials.

#### Social competences

1. Is aware of the role of engineering knowledge and its importance for society and the environment.

2. Can present and make others aware of the importance of analyzes and calculations in public life.

3. The student is able to define the priorities for the implementation of a specific task.

4. The student is open to launching new biomedical technologies, understands the needs of learning and acquiring new knowledge.

#### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: the basis of a test consisting of questions and short tasks.

The condition for receiving a positive evaluation is obtaining at least 50% of the possible points

#### Programme content

1. Introduction to the basic issues of materials and biomaterials technology.

2. Characteristics, classification, role and application of biomaterials.

3. Shaping the biological properties of the biomaterial surface.

4. Surface engineering of the surface layer and material layer requirements.

5. The importance of the surface layer in issues of quality and durability of materials.

6. Research and control methods (tribometric, fluorescent, nanoindent).

7. Basic content on biomaterials, research and industrial biotechnology.

8. Shaping the surface properties and modification of biomaterials.

9. Metallic biomaterials.

10. The role of biomaterials in surface engineering.



## Teaching methods

1. Lecture: presentation illustrated with examples given on the board, solving problems.
2. Laboratory exercises: conducting experiments, working in teams, discussion.

## Bibliography

### Basic

1. Bednarski W., Fiedurka J.; Podstawy biotechnologii przemysłowej; Wydawnictwo Naukowo-Techniczne; Warszawa 2007
2. Blicharski M.; Inżynieria powierzchni; Wydawnictwo Naukowo-Techniczne; Warszawa 2004
3. Chmiel A.; Biotechnologia. Podstawy mikrobiologiczne i biochemiczne; Wydawnictwo Naukowe PWN; Warszawa 1998
4. Jurczyk M.; Jakubowski J.; Bionanomateriały; Wydawnictwo Politechniki Poznańskiej; Poznań 2008.
5. Kula P.; Inżynieria warstwy wierzchniej Wydawnictwo Politechniki Łódzkiej; Łódź 2000
6. Kupczyk M.; Inżynieria powierzchni; Wydawnictwo Politechniki Poznańskiej, Poznań 2004
7. Ledakowicz S.; Inżynieria biochemiczna; Wydawnictwo Naukowo-Techniczne; Warszawa 2011.

### Additional

1. Ratledge, C.; Podstawy biotechnologii; red. Kristiansen, B., Kononowicz, A.; tł., Bielecki, S., Chmiel, A.; Wydawnictwo Naukowe PWN; Warszawa 2011
2. Skręta A.; Biomateriały. Materiały pomocnicze; Wydawnictwo Politechniki Rzeszowskiej; Rzeszów 2004

## Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	30	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	20	1,0

<sup>1</sup> delete or add other activities as appropriate