COURSE DESCRIPTION CARD - SYLLABUS

Course name
Engineering of bioprocesses and biomaterials surfaces [S2IBio1-IIiP>IBiPB]

Course

Field of study
Biomedical Engineering

Year/Semester
1/2

Area of study (specialization)
Engineering of Implants and Prosthesis

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
15

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of the basics of biomaterials, medical bioengineering, including biomaterials engineering and tissue engineering. Knowledge of basic engineering groups of biomaterials, bionanomaterials. Ability to think logically, use information from the library and the Internet. Able to use laboratory techniques in the field of materials engineering, chemical engineering. Basic knowledge of methods to study the properties of biomaterials. Understands the need to learn and acquire new knowledge and improve their professional competences.

Course objective

1.Provide students with basic knowledge of bioprocess engineering and surface modification methods of biomaterials/bionanomaterials, to the extent specified by the curriculum content specific to the field of study. 2.Develop students" skills for solving problems related to the selection of biomaterials, distinguishing them and analysing research results based on the knowledge gained. 3.Shaping teamwork skills in students.

Course-related learning outcomes

Knowledge:

1. The student should characterize the basic biomaterials
2. The student should characterize the basic processes of obtaining biomaterials and modifying their surface

Skills:
1. Student can choose material for medical application
2. The student can propose the use of biomaterials
3. Student can conduct in vitro and corrosive tests

Social competences:
1. Student can collaborate in a group
2. The student is aware of the role of biomaterials for society

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
Ongoing knowledge control from the preparation for classes. Lecture: Exam consisting of a series of 5 general questions (pass in case of correct answer to min. 3 questions).
Project: Completion on the basis of an oral response from the content of each project carried out, a report on the implementation of the project according to the indications of the presenter. To be credited, projects must be credited (positive rating).

Programme content

Biomaterials
- Manufacturing methods and characteristics.
- Surface modification: bioactive coatings, bactericidal coatings, multifunctional coatings.
- Corrosion. In vitro studies. In vivo studies.
- Designing the properties of biomaterials and bioprocesses in the interphase human tissue/biomaterial.

Course topics

Lecture:
Biomaterials/Bionanomaterials. Manufacturing methods and characteristics. Technological processes of the manufacture of dentures. Shaping the microstructure. Modification of the chemical composition of biomaterials. Surface modification: bioactive coatings, bactericidal coatings, multifunctional coatings. Corrosion. In vitro studies. In vivo studies. Characteristics of the biological environment and physiological bioprocesses occurring in tissues and in the human tissue/biomaterial system.
Designing the properties of biomaterials and bioprocesses in the interphase human tissue/biomaterial taking into account functionalisation processes and nano-functionalisation of the surface (nano- coverings: nanofibres, nanotubes, nanocomposites, thin film deposition and hybrid surface nanostructuring, production of porous coverings with a hierarchical microstructure).
Requirements for artificial biomaterials (biotolerance, corrosion resistance, atrombogenicity, magnetic properties of implants, condition of implant surfaces, chemical composition of implants, toxicity and carcinogenicity, selected issues related to biocompatibility testing of medical biomaterials (PN-EN ISO 10993).

Teaching methods

1. Lecture: multimedia presentation, presentation illustrated by examples given on the board.
2. Design: implementation and presentation of a project containing, determination of working and operating conditions, determination of technical requirements, selection of material and technology for the manufacture of asimple element made of biomaterial, at the discussion during the presentation.

Bibliography

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M. Tulinski, M. Jurczyk, Nanomaterials Synthesis Methods, chapter 4 in “Metrology and Standardization of Nanomaterials: Protocols and Industrial Innovations”, pp. 75-98 Eds Elisabeth Mansfield, Debra Kaiser, Daisuki Fujita, Marcel Van de Voorde
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Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	47	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	53	2,00