AGH UNIVERSITY OF SCIENCE AND TECHNOLOGY

Module name: BioSurface Engineering (Prof. Dieter Scharnweber)

Academic year: 2017/2018 Code: CIM-2-408-MF-s ECTS credits: 3

Faculty of: Materials Science and Ceramics

Field of study: Materials Science Specialty: Materiały funkcjonalne

Study level: Second-cycle studies Form and type of study: Full-time studies

Lecture language: English Profile of education: Academic (A) Semester: 4

Course homepage: —

Responsible teacher: prof. dr hab. inż. Pamuła Elżbieta (epamula@agh.edu.pl)

Academic teachers:

Description of learning outcomes for module

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Connections with FLO	Method of learning outcomes verification (form of completion)
Social competence			
M_K001	Is able to work in a team and communicate pieces of information on biosurface engineering in a clear and comprehensive way		Presentation
Skills			
M_U001	Is able to propose modification method of different biomaterials for use in contact with different tissues		Presentation
M_U002	Knows the principles of immobilization of biologically active molecules on biomaterials' surface		Presentation
Knowledge			
M_W001	Knows how surface chemistry, topography as well as mechanical and physical factors influence cellular response		Test
M_W002	Knows different methods for a defined design of biomaterials' surface properties		Test

FLO matrix in relation to forms of classes

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Form of classes										
		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Others	E-learning
Social competence												
M_K001	Is able to work in a team and communicate pieces of information on biosurface engineering in a clear and comprehensive way	-	-	-	-	-	+	-	-	-	-	-
Skills												
M_U001	Is able to propose modification method of different biomaterials for use in contact with different tissues	-	-	-	-	-	+	-	-	-	-	-
M_U002	Knows the principles of immobilization of biologically active molecules on biomaterials' surface	-	-	-	-	-	+	-	-	-	-	-
Knowledge												
M_W001	Knows how surface chemistry, topography as well as mechanical and physical factors influence cellular response	-	-	-	-	-	+	-	-	-	-	-
M_W002	Knows different methods for a defined design of biomaterials' surface properties	-	-	-	-	-	+	-	-	-	-	-

Module content

Seminar classes

The course aims to introduce to the students different methods for a defined design of biomaterials surface properties with special attention paid to

- the biological background,
- the methods to generate the surface property profile,
- the biologically wanted surface property as well as
- relevant results from cell biological experiments, animal testing, and clinical trials.

This includes (i) methods to create defined surface morphologies via physical and chemical processing, (ii) physical and chemical modifications of surface properties, (iii) inorganic coating systems, and (iv) the whole area of BioSurface Engineering, i.e. the biomimetic imitation of the native cellular microenvironment given by the properties of the native extracellular matrix (ECM).

This will enable students to design biomaterials surfaces from various substrates for biomedical applications in different areas such as tissue engineering and regenerative medicine for use in contact with different tissues.
Topics:
1.Biofunctionality, cell communication and surfaces
2.Surface morphology and cellular response
3.Physico-chemical surface properties and cellular response
4.Mechanical and physical factors influencing cellular response
5.Introduction to BioSurface Engineering
6.Strategies for immobilization I
7.Strategies for immobilization II
8.Peptides
9.Components of the extracellular matrix
10.Growth factors and cytokines

Method of calculating the final grade
The algorithm of the final mark calculation: test 1 (33.3%), test 2 (33.3%), presentation (33.3%).

Prerequisites and additional requirements
Basic course of chemistry, physics, materials science, knowledge of English

Recommended literature and teaching resources
Biomaterials Science, Edited by Ratner et al., Elsevier, 2004.
Titanium in Medicine, Edited by Brunette et al., Springer, 2001.
Molecular Biology of the Cell, Edited by Alberts et al., Taylor & Francis, 2004.

Scientific publications of module course instructors related to the topic of the module
Additional scientific publications not specified

Additional information
The course is given during two weeks by Prof. Dieter Scharnweber (Technical University Dresden, Max Bergmann Center for Biomaterials).

Student workload (ECTS credits balance)

Student activity form	Student workload
Participation in seminar classes	30 h
Preparation of a report, presentation, written work, etc.	20 h
Preparation for classes	10 h
Realization of independently performed tasks	20 h
Summary student workload	80 h
Module ECTS credits	3 ECTS