

DESCRIPTION/Syllabi of Curricula/Module

Short Name of the University/Country code	PSTU Ukraine
Date (Month / Year)	June 2021
TITLE OF THE MODULE	Code
Biomaterials	

Teacher(s)	Department
Coordinating: Assoc. Prof. Oleinik I.M., PhD Others:	Department of Material Science and Advanced Technologies

Study cycle (BA/MA)	Level of the module (Semester number)	Type of the module (compulsary/elective)
BA	6th semester	Compulsary

Form of delivery (theory/lab/exercises)	Duration (weeks/months)	Language(s)
Lectures, Seminars	18 weeks	Ukrainian/English

Prerequisites	
Prerequisites: Knowledge: Materials engineering. Skills: Ability to search information, analysis. Competences: Work on presentation.	Co-requisites (if necessary): Students should have skills to work in basic computer software (eg. MS Word, MS PowerPoint)

ECTS (Credits of the module)	Total student workload hours	Contact hours	Individual work hours
3	90	54	36
Aim of the module (course unit): competences foreseen by the study programme			
Students should be able to: <ul style="list-style-type: none"> - Take part in a discussion on new trends in biomaterials; - Find, analyze and compare information of new biomaterials; - Make a presentation on a selected topic. 			
Learning outcomes of module (course unit)	Teaching/learning methods (theory, lab, exercises)	Assessment methods (written exam, oral exam, reports)	
Knowledge: Knowledge of basic information of various biomaterials. Knowledge of biomaterials application in biomedicine.	Lectures	Test	
Skills: Ability to analyze and compare physical and mechanical properties of different types of biomaterials. Explain the basic advantages and disadvantages of biomaterials in biomedicine. Proper project presentation.	Seminar	Project in the form of presentation	
Competences: Demonstrate innovation ideas in the field of bio materialsfor biomedicine and theirs applications. Select an appropriate biomaterials and the technology of their processing for specific biomedical applications.	Lectures	Test	

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultations	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
1. The content, meaning and objectives of the course "Biomaterials". Field of application of biomaterials. Types of biomaterials (implants and transplants). The concept of biocompatibility. Review of the body as a target for implants. Requirements for biomaterials (chemical, mechanical and biological properties. Traditional and advanced biomaterials. Historical perspective and current state. Biomaterials as an advanced material. Topics of presentations for students.	6		2				8	12	Study of theoretical material, case study
2. Bone tissue: structure, mechanical and biological properties. Levels of organization of bone tissue. Approaches to the replacement of human tissues and organs. Specificity of bone replacement.	4		2				8	15	Study of theoretical material, case study
3. Classification of biomaterials. Biopolymers, biomaterials, bioceramics. Classification of biomaterials according to the origin. Classification of biomaterials for use. Structure of biomaterials.	4		2				6	15	Study of theoretical material, case study
4. Metal biomaterials. Chemical and phase composition of metal biomaterials. Properties of biomaterials and implants. Titanium and its alloys as biomaterials. Shape memory alloys in medicine.	4		2				6	14	Study of theoretical material /case study/ presentations
5. Bioceramics and ceramic composites: the specificity of the receipt, test the properties, problems and modern trends. Bio-glass and glass-crystal materials. Calcium phosphate coatings on metal implants. Reaction binding materials: advantages and disadvantages compared to	4		2		2		8	14	Study of theoretical material /case study/ presentations

phosphate bioceramics. Composites phosphate / (bio)polymer: current trends, prospects.									
6. Polymers compatible with living organisms. Synthetic and natural materials, bioinert (not destructible in biological media) and destructible (bioresorbable) polymers; high-crystalline thermoplastics and rubber-like elastomers.	2		1		2		10	14	Study of theoretical material /case study/ presentations
7. Methods of studying biomedical materials. The system of methods and tests used in biomedical materials science. Physical and physico-chemical methods of research materials for biomedical applications. Methods of materials processing for production of specialized structures and biomedical products.	4		1				6	14	Study of theoretical material /case study/ presentations
8. Final open questions test	2						2	4	
Total	32		12		4		48	102	

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Presentation	50	18 th week	Attendance, activity, presentation
Final test	50	18 th week	Open questions test

Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
Compulsory literature				
Edited by Cuie Wen	2020	Structural Biomaterials: A Materials Science Perspective		Woodhead Publishing.– 375 p.
Edited by Magnus S. Agren	2016	Wound Healing Biomaterials. Volume 2: Functional Biomaterials		Elsevier Science. – 197 p.
Maria Cristina Tanzi, Silvia Farè	2017	Characterization of polymeric biomaterials		Firstedition Publisher: Woodhead Publishing Language. – 500 p.

Edited by William Wagner, Shelly Sakiyama-Elbert, Guigen Zhang, Michael Yaszemski	2020	Biomaterials Science		Academic Press. – 1616 p.
Additional literature				
J. Marciniak	2018	Biomateriały		Politechniki Śląskiej Gliwice. – 471 p.
Edited by Xian Zhang	2016	Science and Principles of Biodegradable and Bioresorbable Medical Polymers: Materials and Properties		Elsevier Science. - 982 p.
W. Kaczorowski.	2016	Plazmowa modyfikacja biomateriałów polimerowych z wykorzystaniem powłok węglowych		Politechniki Łódzkiej, Łódź. – 109 p.
Editors: M. Gzik	2017	Innovations in Biomedical Engineering		Springer International Publishing. – 338 p.
Velnar Tomaz, Bunc Gorazd, Klobucar Robert, Gradisnik Lidija	2016	Biomaterials and host versus graft response: a short review	vol. 16(2). – P. 82–90.	Bosnian Journal of Basic Medical Sciences.
Singh Yashpal, Arora Pooja, Arora Vipin, Jain Krati	2015	Implant biomaterials: A comprehensive review	vol. 3(1). – P. 52–7.	World Journal of Clinical Cases