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<b>Short Name of the University/Countrycode Date (Month / Year)</b>	<b>PSTU January 2019</b>
<b>TITLE OF THE MODULE</b>	<b>Code</b>
Biomaterials	

<b>Teacher(s)</b>	<b>Department</b>
<b>Coordinating:</b> Assoc. Prof. Oleinik I.M.  <b>Others:</b>	Department of Material Science and Advanced Technologies

<b>Study cycle</b>	<b>Level of the module</b>	<b>Type of the module</b>
BA	6 <sup>th</sup> semester	compulsary

<b>Form of delivery</b>	<b>Duration</b>	<b>Langage(s)</b>
Lectures, seminars	18 weeks	Ukrainian/English

<b>Prerequisites</b>	
<b>Prerequisites:</b>  Knowledge: materials engineering  Skills: ability to search information, analysis.  Competences: work on presentation.	<b>Co-requisites (if necessary):</b>  Students should have skills to work in basic computer software (eg. MS Word, MS PowerPoint)

<b>ECTS (Credits of the module)</b>	<b>Total student workload hours</b>	<b>Contact hours</b>	<b>Individual work hours</b>
3	90	54	36

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<b>Aim of the module (course unit): competences foreseen by the study programmes</b>		
Students should be able to: <ul style="list-style-type: none"> <li>- Take part in a discussion on new trends in biomaterials;</li> <li>- Find, analyze and compare information of new biomaterials;</li> <li>- Make a presentation on a selected topic.</li> </ul>		
<b>Learning outcomes of module (course unit)</b>	<b>Teaching/learning methods</b>	<b>Assessment methods</b>
Knowledge: Knowledge of basic information of various biomaterials.  Knowledge of biomaterials application in biomedicine.  Competences: Demonstrate innovation ideas in the field of biomaterials for biomedicine and their applications.  Select an appropriate biomaterials and the technology of their processing for specific biomedical applications.	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

<b>Themes</b>	<b>Contact work hours</b>						<b>Time and tasks for individual work</b>		
	Lectures	Consultations	Seminars	Practical work	Laboratory work	Placements	Total contactwork	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	4	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	4		4				8	5	Study of theoretical material, case study

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and organs. Specificity of bone replacement.									
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	5	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	5	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 phosphate bioceramics. Composites phosphate / (bio)polymer: current trends, prospects.	6		2				8	5	Study of theoretical material/case study/ presentations
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.	6		4				10	5	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		2				6	5	Study of theoretical material /case study/ presentations
8. Final open questions test	2						2	2	
<b>Total</b>	<b>36</b>		<b>18</b>				<b>54</b>	<b>36</b>	

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

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Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
<b>Compulsory literature</b>				
Narayan R.	2009	Biomedical Materials		Springer
<b>Additional literature</b>				
Park J.	2007	Biomaterials Principles and Applications		CRC Press
Ramakrishna S., Ramalingam M., Kumar T.S.S., Soboyejo W.O.	2010	Biomaterials		CRC Press
Bhat S. V.	2005	Biomaterials		Alpha Science Intl Ltd
Wnek G. E., Bowlin G. L. (Ed.)	2004	Encyclopedia of Biomaterials and Biomedical Engineering. V. 2. 2nd ed		Marcel Dekker
Штильман М.И.	2006	Полимеры медико-биологического назначения		Москва: ИКЦ, Академкнига
Вихров С.П., Холомина Т.А., Бегун П.И., Афонин П.Н.	2006	Биомедицинское материаловедение		Москва: Горячая линия-Телеком
Хлусов И.А., Пичугин В.Ф., Рябцева М.А.	2007	Основы биомеханики и биосовместимых материалов и биологических тканей		Томск: Издательство Томского политехнического университета