

DESCRIPTION/Syllabi of Curricula/Module

Short Name of the University/Country code Date (Month / Year)	PSTU Ukraine Jan 2019
TITLE OF THE MODULE	Code
3D Printing for Biomedical Applications	

Teacher(s)	Department
Coordinating: Assoc. Prof. Yefremenko Bohdan, PhD Others:	Department of Biomedical Engineering

Study cycle (BA/MA)	Level of the module (Semester number)	Type of the module (compulsary/elective)
MA	10th semester	Compulsary

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

Prerequisites	
Prerequisites: Knowledge: Basic knowledge in physics, mechanics, modeling. Skills: Basic skills in 3D modeling, ability to search information, analysis. Competences: None	Co-requisites (if necessary): Students should have skills to work in basic computer software.

ECTS (Credits of the module)	Total student workload hours	Contact hours	Individual work hours
4	120	64	56
Aim of the module (course unit): competences foreseen by the study programme			
Students should be able to: <ul style="list-style-type: none"> - Have knowledge about 3D prints in medical and biological; - Choose the appropriate additive technology to application in medicine and biotechnology; - Compare the advantages and disadvantages various 3D printing techniques for applications in medicine and biotechnology. 			
Learning outcomes of module (course unit)	Teaching/learning methods (theory, lab, exercises)	Assessment methods (written exam, oral exam, reports)	
<p>Knowledge:</p> <p>Knowledge of the design of parameters for additive manufacturing processes.</p> <p>Knowledge of basic additive technologies of metal products</p> <p>Knowledge of basic additive technologies of polymer products.</p>	Work with the lecture notes as well as on the available fundamental subject literature	Knowledge test	
<p>Skills:</p> <p>The ability to select methods and tools for printing with metallic and polymeric materials.</p> <p>Ability to design and select the technology of printing metal and polymer models.</p> <p>Ability to prepare 3D models for printing and select optimal printing modes.</p> <p>Ability to solve problems with analytical and simulation methods.</p>	Lectures, labs, project, consultation	Active attendance on lectures, individual/group project and presentation	
<p>Competences:</p> <p>Demonstrate innovation ideas in the field of additive technology in medicine.</p> <p>Collecting and transferring information about the achievements of technology in a comprehensible way.</p> <p>Basic 3D printing technologies, their advantages and drawbacks;</p> <p>Features of preparation of 3D models for printing;</p>	Lectures, project, consultation	Individual/group project and presentation	

<p>The main types of materials used for 3D printing, their properties, advantages and drawbacks;</p> <p>The directions of using 3D printing for biomedical purposes</p>		
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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. Introduction to 3d printing	2						2	2	Study of theoretical material/case study/ presentations
2. Additive manufacturing technologies and associated equipment	4			2			6	12	Study of theoretical material/case study/ presentations
3. Materials for 3D printing	4			4			8	6	Study of theoretical material/case study/ presentations
4. 3D models developing	8			6	4		18	12	Study of theoretical material/case study/ presentations
5. Preparation of 3D model for printing. Printing procedure	10			10	4		24	20	Study of theoretical material/case study/ presentations
6. Manufacturing the implants for biomedical application	4			2			6	4	Study of theoretical material/case study/ presentations
Total	32			24	8		64	56	

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Individual or group final project referred during seminars	50	3 th - 16 th week	Project

Final exam	50	17 th week	Test
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Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
Compulsory literature				
Andreas Gebhardt, Julia Kessler, Laura Thurn	2018	3D Printing: Understanding Additive Manufacturing		Carl Hanser Verlag GmbH & Company KG
Rafiq Noorani	2017	3D Printing: Technology, Applications, and Selection		CRC Press
David Ian Wimpenny, Pulak M. Pandey, L. Jyothish Kumar	2016	Advances in 3D Printing & Additive Manufacturing Technologies		Springer
Additional literature				
Зленко М.А., Нагайцев М.В., Довбыш В.М.	2015	Аддитивные технологии в машиностроении		М. ГНЦ РФ ФГУП «НАМИ»
Валетов В.А.	2015	Аддитивные технологии (состояние и перспективы). Учебное пособие.		Санкт-Петербург: Университет ИТМО
Каменев С.В., Романенко К.С.	2017	Технологии аддитивного производства		Министерство образования и науки Российской Федерации, Оренбургский Государственный Университет. – Оренбург : Оренбургский государственный

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