NAME OF THE COURSE	3D PRINTING					
Code	PMT201	Year of study	2.			
Course teacher	Ivan Peko Phd Assistant Professor	Credits (ECTS)	6			
Associate teachers		Type of instruction (number of hours)	L	S	E	F
			30		30	
Status of the course	elective	Percentage of application of e-learning				

COURSE DESCRIPTION	
Course objectives	- To be informed about different processes and technologies of 3D printing and the possibilities of their application in different branches of industry, medicine, dentistry, bioengineering, biotechnology, nanotechnology... - Develop skills for 3D design and creation of designed models on devices and machines for 3D printing - Acquire skills about all stages of the 3D printing process and producing a functional product - To be informed about the possibilities of connecting 3D printing and 3D scanning and other 3D technologies with the aim of applying them in different fields: in industry, medicine, dentistry, bioengineering, biotechnology...
Course enrolment requirements and entry competences required for the course	None.
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	- Describe different 3D printing procedures and processes - Choose the appropriate 3D printing technology depending on specific requirements and applications - Choose a suitable material for making the desired product using the 3D printing process - Define suitable parameters on the machine/device for 3D printing with the aim of obtaining a quality printed product - Plan the 3D printing process from the initial design to the final product - Connect 3D scanning with 3D printing - Design own product in 3D design software and produce it on a 3D printer
Course content broken down in detail by weekly class schedule (syllabus)	Lectures: 1. Introduction to 3D printing, historical development of the technology 2. Application of 3D printing 3. Phases and flow of the 3D printing process 4. 3D printing processes: production from liquid materials 5. 3D printing processes: production from powder materials 6. 3D printing processes: production from solid materials 7. Machines and devices for 3D printing, 3D printing parameters settings 8. Materials for 3D printing 9. Design for 3D printing 10. 3D printing in industry 11. 3D / 4D printing in medicine, dentistry 12. 3D / 4D printing in bioengineering and biotechnology 13. 3D printing in nanotechnology 14. Future perspectives and trends in the development of 3D printing 15. 3D scanning, connecting 3D scanning and 3D printing, reversible engineering

	Exercises: Week 1 - Week 7: 3D design on the computer Week 8 - Week 10: 3D design of own product on the computer Week 11 - Week 13: 3D printing of designed products Week 14: 3D scanning. Connection between 3D scanning and 3D printing. Reversible engineering.

Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☐ partial e-learning ☐ field work	☐ independent assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	Active participation in lectures and constructive/practical exercises.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	1	Research		Practical training	1
	Experimental work	1	Report		Attending the exercises	
	Essay		Seminar essay		Homework (programs)	
	Tests	1	Oral exam		Independent learning	
	Written exam	1	Project	1	(Other)	

Grading and evaluating student work in class and at the final exam	2 tests (midterm exams)/final exam from the theoretical part Grade = (K1 + K2)/2 (K1: result of the 1st test, K2: result of the 2nd test) Rating by percentages: 50 - 62%: sufficient (2), 63 - 75%: good (3), 76 - 87%: very good (4), 88 - 100%: excellent (5)

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Andreas Gebhardt, Jan-Steffen Hötter: Additive Manufacturing - 3D Printing for Prototyping and Manufacturing, Hanser Publications, Cincinnati, 2016.		
	Ben Redwood, Filemon Schöffer, Brian Garret: The 3D Printing Handbook -Technologies, design and applications, 3D Hubs, Amsterdam, 2017.		
	Ian Gibson, David Rosen, Brent Stucker, Mahyar Khorasani: Additive ManufacturingTechnologies, Springer, 2021.		
	Mohammed Maniruzzaman: 3D and 4D Printing in Biomedical Applications, Wiley-VCH, 2019.		
	Georgios Tsoulfas, Petros I. Bangeas, Jasjit S. Suri: 3D Printing: Applications in Medicine and Surgery, Elsevier, 2020.		
	Deepak M. Kalaskar: 3D Printing in Medicine, Elsevier, 2017. Sanjay Kumar: Additive Manufacturing Processes, Springer, 2020.		
	John O. Milewski: Additive Manufacturing of Metals - From Fundamental Technology to Rocket Nozzles,		

	Medical Implants, and Custom Jewelry, Springer, 2017.		
	Ehsan Toyserkani, Dyuti Sarker, Osezua Obehi Ibhadode, Farzad Liravi, Paola Russo, Katayoon Taherkhani: Metal Additive Manufacturing, Wiley, 2022.		
Optional literature (at the time of submission of study programme proposal)	Richard Leach, Simone Carmignato: Precision Metal Additive Manufacturing, CRC Press, 2021.		
Quality assurance methods that ensure the acquisition of exit competences	Conversation with students, student evaluation using an anonymous survey, student success in the exam, self-assessment.		
Other (as the proposer wishes to add)			