No. 53

Course program for the first cycle of studies						
1.	Course title	**Virtual Manufacturing**				
2.	Code	**MDE8E6**				
3.	Study group(s)	Virtual Manufacturing Engineering (VME)				
4.	The organizer of the study program (unit, institute, department)	„Ss. Cyril and Methodius“ University in Skopje, Faculty of Mechanical Engineering – Skopje Institute of Production Engineering and Management				
5.	Level (first, second, third degree)	First				
6.	Academic year / semester	Fourth / (VIII)	7.	ECTS credits	6	
8.	Professor	Prof. Dr. Sc. Gligorche Vrtanoski				
9.	Prerequisites for enrolling the course	None Completed undergraduate studies				
10.	Course objectives (competences): This course will contribute to getting acquainted with the techniques of visual communication of computer design and advanced elements of virtual production. Advanced 3D geometric modeling in the direction of making simulation virtual models and computer animation. Virtual techniques for evaluating products and production processes in virtual production.					
11.	Course content: Introduction to virtual manufacturing as a tool for improving the design and production engineering. 3D graphics and concepts of virtual reality and virtual production. Definition, application of VM technology in product design, manufacturing processes, operation management, relationships in the key domains of applying VM in virtual production. 3D advanced modeling using special geometric modeling techniques. Graphic visualization of models, level detail management - LOD, principles of visual perception, choice of lighting, color, illumination and shading. Collaborative design in creating models for conceptualizing the idea of computer animation. Graphic Virtual scenario by choosing the appropriate tools and techniques. Composition and installation of computer simulation and animation. Simulation of the behavior of systems, products in the manufacturing process and manufacture parts with CNC machines. Documentation management in a virtual production environment through Internet WEB technology. Simulation of the layout of machines in the factory by analyzing and evaluating the appearance of virtual production.					
12.	Study methods: Interactive lectures, auditory and/or laboratory practice, self running and/or team work on project assignments, self running assignments					
13.	Total hours	6 ECTS x 30 = 180 hours				
14.	Hours allocation per activity:	30+20+80+20+30=180 hours				
15.	Lectures/Lab	15.1.	Lectures (15 weeks x 2)	30 hours		
		15.2.	Lab (student work)	20 hours		
16.	Project Work/Assignments	16.1.	Project assignments	80 hours		
		16.2.	Individual assignments	20 hours		
		16.3.	Self-study	30 hours		
17.	Points/Marks:					
	17.1.	Exams	30 points			
	17.2.	Projects	60 points			
	17.3.	Attendance	10 points			
18.	Grading scale	Under 50	Fail 5 (five) (F)			
		51 - 64 points	Sufficient 6 (six) (D)			
		65 - 74 points	Good 7 (seven) (C)			
		75 - 84 points	Very Good 8 (eight) (B-)			
		85 - 94 points	Excellent 9 (nine) (A-/B+)			

			95 - 100 points	Excellent 10 (ten) (A/A+)	
19.	Prerequisites for taking the final exam		Seminar works delivered and approved		
20.	Language		English, Macedonian		
21.	Course evaluation		Student questionnaire and other methods for continual self evaluation		
22.	Textbooks				
	22.1	Instruction materials			
		No.	Author	Title	Publisher	Year
		1.	Gligorche Vrtanoski	Unauthorized lectures of Virtual Manufacturing	Faculty of Mechanical Engineering	2018
		2.	Prashant Banerjee and Dan Zetu	Virtual Manufacturing	Wilye	2001
		3.	Wasim A. Khan, Abdul Raouf K. Cheng	Virtual Manufacturing	Springer	2011
	22.2	Supplemental Instruction Materials			
		No.	Author	Title	Publisher	Year
		1.	Rick Parent and otr.	Computer animation complete	Elsevier	2010
		2.	Dariush Derakhshani	Introducing Maya 6: 3D for Beginners	Sybex	2004
		3.	Andrew Gahan	3ds Max Modeling for Games	Elsevier	2009