Order number: 15

Attachment No. 3		**Subject program of the second cycle of studies**			
1.	Title of the teaching subject	Digitalization in the food chain			
2.	Code	FE2M34			
3.	Study program	**Food engineering – innovation, sustainability and technologies**			
4.	Organizer of the study program (unit, i.e. institute, department, department)	Faculty of Technology and Metallurgy, University "St. Cyril and Methodius" in Skopje Department of Food Technology			
5.	Degree (first, second, third cycle)	Second			
6.	Academic year / semester	Year	I	semester	II
7	Course load expressed in ECTS credits	6			
8.	Teacher (in the case of multiple teachers designated responsible teacher*)	Dr. Michela Temkov, assistant professor, TMF Dr. Jana Klopchevska, associate professor, TMF *FINKY			
9.	Language of instruction	English			
10.	Necessary prerequisites for listening and passing the subject	there is none			
11.	Objectives of the subject program (competencies) and learning outcomes:	**Objectives of the program:** Analysis and application of digital tools to improve efficiency and sustainability in post-agricultural processes of food supply chains. Implementing IoT, AI and Blockchain to improve security, traceability and quality control. Big data analysis to optimize food production, processing and distribution. Designing digital solutions to reduce waste and increase transparency in the food system. Challenges of digitization in food systems, including technological, regulatory and ethical issues. Digital transformation initiatives in the food industry and supply chain management. **Learning outcomes:** 1. Students will gain knowledge on improving traceability, transparency and efficiency infood supply chains. 2. Students will acquire skills for analysis and interpretation of data fromfood supply chains to improve logistics and reduce food waste. 3. Students will acquire knowledge on developing strategies for building resilient food systems, using digital solutions.			
12.	Detailed course content by chapter and unit with learning outcomes for each chapter	1. Introduction to digital transformation in the food industry 2. IoT (Internet of Things) and smart food systems 3. Artificial Intelligence (AI) and Machine Learning in Food Systems 4. Big data and analytics in the food industry 5. Digitizing the food supply chain for sustainability 6. Blockchain for traceability and food safety 7. Challenges and risks in the digitalization of food systems 8. E-commerce in food			
13	Interrelationship of	There is none			

	subjects				
14.	Detailed description of teaching and working methods for the subject	Participation and discussions in class (10%) Case study analysis and presentations (20%) Mid-term project: Proposal for the implementation of a digital solution in a food supply chain (20%) A comprehensive digital transformation strategy for the real-world challenge of the food system (50%)			
15.	Total available fund on time	180 hours			
16.	Forms of teaching activities	16.1.	Lectures - theoretical teaching. hours	45 hours	
		16.2.	Exercises (laboratory, classroom), seminars, teamwork: lessons		
		16.3.	Practice: classes	45 hours	
17.	Other forms of activities	17.1.	Project assignments: lessons	50 hours	
		17.2.	Independent assignments: lessons	10 hours	
		17.3.	Home study - assignments	60 hours	
18	Conditions of signature				
19	Method of assessment				
	19.1.	Tests: points			
	19.2.	Seminar work/project, written and oral presentation: points		80 points	
	19.3.	Final exam: points		20 points	
20	Evaluation criteria (points/grade)		up to 50 points	5 (five) (F)	
			51 x to 60 points	6 (six) (E)	
			61 x to 70 points	7 (seven) (D)	
			from 71 to 80 points	8 (eight) (C)	
			from 81 to 90 points	9 (nine) (B)	
			from 91 to 100 points	10 (ten) (A)	
21.	A method of monitoring the quality of teaching		Surveys and self-evaluation		
22.	Literature				
	22.1.	Required reading			
		Ord. number	Author	Title	Publisher	Year
		1.	Riccardo Accorsi and Riccardo Manzini	A Practical Guide to Industry 4.0"	The Digital Transformation of Supply Chain Management	2020
		2.	Dr. Samuel K. Jones, Maria Esteban, and Rahul Gupta	Articles on IoT, AI, and big data applications in food processing and safety.	Journal of Food Engineering	2023
		3.	Dr. Fiona	Articles on digital innovations	Trends in Food	2023

			Yang, Robert Chalmers, and Dr. Naomi Lee	in food safety, sustainability, and consumer engagement.	Science & Technology	
	22.2.					
		Ord. number	Author			
		1.		Reports from McKinsey & Co., PwC, and Accenture on the impact of AI, IoT, and blockchain in food industries.	McKinsey & Company	2023
		2.		The Food and Agriculture Organization (FAO) reports on digital agriculture and supply chain innovations.	FAO	2023
		3.		FAO and OECD reports on the digital transformation of agriculture and food systems.	OECD and FAO	2023