Order number: 3

Annex no. 3		**Subject program of the second cycle of studies**			
1.	Title of the teaching subject	Circular and sustainable food engineering			
2.	Code	FE1M3			
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 Institute of Organic Technology Food Technology and Biotechnology			
5.	Degree (first, second, third cycle)	Second cycle			
6.	Academic year / semester	Year	1	semester	1
7	Course load expressed in ECTS credits	7 ECTS			
8.	Teacher (in the case of multiple teachers designated responsible teacher*)	Dr. Vesna Rafajlovska, professor* Dr. Jana Klopchevska, associate professor			
9.	Language of instruction	English language			
10.	Necessary prerequisites for listening and passing the subject				
11.	Objectives of the subject program (competencies) and learning outcomes:	Getting to know the basic principles and concepts of the circular economy and the sustainability of food engineering with the aim of improving the efficiency of resources, reducing waste and impact on the environment.			
12.	Detailed course content by chapter and unit with learning outcomes for each chapter	*Circular economy strategies for sustainable development of the food industry*.Design for longevity - products are designed to last longer, be easily repaired or reused. Waste reduction - reuse of materials, by-products and packaging. Recovering resources and creating closed-loop systems - waste streams are potential resources that can be recovered, reused or recycled and waste from one process becomes an input for another. Renewable energy - use of sustainable and renewable energy sources in production processes. Sustainability in Food Engineering. Energy efficiency-optimization of processes and use of renewable energy. Management of water needs - efficient use of water and recycling of waste water. Waste reduction - optimizing processes to reduce food waste at every stage from procurement of raw materials to production, packaging and distribution, as well as valorization of by-products and waste into products with added value. Introduction of ecological processes and technologies. Automation of processes and introduction of smart technologies. Sustainability assessment and metrics—product and technology lifetime, carbon footprint, water footprint, and packaging index. Learning outcomes: After completing the course in this subject, the student should know the basic principles and principles of circular and sustainable food processing.			

13	Interrelationship of subjects				
14.	Detailed description of teaching and working methods for the subject	Interactive theoretical and practical teaching combined with independent work and individual consultations will be applied in all teaching chapters of the course to a varying extent, depending on the number of students. Of the teaching methods, individual and possibly group or team collaborative and cooperative methods of active learning will be used. Developing skills for presenting and presenting research according to the latest relevant scientific research in the field of circular economy and sustainability in the food industry.			
15.	Total available fund on time	210 Active teaching 5 hours x15 weeks = 90 hours Project, independent tasks and homework = 120			
16.	Forms of teaching activities	16.1.	Lectures - theoretical teaching. hours	60	
		16.2.	Exercises (laboratory, classroom), seminars, teamwork: lessons	20	
		16.3.	Practice: classes	10	
17.	Other forms of activities	17.1.	Project assignments: lessons	20	
		17.2.	Independent assignments: lessons	20	
		17.3.	Home study - assignments	80	
18.	Conditions of signature	Realized 60% of activities under number 16 and 17			
19.	Method of assessment				
	19.1.	Tests: points		30	
	19.2.	Seminar work/project, written and oral presentation: points		10	
	19.3.	Final exam: points		60	
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	Anonymous survey/self-evaluation			
22.	Literature				
	22.1.	Required reading			
		Ord. number	Author	Title	Publisher	Year
		1.	Stefanakis, A. Nikolaou, I.	Circular Economy and Sustainability	Elsevier	2022
		2.	Galanakis, MC	Sustainable Food Processing and Engineering Challenges	Academic Press	2021

		3.	Juliano, P. Knoerzer, K. Sellahewa, J. Nguyen NM Buckow, R.	Food Engineering Innovations Across the Food Supply Chain	Academic Press	2022
	22.2.	Additional literature				
		Ord. number	Author	Title	Publisher	Year
		1.	Authors of scientific papers	Scientific papers in the field of interest	Publishers of scientific papers	2010-202X