Order number: 12

Annex no. 3		**Subject program of the second cycle of studies**			
1.	Title of the teaching subject	Treatment and valorization of biowaste			
2.	Code	FE2M31			
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	2
7	Course load expressed in ECTS credits	6 ECTS			
8.	Teacher (in the case of multiple teachers designated responsible teacher*)	Dr. Vesna Rafajlovska, professor* Dr. Jana Klopchevska, associate professor Dr. Darko Dimitrovski, 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:	Acquaintance with the basic principles for the treatment and valorization of biowaste. Study of technologies for the treatment of biowaste in order to minimize its impact on the environment, as well as technologies for the valorization of biowaste in the form of energy, nutrients and other valuable products.			
12.	Detailed course content by chapter and unit with learning outcomes for each chapter	The characteristics and classification of biowaste. The treatment of biowaste. Valorization of biowaste into raw materials and value-added products. Benefits of biowaste valorization for the environment, economy and social status. Biocascade model-hierarchy from low to high value. Concepts of reuse, refurbishing, remanufacturing and recycling. Application of biowaste valorization methods: extraction methods, thermochemical methods, biotechnological and physical methods. Modern methods of circular design in the direction of using waste or bio-waste to obtain products for the protection of human health, food for humans and animals, bioactive substances, chemicals, fuels, fertilizers and other types of products. Overview of in situ and ex situ bioremediation methods through which it is possible to reduce and/or utilize environmental waste. Development of biorefineries with zero waste contributing to achieving the principles of sustainability and the circular bioeconomy, reducing the harmful impact on the environment and ensuring a cleaner and economically more resilient future. Learning outcomes: After completing the course in this subject, the student should know the basic principles and principles of treatment, valorization and transformation into products with added value.			
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 displaying and presenting research according to the latest relevant scientific research in the field of treatment and valorization of biowaste.			
15.	Total available fund on time	180 Active teaching 4 hours x15 weeks = 60 hours Project, independent tasks and homework = 120			
16.	Forms of teaching activities	16.1.	Lectures - theoretical teaching. hours	45	
		16.2.	Exercises (laboratory, classroom), seminars, teamwork: lessons	10	
		16.3.	Practice: classes	5	
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.	Ong, CH Rizwanul Fattah, MI Mahlia, I.	Waste Valorization for Bioenergy and Bioproducts	Elsevier	2024
		2.	Pal, BD Tiwari, KA .	Sustainable Valorization of Agriculture & Food Waste Biomass	Springer Open	2023

		3.	Shah, S. Venkatramanan, V . Prasad, R.	Bio-valorizationof Waste Trends and Perspectives	Springer	2021
	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