

Attachment no. 3		Course program of the first, second and third cycle of studies			
1.	Subject	OXIDANTS AND ANTIOXIDANTS (NATURAL AND SYNTHETIC)			
2.	Code	ITHN-10			
3.	Study Program	<i>Innovative technologies on food and nutrition</i>			
4.	Study Program organized	Faculty of Technology and Technical Science- Veles			
5.	Degree (first, second, third cycle)	Phd			
6.	Academic year/ semester	1 / II	7.	Number of EKT credits	5
8.	Professor	Prof.d-r Valentina Pavlova Red.prof.d-r Marija Srbinska Doc.d-r Daniela Nedelkovska Nikoloska Vonr.prof.d-r Goce Cilev			
9.	Precondition for taking the subject	Postgraduate studies completed			
10.	<p>Objectives/Competence:</p> <p>During this course the properties and effects of antioxidants, oxidants and free radicals has been studied. The student will be capable to learn mechanisms of oxidation of food components and antioxidant activity, determination and analysis of food oxidizers and oxidants, antioxidants during food preparation, effects of oxidation of nutritive and health value of food. The student will build a skill to evaluate their role for health and disease in humans, especially in terms of developing the many interactions between oxidants and antioxidants, to learn how these substances can act as natural protectors and/or natural toxins.</p>				
11.	<p>Program Content:</p> <p>Redox systems, radicals and antioxidants. Analysis of free radicals, their reaction products and antioxidants. Response to the antioxidant system of physical and chemical stress. Glutathione and its role to protect the tissues. Oxygen and oxidative stress; peroxidation of lipids and destruction of the liver. Antioxidants in food. Anticancer effects of synthetic phenolic antioxidants.</p>				
12.	Methods of learning: audiovisual				
13.	Time fund	150 hours			
14.	Time distribution	50+30+30+20+20 =150			

15.	Teaching activities	15.1.	Lectures - Theory	50 hours
		15.2.	Exercises (Laboratory, audio), Seminars, Team work	30 hours
16.	Other forms of activities	16.1.	Projects	30 hours
		16.2.	Independent tasks	20 hours
		16.3.	Home learning	20 hours
17.	Way of estimation the results			
	17.1.	Tests/oral exam		80 points
	17.2.	Seminars/ Project (presentation: written and oral)		10 points
	17.3.	Activity/Participation in discussions		10 points
18.	Evaluation Criteria (points/ grades)	Up to 50points		5 (five) (F)
		From 51 to 60 points		6 (six) (E)
		From 61 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)
19.	Precondition for going to final exam	Seminar	
20.	Language of teaching	Macedonian, English	

22.	Literature				
	Compulsory literature				
	Ред. број	Author	Title	Publisher	Year of publishing
	1.	Steven Baskin, Harry Salem	Oxidants, antioxidants and free radicals	Taylor & Francis ISBN10:15603 26441	1997

22.1.	2.	Grzegorz Bartosz	Food oxidants and antioxidants: chemical, biological and functional properties	CRC Press ISBN:9781439882412	2013
	3.	<i>Mirjana M. Đukić</i>	Oksidativni stres:slobodni radikali,	Mono i Manjana	2010

Additional literature					
Ред. број	Автор	Наслов	Издавач	Година	
22.2.	1.	Chandan Sen, Lester Packer, Osmo Hänninen	Handbook of oxidants and antioxidants in	Elsevier ISBN:978-0-444-82650-3	2000
	2.	Helmut Sies	Oxidative stress: oxidants and antioxidants	Academic Press	1991
	3.	Tova Navarra	The encyclopedia of vitamins, minerals, and supplements	Wendy Shankin	2004