

Attachment no. 3		Course program of the third cycle of studies			
1.	Course title	NANOTECHNOLOGY AND FOOD			
2.	Code	ITHN - 16			
3.	Student program	<i>Innovative technologies on food and nutrition</i>			
4.	Organiser of the student program (unit, institute, department)	Faculty of Technology and Technical Science -Veles			
5.	Degree (first, second, third cycle)	Third cycle			
6.	Academic year/ semester	1 / I	7.	Number of ECTS credits	5
8.	Professor	Vonr.prof.d-r Anka Trajkovska Petkoska Doc.d-r. Daniela Nikolovska Nedelkoska			
9.	Preconditions for enrolling on the course	/			
10.	Objectives of the course program (competences): Competences in knowledge of nanotechnologies and food. Nanomaterials as materials of future: opportunities, perspectives and risks in their usage in food. Innovative trends in application of nanotechnology and nanomaterials in food industry, food packaging, nano-sensors, etc...				
11.	Course content: - Basic concepts of nanoscience and nanotechnologies. Relationship between nanotechnology and food: opportunities, perspectives and risks. - Nanomaterials: advantages and disadvantages; safety aspects of nanomaterials in food. - Bionanotechnology and food industry, natural food nanostructures. Nnano-ingridients and food additives (encapsulation, transport mechanisms of nutrients, structure and modification, antimicrobial nanomaterials, antioxidants...) - Engineered nanomaterials in contact with food (nanocoatings in food industry, thin films in packaging systems, nanomaterials in packed food products). Nanocomposite materials and their application in food processing sector (nanodopants, biopolymers, nano-biocomposites) - competences in nanotechnologies in food industry, nanotechnologies in food packaging, nano-biosensors.				
12.	Methods of studying:				
13.	Total available time fund	150 classes			
14.	Distribution of the available time	50 + 50+20+30 = 150			
15.	Forms of teaching activities	15.1.	Lectures- theoretical instruction	50 classes	
		15.2.	Exercises (laboratory, auditorium), seminars, teamwork	classes	
16.	Other forms of activities	16.1.	Project exercises	50 classes	
		16.2.	Independent exercises	20 classes	
		16.3.	Home learning	30 classes	
17.	Methods of assessment				
	17.1.	Tests			80 points
	17.2.	Seminar work / project, presentation written and oral			10 points
	17.3.	Activity and participation			10 points
18.	Assessment criteria (points/grade)	Up to 50 points		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.	Condition for getting a signature and taking the final exam	
20.	Teaching language	
21.	Method of monitoring the quality of teaching	

22.	Literature				
22.1.	Compulsory literature				
	Number	Author	Title	Publisher	Year
	1.	Jatindra K. Sahu	Intorduction to Advanced Food Process Engineering	Taylor & Francis Group, LLCCRC	2014
	2.	Bhesh Bhandari	Food Materials Science and Engineering	Blackwell Publishing Ltd	2012
	3.	David E. Reisner	Bionanotechnology-global prospects	Taylor & Francis Group	2009
	4.	Qasim Chaudhry, Laurence Castle, Richard Watkins	Nanotechnologies in Food	Royal Society of Chemistry	2010
	5.	Lynn J. Frewer, Willem Norde, Arnout Fischer, Frans Kampers	Nanotechnology in the Agri-Food Sector	Wiley-VCH Verlag GmbH & Co. KGaA	2011
	6.	S. Clark, S. Jung, B. Lamsal	Food Processing-Principles and Applications, IInd Ed.	John Willey&Sons Ltd.	2014
22.2.	Number	Author	Title	Publisher	Year
	1.	Debasis Bagchi et. al.	Bio-Nanotechnology A Revolution in Food, Biomedical and Health Sciences	John Wiley & Sons, Ltd	2013
	2.	Jeremy Ramsden	Nanotechnology	Jeremy Ramsden & Ventus Publishing ApS	2009
	3.	Alan Kin-Tak Lau, Farzana Hussain, Khalid Lafdi	Nano- and Biocomposites	Taylor and Francis Group, LLC	2010
	4.	Leslie Pray and Ann Yaktine	Nanotechnology in food products	The National Academies Press	2009
	5.	Rory A. Wolf	Plastic surface modification : surface treatment, decoration, and adhesion	Carl Hanser Verlag, Munich	2010
	6.	Sharmila M. Mukhopadhyay	Nanoscale multifunctional materials	John Wiley & Sons, Inc	2012
	7.	Ben Rogers et. al.	NaNotechNology - the Whole Story	Taylor & Francis Group	2013
8.	Abdel Salam Hamdy Makhlouf and Ion Tiginyanu	Nanocoatings and ultra-thin films	Woodhead Publishing Limited	2011	