COURSES OFFERED IN ENGLISH

faculty of food technology and biotechnology

University of Zagreb

Semester: Winter						
COURSE	COURSE TEACHER	L	S	E	e-learning	ECTS
Modelling and Optimisation in Nutrition	Jasenka Gajdoš Kljusurić	20	10	20	0	4
Modelling in Food Engineering	Jasenka Gajdoš Kljusurić	25	5	10	0	3
Basics of Measurement Methods in Nutrition	Jasenka Gajdoš Kljusurić	10	15	15	0	3
Process Measurement and Control in Food Engineering	Jasenka Gajdoš Kljusurić	25	0	20	0	3
Food Packaging	Kata Galić	25	0	15	0	4
Selected Topics in Food Packaging	Kata Galić	15	15	0	0	3
Genetics of Industrial Organisms	Ksenija Durgo	20	0	15	0	3
The Fundamentals of Bioorganometallic Chemistry	Lidija Barišić	15	0	23	0	3
Peptidomimetics and Pseudopeptides	Lidija Barišić	15	4	20	0	3
Chemistry and Technology of Cereals	Duška Ćurić	60	15	45	0	10
English 2	Dijana Njerš	10	15	0	0	1

Semester: Summer						
COURSE	COURSE TEACHER	L	S	E	e- learning	ECTS
Shelf Life of Packaged Foodstuffs	Mario Ščetar	15	15	0	0	3
Nutrigenomics	Jurica Žučko	20	10	20	0	4
Bioinformatics	Antonio Starčević	20	10	10	0	4
Ecogenetic Studies	Ksenija Durgo	12	12	0	0	2
Biochemical Analysis	Vladimir Mrša	30	0	45	0	6
Biochemical Function of Vitamins and Ions in Food and Nutrition	Vladimir Mrša	45	0	0	0	5
Powder Technology	Maja Benković	20	10	0	0	3
Organic Chemistry	Lidija Barišić	30	15	30	0	6
Ultrasound in Food Engineering	Mladen Brnčić	30	20	10	0	5
Mechanisms of Evolution	K <u>senija</u> <u>Durgo</u>	20	15	0	0	3
Mineral, Spring and Table Water	Josip Ćurko	15	0	22	0	3
Membrane Bioreactors in Environment Protection	Marin Matošić	15	7	15	0	3
Production of Predicate and Sparkling Wines	Natka Ćurko	20	7	8	0	3
English 4	Dijana Njerš	20	30	0	0	3
Probiotics and starter cultures	Blaženka Kos	16	0	23	0	3

COURSE ENROLMENT REQUIREMENTS

Modelling and Optimisation in Nutrition	Mathematics Basic Informatics
	Transport Dhenomena
Process Measurement and Control in Food Engineering	Unit Operations
	Statistics
Constic Engineering	Molecular Genetics
	Biochemistry 1

INFORMATION ON INDIVIDUAL EDUCATIONAL COMPONENTS

1. GENERAL INFORMATION							
1.1. Course lecturer(s)	Jasenka Gajdoš Kljusurić, PhD, Full Professor Davor Valinger, PhD, Assistant Professor Ana Jurinjak Tušek, PhD, Assistant Professor Tamara Jurina, PhD Jelena Đugum, PhD, Assistant Professor	1.8. Semester when the course is delivered	winter				
1.2. Course title	Modelling and Optimisation in Nutrition	1.9. Number of ECTS credits allocated	4				
1.3. Course code	32441	1.10. Number of contact hours (L+E+S+e-learning)	20 + 18 + 10 + 2				
1.4. Study programme	Undergraduate university study programme Nutrition	1.11. Expected enrolment in the course	50				
1.5. Course type	compulsory	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	2. 5 %				
1.6. Place of delivery	lectures in P2, exercises in P6	1.13. Language of instruction	Croatian & English				
1.7. Year of study when the course is delivered	second	1.14. Mogućnost izvođenja na stranom jeziku	Υ				
2. COURSE DESCRIPTION							
2.1. Course objectives	Through the introduction to the distribution of DRI (recommendation individuals will be clarified. Studen databases and apply the basics of lin be used in programming of meals an of the aims (more goal functions: pr in optimizing age, gender and energy and storage on nutritional value an loss during thermal treatment. Thro PC tools for optimization and analy of fuzzy logic that is used daily in f intake" and so on).	e Course Modeling and Optim on) and their differences in nutrition its will learn how to use the ener near optimization (Simplex metho and daily/weekly meal plans. Paret rice, nutrition and preferences). D cy needs. It also analyses the impa- ned the energy and nutritional com bugh lectures and exercises, stude rysis of menus. The Course is also food science (eg. linguistic variab	ization in Nutrition, the on planning for groups and rgy and nutrition content d). Recommendations will o Optimization will be one iversity will be highlighted ct of technological process aposition of foods and the nts will investigate various aimed to teach the basics les as "slightly", "increase				
2.2. Enrolment requirements and/or entry competences required for the course	To enrol in this course, the followin Mathematics Basic Informatics	g courses must be completed:					
2.3. Learning outcomes at the level of the programme to which the course contributes	 have knowledge and understanding of specific and general skills and knowledge of basic and applied disciplines define and explain particular problems in the systems which deal with food preparation or food distribution to targeted population groups / individuals in state and private institutions of the above mentioned profile define and explain methods in the systems which deal with dietary status assessment of nation and / or an individual in state and private institutions of the above mentioned profile understand and apply appropriate methods in the systems which deal with diet quality assessment on national and / or individual level collect and interpret results obtained by methods which assess diet quality of healthy provide a state of the above methods. 						

	 present indep 	bend	ently a	nd / or as a mem	ber of	the h	omogenous or interdi	sciplinar	γ			
	team results i	in vei	rbal an	d written form, u	sing pi	rofess	ional terminology					
	 present and p 	opul	larize t	he profession								
	• apply ethical	princ	iples i	n relationships to	cowor	kers a	and employer					
	 use and value 	use and value scientific and occupational literature with the aim of lifelong learning and										
	profession en	profession enhancement										
	Define the dif	Define the differences in model division and differentiate data from informatic										
	important in	nutri	tion									
	• define and describe the database on the chemical composition of the food and identify											
	what affects the nutritional value of foods (in most cases)											
	explain the modeling of nutritional recommendation distribution curves and their											
	statistical bac	kgro	und ar	nd distinguish sim	ilaritie	s and	differences in nutritio	on plann	ing.			
2.4. Expected learning	 adapt dietary 	reco	mmer	idations to differe	ent use	rs usi	ng computer program	ns (eg ad	justing			
outcomes at the level of	programs to	or di	tteren	t gender, age,	physi	cal a	activity, etc. based	on di	fferent			
the course (3 to 10	needs/recom	men	dation	s)					C . 1			
learning outcomes)	 define the ba 	SIC ST	ructur	e of each step in	nutrit	ion p	lanning through the s	tructure	of the			
	LINDO progr	am	(a goa	al associated wi	th hu	tritioi	hal constraints) and	nigniigi	nt the			
	amerences in	nuti	пиопа	i supply planning	anu m	pian	ning of optimal condi	lions for	anew			
	 define and ex 	nlain	what	are linguistic vari	ablesa	and w	by they are applied in	nutritio	'n			
	 define and ex address set to 	piaii acke	that a	ane iniguistic vari	a in no	nu w	ment with analysis a	nd comr	narison			
	with explicit v	asks Value	s (such	pply insignificance as for example	recom	men	henri with analysis a		Janson			
	The subject is fund	dame	ental o	n the second yea	r of un	dergr	aduate study (4 FCTS)	and it is	s			
	performed throug	the	e follo	wing units:				,	-			
	1) Modeling and models in nutrition											
	(Data and informa	ation.	Mode	els and modeling.	The ap	oplica	tion and review of typ	oes of				
	modeling and models in nutrition. The recommendations of the daily intake of nutrients;											
	model examples)											
	2) Databases of the chemical composition of foods (Databases of energy and nutritional											
	composition of for	ods.	Definir	ng different types	of dat	abase	e structures and wher	e they b	elong			
	to. The developm	ent a	nd life	span of a databas	se on c	hemi	cal composition. Ther	mal trea	tment			
	of foods and data	base	s.)									
	3) Meal/menu crit	teria,	dimer	isions and decision	on theo	ory in	the analysis and plan	ning of				
	meals/menus (and	alysis	and p	ianning menus th	rougn	criter	hasis of the rules)	plicatio	n of			
2.5. Course content	(1) Linear ontimiza	tion	eu rea	soning and concil analysis and mea	ISION O	n the Uplan	basis of the rules)					
(syllabus)	(Basics of linear of	ntimi	zation	the Simplex met	hod t	he str	ucture of the linear n	rogram	The			
	recommendation	s in li	near p	rogramming and	planni	ng me	eals and menus. The d	lifferenc	es in			
	the optimization of	consi	dering	the age, gender a	and en	ergyi	needs. Summary of w	ork with	the			
	software for optin	nizat	ion, pr	ogramming and a	inalysis	s of fo	, ood / menu. Optimizat	tion and	meal			
	planning, menu, a	nd a	new p	roduct.)								
	5) Fuzzy logic in n	utriti	on									
	(Linguistic variable	es an	d theiı	r relationship with	n nutri	tion. ⁻	The basics of fuzzy log	ic and it	S			
	applications in an	alysis	and p	lanning meals an	d men	us. Di	versity membership f	unctions	of			
	energy and nutrients fuzzy set due to age, gender and energy needs. Pareto optimiza (more equally important objective function). The basics of fuzzy optimization. Defuzz								on .			
									cation			
	(translation fuzziness in the express collection) using Prerow value).							soc in				
	course objective:	ram s dov	ulong	ig with models, h	o thin	ng an king s	a optimization proces	nrofossi	on			
	nutrition as well d	s uel	/eiopit		e uiii	KIII G		professi	011.			
	🛛 lectures			assignments			2.7. Comments:					
	🛛 seminars and w	vorks	hops	X multimedia a	nd the							
2.6 Format of instruction	🛛 exercises			internet								
	□ online in entire	ty										
	🗆 partial e-learnin	ng		\square work with m	entor							
	🛛 field work			\Box (other)								
	Class			<u> </u>								
2.8. Praćenje rada studenata	attendance		Ν	Research	Y		Oral exam		N			

	Experimental work	ſ	N	Report		Ν	(other)				
	Essay	1	N	Seminar paper	Y		(other)				
	Preliminary exam	1	N	Practical work	Y		(other)				
	Project	ſ	N	Written exam	Y		ECTS credits (total)		4		
	Two partial exams are written, each lasting 60 minutes and bringing 30 points.										
	the first partial exam is taken mid-semester the second partial exam is taken at the end of semester										
	A minimum of 15	points r	need	ds to be achieved	on the	e parti	ial tests to pass.				
2.9. Assessment methods and criteria	Students also make a seminar paper covering a given topic and implying group work. seminar paper is orally presented and shows team work in which through course knowle application – data needed for computer nutrition planning is gathered and organized, with objective of adoption of expert terminology, rounding up the whole and summing up or facts and independent conclusions related to the seminar paper theme. The maximum number of points for the seminar paper is 40. The exam is used for assessing knowledge level, and the seminar paper for assessing knowled application level. Through additional, continuous work (monitored through homework) an additional five particle can be achieved. The final grade is a sum of partial tests points and seminar paper points (and homework particle if applicable). The final grade is achieved according to the total number of points: $<51 \rightarrow fail (1)$ $51 - 62 \rightarrow sufficient (2)$ $63 - 75 \rightarrow good (3)$ $76 - 88 \rightarrow very good (4)$ $89 - 100 \rightarrow$ excellent (5) Students who did not take or did not pass one of the partial exams in the first take, have t right to retake the exam in partial form (in the first exam period immediately following th second partial exam). Students who didn't pass any partial exam and the ones who did not						rk. The wledge vith the crucial wledge e points points, points, re the the not g the				
	Students who are unsatisfied with the final grade can take the oral exam										
2.10. Student responsibilities	 Students who are unsatisfied with the final grade can take the oral exam. To pass the course, students have to: successfully do all the exercises in practical work pass the exam (through partial exams or writing the entire course content) prepare a seminar paper attend classes (a maximum of two absences is allowed, any further absence makes 										
2.11. Required literature			Tit	le			Number of copies in the	Availabili other m	ty via edia		
(available in the library and/or via other media)	J. Gajdoš Kljusurić Nutrition (reviewe	(2011) d interi	Mo nal :	delling and Optim script)	nisatio	n in	0	YES, Merli web pa	in and ges		
2.12. Optional literature	 Kurtanjek, Ž., characteristic Food Science pp. 285 – 302 Gajdoš Kljusu Therapy – Adv Applications (Nutrition (reviewed internal script) Kurtanjek, Ž., Gajdoš Kljusurić, J. (2014) Statistical modelling of anthropometric characteristics evaluated on nutritional status. U Mathematical and Statistical Methods in Food Science and Technology (ur. Granato, D. i Ares, G.) John Wiley and Sons, Oxford, UK. pp. 285 – 302. Gajdoš Kljusurić, J., Rumora, I., Kurtanjek, Ž. (2012) Application of Fuzzy Logic in Diet Therapy – Advantages of Application. U Fuzzy Logic – Emerging Technologies and Applications (ur. Dadios, E.P.). InTech. Bijeka 									

	• Koh, Eunsook T., Owen, Willis L. (2001) Introduction to Nutrition and Health Research. Springer.
2.13. Exam dates	Exam dates are published in Studomat.
2.14. Other	-

1. GENERAL INFORMATION							
1.1. Course lecturer(s)	Jasenka Gajdoš Kljusurić, PhD, Full Professor Davor Valinger, PhD, Assistant Professor Ana Jurinjak Tušek, PhD, Assistant Professor Tamara Jurina, PhD	1.8. Semester when the course is delivered	winter				
1.2. Course title	Modelling in Food Engineering	1.9. Number of ECTS credits allocated	3				
1.3. Course code	53291	1.10. Number of contact hours (L+E+S+e-learning)	25 + 9 + 5 + 1				
1.4. Study programme	Graduate university study programme Food Engineering	1.11. Expected enrolment in the course	10				
1.5. Course type	optional B	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	2. 5 %				
1.6. Place of delivery	lectures in P6, exercises in the LMRA	1.13. Language of instruction	Croatian and English				
1.7. Year of study when the course is delivered	first	1.14. Mogućnost izvođenja na stranom jeziku	Y				
2. COURSE DESCRIPTION							
2.1. Course objectives	 By means of models clarify food production processes because the development of biotechnical sciences leads to the need to study, monitor and control an increasing number of parameters - morphological, physiological, and chemical, etc. Progressive increase of parameters and data that in very complex relationships are facilitated by statistical models and procedures that provide a complete picture of the observed measuring system that is the subject of research. Univariate analyses that individually analyse variables do not provide sufficiently reliable options for aggregating multiple observations, nor ultimately for a proper scientific conclusion. On the other hand, multivariate analysis is a branch that is involved in the analysis of multiple measurements of a larger number of variables on one or more of the observed samples. Through this subject we will start from simple tests and regression models, and through the application of multivariate analysis methods, clarify application in food engineering, and how and by using these methods can and must be concluded. Using examples from the biotechnical field (with particular reference to the food industry) to demonstrate the application and purpose of modeling and to use the data collected for 						
2.2. Enrolment requirements and/or entry competences required for the course	-						
2.3. Learning outcomes at the level of the programme to which the course contributes	 know key aspects of food production and food industry understand basic principles of research work understand the importance of environment protection and know the systems and methods of environment protection supervise and manage the quality management system for production processes in food production conceptualize and carry out improvement of existing technological procedures conceptualize and carry out production of new products 						

		conduct scien	ntific re	esearch	n in the field of	food								
 identify the need to improve certain segments in such companies present moder find of technology trends apply thick principles, legal regulations and standards related to specific requirements of the profession use and values celentific and occupational literature with the aim of lifelong learning and profession enhancement 2.4. Expected learning outcomes) add written way, using appropriate terminology use and values celentific and occupational literature with the aim of lifelong learning and profession enhancement define mathematical modeling and its application (and importance) in food engineering identify primary and secondary 'Variables'' in the observed system with the use of technological processes models evaluate the application of modeling and chemometric techniques in processing experimental data organize data analysis methods by complexity (descriptive analysis) plan complex data analysis, factor analysis and main component analysis) plan complex data analysis, factor analysis and main component analysis) plan complex data analysis according to the set research goals, using the chemometric tools (lauser analysis) plan complex data analysis according to the set objectives of the research, using chemometric tools (lauser analysis) presentiation method of data analysis according to the set objectives of the research, using chemometric tools (lauser analysis) The vagiazation and valid conclusions in the observed multivariate system using specific computer system in the roadilazion of maching and chemometric techniques in the roadilazion of analysis and threir data indivisi) the organization of apace by chemometric method. Process		make everyday decisions related to production processes in food produc								anies				
Present modern food technology tends apply contemporary optimal communication methodology with their colleagues in verbal and written way, using appropriate terminology apply optimal principles, legal regulations and standards related to specific requirements of the profession use and value scientific and occupational iterature with the aim of lifelong learning and profession enhancement define mathematical modeling and its application (and importance) in food engineering identify principles, legal modeling and the observed system with the use of technological processes models vealuate the application of modeling and chemometric techniques in processing experimental data organize data analysis methods by complexity (descriptive analysis and multivariate analysis) plan complex data analysis according to the set research goals, using the chemometric tools (cluster analysis, factor analysis and main component analysis) create and evaluate conclusions about the connection of variables and amples in the observed multivariate system using certain computer skill (Sec.I.XIstat, B program) Mathematical modeling and its application (and importance) in food engineering the organization method of data analysis according to the complexity of the (descriptive analysis) and wall donclusions in the observed multivariate system using getain computer skill (Sec.I.XIstat, B program) Mathematical modeling and their basics. Models through the manufacturing system in the food industry. Basics of bata Analysis according to the complexity of the (descriptive analysis) Interpretation and valid conclusions in the observed multivariate system using specific computer skills the available computer skills and afform analysis. Interpretation and valid conclusions in the observed multivariate system in the food industry. Basics of bata Analysis and Computer Supopt Overive Wetermining the Space of Major Components anal t		identify the need to improve certain segments in such companies												
 apply contemporary optimal communication methodology with their colleagues in verbal and written way, using appropriate terminology apply ethical principles, legal regulations and standards related to specific requirements of the profession use and value scientific and occupational literature with the aim of lifelong learning and profession enhancement define mathematical modeling and its application (and importance) in food engineering identify primary and secondary "variables" in the observed system with the use of technological processes models evaluate the application of modeling and chemometric techniques in processing experimental data organize data analysis methods by complexity (descriptive analysis and multivariate analysis) plan complex data analysis according to the set research goals, using the chemometric tools (cluster analysis, factor analysis and multivariate analysis) create and evaluate conclusions about the connection of variables and samples in the observed multivariate system using certain computer skills (Excel. X15tat, Program) How to evaluate the application (and moportance) in food engineering. How to evaluate the application (and moportance) in food engineering. How to evaluate the application (and moportance) in the processing of experimental data 2.5. Course content (syllabus) The organization method of data analysis according to the set objectives of the research, using chemometric tools (cluster analysis, factor analysis and principal component analysis) in the available computer subjects or of the research, using chemometric tools (cluster analysis, factor analysis and principal component analysis) in the available computer subject work busing processes and principal component analysis) in the available computer subject wore		 present modern food technology trends 												
2.4. Expected learning outcomes at the level and written way, using appropriate terminology apply ethtical principles, legal regulations and standards related to specific requirements of the profession use and value sciency and value sciency "variables" in the observed system with the use of technological processes models evaluate the application of modeling and the application (and importance) in food engineering evaluate the application of modeling and chemometric techniques in processing experimental data organize data analysis methods by complexity (descriptive analysis) plan complex data analysis according to the set research goals, using the chemometric tools (duter analysis) create and evaluate conclusions about the connection of variables and samples) create and evaluate conclusions about the connection of variables and samples) create and evaluate conclusions about the connection of variables and samples) create and evaluate conclusions about the connection of variables and samples) create and evaluate conclusions about the connection of variables and samples) create and evaluate conclusions in the observed multivariate system using certain components and chemometric techniques in the processing descriptive analysis) the organization method of data analysis according to the set objectives of the research, using chemometric tools (cluster analysis, factor analysis and multivariate system using specific computer skills in the available computer skills and related to food analysis) the topics are as follows: 2.5. Fourse content (system) abacoratory, bapply or greessan models for motioring and		• apply contemporary optimal communication methodology with their colleagues in												
Papply ethical principles, legal regulations and standards related to specific requirements of the profession use and value scientific and occupational literature with the aim of lifelong learning and profession enhancement define mathematical modeling and its application (and importance) in food engineering, identify primary and secondary "variables" in the observed system with the use of technological processes models experimental data organize data analysis according to the set research goals, using the chemometric tools (cluster analysis), plan complex data analysis according to the set research goals, using the chemometric tools (cluster analysis), create and evaluate conclusions about the connection of variables and samples in the observed multivariate system using certain computer skills (Excel. XISA, R program) despremental data requinize the application of modeling and chemometric techniques in the processing of experimental data requinization method of data analysis according to the complexity of the (descriptive analysis and multivariate analysis) the valuate the application of modeling and theometric techniques in the processing of experimental data The organization method of cluster analysis according to the set objectives of the research, using chemometric tools (cluster analysis, factor analysis and principal component analysis) The way you design complex data analysis according to the set objectives of the research, using chemometric tools (cluster analysis, factor analysis and principal component analysis) The way you design complex data analysis according to the set objectives of the research, using chemometric tools (cluster analysis according to the set objectives of the research, using chemometric tools (cluster analysis according to the set objectives of the research, using chemometric tools (cluster analysis and principal component analysis) The topics are as follows:		and written w	and written way, using appropriate terminology											
Constrained by the profession of the profession of the profession enhancement curve and value scientific and occupational literature with the aim of lifelong learning and profession enhancement cellent of the profession of modeling and its application (and importance) in food engineering identify primary and secondary "variables in the observed multivariate space of the analysis is according to the set research goals, using the chemometric tools (cluster analysis, factor analysis and main component analysis) create and evaluate conclusions about the connection of variables and symples in the observed multivariate symmetry (descriptive analysis) create and evaluate conclusions about the connection of variables and symples in the observed multivariate symmetry and profession (figure analysis, factor analysis, and main component analysis) create and evaluate the application of modeling and the mometric techniques in the processing of experimental data The organization method of data analysis according to the set objective of the research, but you design complex data analysis according to the set objective of the research, using chemometric tools (cluster analysis, according to the set objectives of the research, using chemometric tools (cluster analysis, according to the set objective of the research, using chemometric tools (cluster analysis, according to the set objective). The value take and utivariate analysis according to the set objective of the research, using chemometric tools (cluster analysis, according to the set objective) of the research, whole the application of modeling and theorematical and the analysis according to the set objective of the research, whole the application of profession models for analysis and using chemometric tools (cluster analysis, according to the set objective of the research, using chemometric tools (cluster analysis, according to the set objective) of the research, assis of Data Analysis and Computer Support Overview Determining the Space of Majo		• apply ethical	princip	oles, le	gal regulations	and sta	ndar	ds related to specific r	equirem	nents				
 use and value scientific and occupational Iterature with the aim of lifelong learning and profession enhancement define mathematical modeling and its application (and importance) in food engineering identify primary and secondary "variables" in the observed system with the use of technological processes models evaluate the application of modeling and chemometric techniques in processing experimental data organize data analysis according to the set research goals, using the chemometric tools (cluster analysis, factor analysis and main component analysis) plan complex data analysis according to the set research goals, using the chemometric tools (cluster analysis, factor analysis and main component analysis) create and evaluate conclusions about the connection of variables and samples in the observed multivariate system using certain computer skills (Excel, XLSR, program) Mathematical modeling and its application (and importance) in food engineering. How to evaluate the application of modeling and chemometric techniques in the processing of experimental data the organization method of data analysis according to the set objectives of the research, using chemometric tools (cluster analysis) Interpretation and valid conclusions in the observed multivariate system using specific computer skills in the available computer system computer skills in the available computer system with the space of Major Component analysis) Individual semiar work with the topic modeling using processes and collected data from a chosen food production process or a part of it. 2.5. Course content (system in entitic by the main components area. Seeminar presentation (S = 2) Individual semiar work with the top it modeling using processes and collected data from a chosen food		of the profess	sion											
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes) • define mathematical modeling and its application (and importance) in food engineering outcomes at the level of the course (3 to 10 learning outcomes) • evaluate the application of modeling and chemometric techniques in processing experimental data • organize data analysis methods by complexity (descriptive analysis and multivariate analysis) • plan complex data analysis according to the set research goals, using the chemometric tools (cluster analysis, factor analysis and main component analysis) • organize data analysis analysis) • create and evaluate conclusions about the connection of variables and simples in the observed multivariate system using certain computer skills (Seck .V.Stat, R program) Mathematical modeling and its application (and importance) in food engineering. How to evaluate the application of modeling and chemometric techniques in the processing of experimental data The organization method of data analysis according to the complexity of the (descriptive analysis and multivariate analysis) The way you design computer data analysis according to the set objectives of the research, using chemometric tools (cluster analysis, factor analysis, factor analysis, interpretation and valial conclusions in the observed multivariate system using specific computer skills in the available computer programs 2.5. Course content (syliabus) The topics are as follows: Mathematical models and their basics. Models through the manufacturing system in the food industry. Basics of Data Analysis and Computer Support Overview Determining the Space of Major Components and Latert Variables. Identification of food asimples in the assignments		 use and value 	use and value scientific and occupational literature with the aim of lifeld											
2.4. Expected learning outcomes at the level of identify primary and secondary "variables" in the observed system with the use of technological processes models experimental data organize data analysis methods by complexity (descriptive analysis and multivariate analysis) plan complex data analysis methods by complexity (descriptive analysis and multivariate analysis) plan complex data analysis methods by complexity (descriptive analysis and multivariate analysis) create and evaluate conclusions about the connection of variables and samples in the observed multivariate system using certain computer skills (Exec. (XLSLR, R program) Mathematical modeling and its application of variables and samples in the observed multivariate system using certain computer skills (Exec. (XLSLR, R program) Mathematical modeling and chemometric techniques in the processing of experimental data The organization method of data analysis according to the complexity of the (descriptive analysis and multivariate analysis, forto analysis, factor analysis, factor analysis and principal component analysis) interpretation and valid conclusions the bootserved multivariate system using specific computer skills in the available computer support Overview Determining the Space of Major Components and Latent Variables. Identification and classification of the space of Major Components and Latent Variables. Identification and classification and class		profession enhancement												
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2.0. Formation instruction:	2.6 Format of instruction:	🛛 exercises			internet									
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Image: Class attendance N Research Y Oral exam N 2.8. Monitoring student work Class attendance N Research Y Oral exam N Experimental work N Report Image: Class attendance N Report Image: Class attendance N Preliminary exam Y N Seminar paper Y Image: Class attendance Image: Class attendance Image: Class attendance N Report Image: Class attendance N N Preliminary exam Y Image: Class attendance Y Image: Class attendance Image: Class attendance Image: Class attendance N N Preliminary exam Y Image: Class attendance Y Image: Class attendance Image: Class attendance Image: Class attendance N N Preliminary exam Y Image: Class attendance Y Image: Class attendance Image: Class attendance Image: Class attendance Image: Class attendance N N N N N N N N N N N N N N N N		🗆 partial e-learnii	ng			montor								
Class attendance N Research Y Oral exam N 2.8. Monitoring student work Experimental work N Report I <		□ field work				nentoi								
Class attendanceNResearchYOral examN2.8. Monitoring student workExperimental workNReportCoher)Image: Class of the state of the st		Class												
2.8. Monitoring student work Experimental work N Report (other) Preliminary exam Y Practical work Y (other)		Class		Ν	Research	Y		Oral exam		Ν				
2.8. Monitoring student work N Report (other) Preliminary exam Y Practical work Y (other)		Experimental												
work Essay N Seminar paper Y (other) Preliminary exam Y Practical work Y (other)	2.8 Monitoring student	work		Ν	Report			(other)						
Essay N Seminar paper Y (other) Preliminary exam Y Practical work Y (other)	work	WUIN			Seminar									
Preliminary Y Practical Y (other)		Essay		Ν	naper	Y		(other)						
exam		Preliminary			Practical									
		exam	Y		work	Y		(other)						

	Project		N	Written exam		N	ECTS credits (total)	3	
2.9. Assessment methods and criteria	Students make an independent seminar paper concerning food safety through the prism of models and modelling. The seminar paper is orally presented to show course knowledge application, with the objective of adoption of expert terminology, rounding up the whole and summing up of crucial facts and independent conclusions related to the seminar paper theme. The seminar paper is graded, and the oral exam is an option for students to raise their grade. The seminar paper must be handed in by the end of the semester; if the dead line is exceeded, the grade is lowered. The oral exam is held according to agreement and another student or associate is present with the lecturer and student.								
2.10. Student responsibilities	To pass the course, students have to: • successfully do all the exercises in practical work • attend a minimum of 80% of all lectures • write and hand in a seminar paper								
2.11. Required literature (available in the library			Title				Number of copies in the library	Availability via other media	
and/or via other media)	J. Gajdoš Kljusurić prehrambenom ir	J. Gajdoš Kljusurić (2013) Modeliranje i kemometrija u prehrambenom inženjerstvu (internal script) 0 YES, Merlin and web pages							
2.12. Optional literature	 R. G. Brereton: Chemometrics: Data Analysis for the Laboratory and Chemical Plant, John Wiley, 2003. Serafim Bakalis, Kai Knoerzer and Peter J Fryer (ed.) Modeling Food Processing Operations. Woodhead Publishing Series in Food Science, Technology and Nutrition, 2015 								
2.13. Exams	Exam dates are pu	Exam dates are published in Studomat.							
2.14. Other									

1. GENERAL INFORMATION						
1.1. Course lecturer(s)	Jasenka Gajdoš Kljusurić, PhD, Full Professor Davor Valinger, PhD, Assistant Professor Ana Jurinjak Tušek, PhD, Assistant Professor Tamara Jurina, PhD	1.8. Semester when the course is delivered	winter			
1.2. Course title	Basics of Measurement Methods in Nutrition	1.9. Number of ECTS credits allocated	3			
1.3. Course code	66826	1.10. Number of contact hours (L+E+S+e-learning)	10 + 14 + 15 + 1			
1.4. Study programme	Graduate university study programme Nutrition	1.11. Expected enrolment in the course	25			
1.5. Course type	optional A	1.12. Level of application of e-learning (level 1, 2, 3), percentage of online instruction (max. 20%)	2. 5 %			
1.6. Place of delivery	lectures in P6, Exercises in the LMRA	1.13. Language of instruction	Croatian i engleski			
1.7. Year of study when the course is delivered	first	1.14. Mogućnost izvođenja na stranom jeziku	Y			
2. COURSE DESCRIPTION						
2.1. Course objectives	 The subject provides an overview of the measurement methods used in nutrition, with their application. Each laboratory or the subject in the food business is collecting data in real or controlled conditions. Experimental measurements (laboratory, warehouse, food preparation place) or collected from questionnaires in the field of nutrition and food control often represent data that should be further elaborated. 					

	 During the lectures, seminars and exercises, the types of errors that may occur during the measurement can be identified and their impact on the final result can be analysed and how to properly avoid the wrong interpretation of such results. The aim of the experimental work is to clarify the importance of good interpretation of measured data and basic statistical parameters so that the student can give a critical review of the importance of measuring errors occurring during measurement and how to choose a proper measuring method and instruments. Measurements that are not directly related to the computer (eg anthropometric measurements: body height, body mass, electrical conductivity and impedance (fat tissue measurement), and operation with metering systems connected to the measurement systems), the student can evaluate the advantages and disadvantages of both measurement systems. Measuring systems computer-related with measuring instrument are very important in food preparation, warehouses, distribution, production units and control laboratories All procedures and examples of measured the method is accompanied by views of the application in practice. The ethics in data analysis is also explained.
2.2. Enrolment requirements	
competences required	-
for the course	
	 understand and have knowledge of basic and specific disciplines of the profession understand and acquire knowledge of general skills in particular interdisciplinary
	disciplines through elective modules
	 apply research methods from the field of nutrition science
2.3. Learning outcomes at the level of the programme to which the course contributes	 present and apply acquired knowledge in order to improve food monitoring systems and strategy programs on national levels, which refer to human diet, improve communication and monitoring of consumers behaviour on the food market, improve food distribution for the healthy and the ill, improve food quality assessment and nutritional and health status, improve production and processing of food and food supplements, and analysis and communication of food and diet
	 set priorities in communication referring to food and diet analyse, compare and interpret the results obtained by research methods present and popularize particular contemporary trends in the field of nutrition science to
	scientific, professional and laymen circles
	present and popularize the result of their individual and team work
	 use and value scientific and occupational literature with the aim of lifelong learning and profession enhancement
	 collect and store data, with understanding metrics as well as potential measurement errors, of the measurement / or measurement methods
	 expand and deepen their knowledge of basic principles of measurement methods in food
2.4. Expected learning	science that will enable the students better interpretation and metric analyses based on
the course (3 to 10	 critically evaluate the applicability of certain measurement procedures and the data
learning outcomes)	processing
	analyse relationships of experimental data using specific computer skills
	 practical application of different computer programs (such as Excel and Statistica) in processing and analysing measured data
	The subject is divided into 4 methodological units:
2.5. Course content (syllabus)	 Measurements and Measurement Features in Food Science (L / S / E = 4/4/3) Course contents related to method unit 1: L: The basic features of the measurement and the measurement result. Precision vs. accuracy in the measuring system. Simple and complex measurement systems and measurement errors. Confidence interval and the least square method in measuring and interpreting results. Calibration of the measuring instrument. S: Experimental data example - clarifying precision, accuracy and error (Excel). Understanding the application of reliability intervals and the method of the smallest squares in the processing of measurement results. Solve tasks on the same tasks.

	E: Collection of measurement data in the laboratory (Exercise Calibration of the pipette of different volume and determination of the density of an unknown sample) with the statistical processing of metering data; by computing the mean values, by monitoring the accuracy and precision of measurements with the calculation of measurement errors.2) Impedance as a measurement method for determining body composition and flow									
	measurement (L / S / E = $4/6/6$) Course contents related to methodical unit 2: L: Current, resistance, voltage and impedance measurement. Measurement of volume and									
	mass flow in indu S: Conductivity an on resistance and and mass flow th measurement exp E: Using an oscillo the change of tem of mass and servi due to loss of hea	 S: Conductivity and impedance through animation and calculation of fatty tissue content based on resistance and current. Getting acquainted with the basic features of measuring volumetric and mass flow through animation and flow calculation on the example of a calorimetric measurement experiment (chips, nuts, etc.). E: Using an oscilloscope to measure impedance and measurements. Calorimetry by monitoring the change of temperature during burning of a given food. Calculation of energy values per unit of mass and serving as well as comparison with data on the declaration. Calculation of faults due to loss of heat transferability. 								
	 3) Temperature, acoustics, humidity and radiation and movement of food molecules as important nutrition factors (L / S / E = 4/2/6). Course contents related to methodical unit 3: Temperature and humidity, radiation, acoustics, and motion of food molecules L: Measurement of temperature and humidity. Radiation and connection with food and nutrition. Acoustics and food. Spectroscopic Methods - Example of NIR Spectroscopy. S: Temperature and humidity as a direct and immediate measure of nutrition science, Calculation of tasks on the subject. Spectroscopy and vibration of molecules, acoustics and frequencies. 									
	E: Using an optical pyrometer in temperature measurement with the calculation of actual temperature on a remote body, apparent and relative errors. Acoustic Measurement of Fruit. NIR spectroscopy of solid and liquid samples and interpretation of the result of the food industry (level, heat transfer). Adjusts the PID controller parameters in the open and closed circuit. Application of artificial intelligence algorithms for monitoring and managing food process technologies (neural networks, fuzzy logic, genetic algorithm).									
	4. Seminar exposi Individual prepara in food science (c	tion (ation ontro	(S = 2) of a se ol, safe	minar work on th ty, public health e	e subjec etc.)	t of some measurement p	rocedure	e used		
2.6. Format of instruction	in food science (control, safe ⊠ lectures ⊠ seminars and workshops ⊠ exercises □ online in entirety □ partial e-learning □ field work			 □ independent assignments ⊠ multimedia a internet ⊠ laboratory □ work with me □ (other) 	2.7. Comments:					
	Class attendance		N	Research	Y	Oral exam		Ν		
	Experimental work		N	Report		(other)				
2.8. Monitoring student work	Essay		N	Seminar paper	Y	(other)				
	Preliminary exam		N	Practical work	Y	(other)				
	Project		Ν	Written exam	Y	ECTS credits (total)	3			
2.9. Assessment methods and criteria	One exam is taken exam consists of a Students prepare methods in nutrit course knowledge	n, in o all the semi ion o e app	duratic e them nar pa r food licatio	on of 60 minutes, nes from the syllal pers on a given the technology. The n, with the object	and the bus. neme of seminar ive of a	maximum number of poir measurement and/or mea paper is orally presented doption of expert termino	nts is 45. asureme to show logy,	The ent		

	seminar paper theme. The maximum number of points for the seminar paper is 40. The exam is used for assessing knowledge level, and the seminar paper for assessing knowledge application level. The final grade is a sum of points of the exam and the seminar paper, and is allocated according to this scale: 3. Grading scale: $< 48 \rightarrow fail (1)$ $48 - 59 \rightarrow sufficient (2)$ $60 - 71 \rightarrow good (3)$ $72 - 83 \rightarrow very good (4)$ $> 84 \rightarrow excellent (5)$ An oral exam is offered as an option to student which want to increase their grade. The oral exam is held according to agreement and another student or associate is present with the lecturer and student							
2.10. Student responsibilities	lecturer and student. To pass the course, students have to: • successfully do all the exercises in practical work • achieve a minimum of 50% of points on the written exam • attend a minimum of 80% of all lectures • write and hand in a seminar paper							
2.11. Required literature (available in the library	Title	Number of copies in the library	Availability via other media					
and/or via other media)	J. Gajdoš Kljusurić (2014) Basics of Measurement Methods in Nutrition (internal script)							
2.12. Optional literature	 Bower, John (2009) Statistical Methods for Food Scie food practitioner by John Wiley and Sons Engle, Patrice L., Menon, Purnima, Haddad, Lawrenc Concepts and Measurement (Occasional Papers (Inte Institute, Washington, DC: International Food Policy Ireton-Jones, Carol S., Gottschlich, Michele M. Bell, S Nutrition Research: An Outcomes Measurement App 	 Bower, John (2009) Statistical Methods for Food Science: Introductory procedures for the food practitioner by John Wiley and Sons Engle, Patrice L., Menon, Purnima, Haddad, Lawrence (1997) Care and Nutrition: Concepts and Measurement (Occasional Papers (International Food Policy Research Institute, Washington, DC: International Food Policy Research Institute. Ireton-Jones, Carol S., Gottschlich, Michele M. Bell, Stacey J. (1998) Practice-Oriented Nutrition Research: An Outcomes Measurement Approach Jones & Partlett Publishers 						
2.13. Exams	Exam dates are published in Studomat.							
2.14. Other	-							

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Jasenka Gajdoš Kljusurić, PhD, Full Professor Davor Valinger, PhD, Assistant Professor Ana Jurinjak Tušek, PhD, Assistant Professor Tamara Jurina, PhD	1.8. Semester when the course is delivered	winter
1.2. Course title	Process Measurement and Control in Food Engineering	1.9. Number of ECTS credits allocated	3
1.3. Course code	39769	1.10. Number of contact hours (L+E+S+e-learning)	25 + 19 + 0 + 1
1.4. Study programme	Undergraduate university study programme Food Technology	1.11. Expected enrolment in the course	70
1.5. Course type	compulsory	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	2. 5 %
1.6. Place of delivery	lectures in P4, exercises in the LMRA	1.13. Language of instruction	Croatian and English

1.7. Year of study when the	third	1.14. Mogućnost izvođenja na stranom jeziku	Y						
2. COURSE DESCRIPTION									
2.1. Course objectives	 Teach the students a systematic approach to metrology. Provide them with the necessary knowledge and experience on the methodology of experiment planning in the biotechnical field (examples from the food industry) with an emphasis on measurements, and processing data for management purposes. To enable the acquisition of knowledge for the selection of measuring devices, measurement methods and measurement accuracy analysis and static evaluation of experimental results when measuring individual Physics sizes in certain accuracy classes Introduce students with the basic concepts of system control, structural forms of management and control based on the analysis of the dynamics of the system in technological processes, in the food industry. In addition to the theoretical basis, practical knowledge of PID regulator parameters for higher-level system models with time lag is also gained. 								
2.2. Enrolment requirements and/or entry competences required	To enrol in this course, the follow Transport Phenomena Unit Operations 	ving courses must be completed:							
for the course	Statistics								
2.3. Learning outcomes at the level of the programme to which the course contributes	 apply knowledge and skills f the field of food technology apply acquired knowledge a technological processes of fi identify, analyse, solve simp physical-chemical control la apply and integrate the acqui work (quality control of prodi- identify problems in product subordinates collect and interpret results summarize conclusions base present plant, research, labor using professional terminolocies develop learning skills which conscience about the need of apply ethical principles, legation 	rom basic, applied and engineering and skills from food engineering pra- ood production and processing ale problems, and do complex jobs in boratories of food industry uired knowledge and skills and part duction and food) tion and communicate them to their of laboratory food analyses ed on research results from the field oratory and business results in verb ogy n are needed to continue studying a of lifelong learning al regulations and standards related	scientific disciplines in ctically in the conduct of n microbiological and icipate in quality control ir superior and d of food technology al and written form, at graduate levels and to specific requirements						
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 assess the calibration proced range of the measuring instru- review different statistical in with accuracy and precision describe different measurem valorise the various measurem evaluate the basic concepts of management (program, feed validate the simulation of system industry distinguish linear systems by the food industry 	lure, the importance of the accurac uments dicators in the analysis of laborator ment methods used in the food indu ement methods used in the food indu of management of technical system lback and pre-connection) stem dynamics in the manufacturing using transfer functions of basic te	y class and the measuring y results and relate them stry lustry is and structural forms of g process in the food chnological operations in						
2.5. Course content (syllabus)	The subject is divided into 3 basic 1) Basic measurement and produce measurement data (L / S / E = 6/3) Course contents related to methor Basic features of measurement a of measurement data (measurement (The basic features of measurement the measurement system. The pro- (simple and complex). Accuracy of	c methodological units: action process management function 3/3) od unit 1: nd management of the production nent system and its features). ent and management and review of recision vs. accuracy in measuremer class in a measurement system. Mea	ns and processing of process, and processing f measurement errors in nt. Measuring systems asurements and the						

	connection of the measurement result with a confidence interval, and the method of least squares. Calibration)										
	2) Measurement (Course contents r	of indiv related	vidual I to me	physical units in hodical unit 2:	the fo	od pro	oduction process (L /	S / E = 9	/6/9)		
	Measurement of t process (current, the molar flow rat thermistors) and of measurement	Veasurement of the individual process(es) (individual measurements in the production process (current, voltage, resistance, pressure, humidity, level, flow rate (mass, volume, and the molar flow rate, the flow of energy in the example calorimetry), temperature (and the thermistors) and radiation (thermography and spectroscopy)). the divisions and descriptions of measurement methods for each measured value)									
	3) Automation Pro Course contents r Automation and I (Introduction to the classification size poles of the trans Feedback Control parameters in ind of the system)	3) Automation Process and Dynamic System Governance (L / S / E = 9/3/9) Course contents related to method unit 3: Automation and Industrial Control Systems (Introduction to the automation and industrial control systems. The meaning and classification size in the control system. The dynamics of the system 1st and 2nd degree. The poles of the transfer function. Features management with two common types of automation: Feedback Control and Sequence Control. Introduction to algorithms tuning PID controller parameters in industrial drives, and use of computer programs for the analysis and simulation of the system)									
	Seminar paper -	· optio	n for a	dditional points							
2.6. Format of instruction	 ☑ lectures ☑ seminars and workshops ☑ exercises 			□ independen assignments ☑ multimedia	it and th	e	2.7. Comments:				
	 □ online in entirety ⊠ partial e-learning ⊠ field work 			□ work with mentor							
	Class attendance		N	Research	Y		Oral exam		N		
2.8. Monitoring student	Experimental work	ļ	N	Report		N	e-learning tests	Y			
work	Essay		N	Seminar paper	Y		(other)				
	Preliminary exam	Y		Practical work	Y		(other)				
	Project		N	Written exam	Y		ECTS credits (total)	3	3		
2.9. Assessment methods and criteria	 Maximum num partial exam partial exam partial exam Final exam (exerci Exercises (Prelimit Total Students can get I Seminar paper Test/e-learning Bonus points are a Partial exams In the exam perio partial exams, tak Passing prior part Grading scale: < 51,0 fail (1) ≥ 51,1 - 62,0, sufl > 62.1 - 75,0 goog 	iber of ises) nary ex bonus 5 2 added id, the king the ial exa ficient d (3)	[:] point xam) points up to failed e exan ms is i	s by activity typ 40 30 12,5 17,5 100 c partial exam is t n in the exam penot a prerequisit	get the aken. I riod is te for ta	final g f stude consic aking t	grade. ents do not pass the lered to be the first e the subsequent ones	course v examinat	<i>r</i> ia tion.		

	\geq 75,1 – 88,0 very good (4) \geq 88.1 excellent (5)								
	An oral exam is offered as an option to students who want to increase their grade. The oral exam is held according to agreement and another student or associate is present with the lecturer and student.								
2.10. Student responsibilities	 To pass the course, students have to: achieve a minimum of 50% of points on the prelin (exercises) pass the preliminary exams and successfully do a attend all lectures (a maximum of two unjustified achieve a minimum of 51 % of points on each par 	 pass the course, students have to: achieve a minimum of 50% of points on the preliminary exams in practical work (exercises) pass the preliminary exams and successfully do all the exercises in practical work attend all lectures (a maximum of two unjustified absences is allowed) achieve a minimum of 51 % of points on each partial exam 							
2.11. Required literature (available in the library	Title	Number of copies in the library	Availability via other media						
and/or via other media)	J. Gajdoš Kljusurić i sur (2016) Mjerenja u prehrambenoj industriji (internal script)	0	YES, Merlin and web pages						
2.12. Optional literature	 ndustriji (internal script) web pages Bhuyan, M. (2007) Measurement and Control in Food Processing. CRC, Taylor & Francis Group. Kurtanjek, Ž., Gajdoš Kljusurić, J. (2014) Mathematical and Statistical Methods in Food Science and Technology (ur. Granato, D. i Ares, G.) John Wiley and Sons, Oxford, UK. Chau, P.C. (2002) Process Control: A First Course with MATLAB, Cambridge University Press, United Kingdom. 								
	 Press, United Kingdom. Prljača, N., Šehić, Z. (2008) Automatsko upravljanje: a 	analiza i dizajn. N	/ikroštampa, Tuzla.						
2.13. Exam dates	 Press, United Kingdom. Prljača, N., Šehić, Z. (2008) Automatsko upravljanje: a Exam dates are published in Studomat. 	analiza i dizajn. N	Лikroštampa, Tuzla.						

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	<u>Kata Galić, PhD, Full Professor</u> <u>Mario Ščetar, PhD, Assistant</u> <u>Professor</u> <u>Mia Kurek, PhD, Assistant Professor</u>	1.8. Semester when the course is delivered	winter
1.2. Course title	Food Packaging	1.9. Number of ECTS credits allocated	4
1.3. Course code	53282	1.10. Number of contact hours (L+E+S+e-learning)	25 + 15 + 0 + 0
1.4. Study programme	Graduate university study programme Food Engineering	1.11. Expected enrolment in the course	50
1.5. Course type	compulsory	1.12. Level of application of e-learning (level 1, 2, 3), percentage of online instruction (max. 20%)	2. 0 %
1.6. Place of delivery	Lectures and seminars P5, Laboratory exercises in LPCC	1.13. Language of instruction	Croatian and English
1.7. Year of study when the course is delivered	first	1. 14. Possibility of instruction in English	Υ
2. COURSE DESCRIPTION	-		
2.1. Course objectives	The objective of the course is to learn packaging materials. Students will lear patterns with a particular type of food packed food.	types, methods of production a rn about food packaging methoo I packaging material as well as w	nd characteristics of food ds, food interaction vith the consequences for
2.2. Enrolment requirements and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme	 recognize the importance of all se technology applied, production ar 	gments of food production (raw nd packaging conditions , effect o	material features, of processing and

to which the course	preservation on chemical composition of food products, potential effects of packaging,												
contributes	quality assurance)												
	 select and put 	urchas	e raw	materials and p	ackag	ing m	aterials, and conduct qua	lity cont	rol of				
	raw material	s and	prod	ucts									
	 conceptualiz do highly con 	e and	carry	out improvement	nt of e	xistin	g technological procedur	es dovelon	mont				
	 uo nigniy-coi laboratories 	of for	d ind	ustry	ai, piry	SICAL		uevelop	ment				
	 make conclu 	sions	about	t selection and p	urchas	sing o	f raw materials, packagin	g and					
	equipment			· · · · · ·		0 -		0					
	• manage or w	/ork ir	ı an ir	iterdisciplinary te	eam, v	which	conceptualizes and cond	ucts					
	experiments	experiments in the field of food technology											
	 apply ethical 	apply ethical principles in relationships to coworkers and employer apply ethical principles, legal regulations and standards related to specific requirements of											
	 apply ethical the profession 	apply ethical principles, legal regulations and standards related to specific requirements of the profession											
	 use and value 	use and value scientific and occupational literature with the aim of lifelong learning and											
	profession er	profession enhancement											
	apply appropriate analytical methods for the characterisation of different packaging												
	materials												
	 interpret the methods 	adva	ntage	s of aseptic food	packa	aging	in comparison to other fo	od pack	aging				
	 apply vacuur 	n nac	kaging	to the appropri	ate fo	od pr	oduct						
2.4. Expected learning	 apply vacual apply modified 	ed atr	nospł	ere packaging to	the a	appro	priate food product						
outcomes at the level of	 provide exan 	nples	of act	ive and intelliger	nt foo	d pacl	kaging and their use for a	specific	food				
learning outcomes)	product												
	 explain the consequences of the food/packaging interaction 												
	 explain advantages and disadvantages of use of different packaging materials and packaging methods for a specific food product 												
	packaging methods for a specific food product explain a possible interaction of a specific food product with different food packaging												
	materials	531010	intere	letion of a specifi		i proc		ackaging	•				
	Definitions, functions and classification of packaging materials (basic, with regard to: waste,												
	handling, material type). Functions and importance of food packaging. Materials (wood; glass,												
	metal, paper, pla	stics,	lamir	ates, biodegrada	able a	nd ed	ible materials). Packaging	g manufa	cture				
2.5. Course content	(injection mould	ing, p	ressin	g, blowing, extru	ision,	calen	dering, blow molding, two	o and thr	ree				
(syllabus)	Pieces cans prou	nc Da	i, gids ckagii	ng methods: ase	ntic v	Packa	n modified/controlled a	iosures. ctive and	4				
	intelligent packa	ging.	suscei	otors. Food/pack	aging	intera	action (corrosion, migrati	on, gas a	ind				
	water vapour pe	rmeal	oility)	. Handling and tr	anspo	rtatio	n. Types of transport. Wa	arehouse	es.				
	Packaging machi	nery.	Packa	iging regulations	(EU le	egislat	ion). Packaging and envir	onment					
	(package waste a	and re	cyclin	ıg).									
	⊠ lectures			□ independent	t		2.7. Comments:						
	⊠ seminars and			assignments									
	workshops			🗆 multimedia a	and th	e							
2.6. Format of instruction	exercises			internet									
	□ on-line in entin	rety		⊠ laboratory									
	□ partial e-learn	ing		□ work with m	entor								
	L field work			□ (other)									
	Class		Ν	Research		Ν	Oral exam		Ν				
	Evnerimental												
	work	Y		Report		Ν	(other)						
2.8. Monitoring student	_			Seminar									
work	Essay		N	paper	Y		(other)						
	Preliminary		NI	Practical		N	(other)						
	exam		IN	work		IN	(other)						
	Project		N	Written	Y		ECTS credits (total)	4	1				
	-	l		exam		l	. ,						

	Grade (%) = $\left(\frac{T_{achieved}}{T_{max}}\right) * 60 + \left(\frac{S_{achieved}}{S_{max}}\right) * 20 + \left(\frac{L_{achieved}}{L_{max}}\right) * 20$									
2.9. Assessment methods and criteria	1. Maximum number of points by activity type: 1. Partial exam (T) 30 2. Partial exam (T) 30 Seminar paper presentations (S) 20 Laboratory exercises (L) 20 Total 100									
	In the exam period, the failed partial exam partial exams, taking the exam in the exam Passing the first partial exam is not a prere	is taken. If stu period is con quisite for tak	Idents do not pass the course via sidered to be the first examination. ing the second partial exam.							
	3. Grading scale: 90 - 100 (excellent-5) 80 - 89 (very good-4) 70 - 79 (good-3) 60 - 69 (sufficient-2) 0 - 59 (fail-1)									
	Oral exam: A possibility for increasing grad	al exam: A possibility for increasing grades								
2.10. Student responsibilities	To pass the course, students have to: successfully do all the exercises in attend all lectures present a given topic (case study) achieve a minimum of 16 points of achieve a minimum of 12 points v achieve a minimum of 12 points v achieve a minimum of 60 points in	 For pass the course, students have to: successfully do all the exercises in practical work and hand in the reports attend all lectures present a given topic (case study) achieve a minimum of 16 points on each partial exam achieve a minimum of 12 points with laboratory exercises achieve a minimum of 12 points with the topic presentation (case study) achieve a minimum of 60 points in total 								
	Title	Number of copies in the library	Availability via other media							
2.11. Required literature (available in the library and/or via other media)	VUJKOVIĆ I., GALIĆ K., VEREŠ M., Ambalaža za pakiranje namirnica, Sveučilišni udžbenik, TECTUS, Zagreb 2007., chapters 1-14.	10	YES, Laboratory for Food Packaging, 400 copies							
	GALIĆ K., CIKOVIĆ N., BERKOVIĆ K. "Analiza ambalažnog materijala", izdavač: Hinus, Zagreb, 2000.	NUL - 1	YES, <u>http://www.hinus.hr/wp-</u> <u>content/knjige/2011/10/ANALIZA-</u> <u>AMBALAZNOG-MATERIJALA.pdf</u>							
2.12. Optional literature	 ROBERTSON, G. L., Food Packaging, Pri 2013 	nciples and Pr	actice, Marcel Dekker, Inc., New York							
2.13. Exams	Exam dates are published in Studomat.									
2.14. Other	-									

1. GENERAL INFORMATION								
1.1. Course lecturer(s)	Kata Galić, PhD, Full Professor	1.8. Semester when the course is delivered	winter					
1.2. Course title	Selected Topics in Food Packaging	1.9. Number of ECTS credits allocated	3					
1.3. Course code	53732	1.10. Number of contact hours (L+E+S+e-learning)	15 + 0 + 15 + 0					

1.4. Study programme	Graduate university study programme Food Safety Management	1.11. Expected enrolment in the course	do 5						
1.5. Course type	optional A	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	2. 0 %						
1.6. Place of delivery	Consultations in lecturer's room (102)	1.13. Language of instruction	Croatian and English						
1.7. Year of study when the course is delivered	second	1. 14. Possibility of instruction in English	Υ						
2. COURSE DESCRIPTION									
2.1. Course objectives	The course objective is to learn students about the choice of packaging materials and methods for a particular group of food products (fresh, frozen, dehydrated, etc.) depending on the processing conditions (thermal and non-thermal). Students will be familiar with different forms of interaction of food with a particular food packaging material as well as with the consequences for packed food.								
2.2. Enrolment requirements and/or entry competences required for the course	-								
2.3. Learning outcomes at the level of the programme to which the course contributes	 establish, manage, control and supervise food safety system in the production chain, and manage its potential risks do complex food analyses in microbiological and physical-chemical control and research laboratories independently analyse, make conclusions and present results of conducted analyses; independently study and interpret results, and make conclusions and solutions manage or participate in interdisciplinary teams, which create or implement new methods with the aim of improving food safety and quality system from field to table convey their knowledge and conclusions to both professionals and the general public, in a clear and well-reasoned manner continuously follow up contemporary trends in the field of food safety apply ethical principles in relationships to coworkers and employer apply ethical principles, legal regulations and standards related to specific requirements of the profession 								
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 explain the choice of protective la food product list the criteria for a protective lac explore and present examples of a dehydrated food argue the choice of packaging material explain the composition of mulitil of packed food list examples of food packaging material argue the choice of food packaging packed food and list the examples list parameters for packaging integrational packaging 	querer depending on the agressiv querer on the metal cans for food use of multilayer materials for pac terial for fresh food ayer and composite materials use aterials to be used in thermal pro g material with regard to thermal g material with regard to non-the s grity control with regard to metal afety control with regards to metal	riness of a particular d packaging ckaging of frozen and d in thermal processing processing of packed ermal processing of and polymer packaging I and polymer						
2.5. Course content (syllabus)	Functional requirements of packaging in food type. Multilayer (laminates) and c food packaging materials and methods food packaging material for fresh, dehy packaging interaction. Legislation in for method with regard to food product (s	materials. Protective laquers on fo omposite (metallised, susceptors . Packaging machinery. Storage co /drated, processed food (thermal, od packaging.Selection of food pa tudent presentation on selected f	ood cans with regard to) materials. Advances in onditions. Selection of . non-thermal). Food- ckaging material and ood product).						

	⊠ lectures			□ independent			2.7. Comments:				
2.6. Format of instruction	☑ seminars and workshops □ exercises			assignments □ multimedia and the internet							
	□ on-line in entirety			□ laboratory	,						
	☐ partial e-learning			🗵 work with	mente	or					
				🗆 (other)	1	1			1		
	Class attendance	Y		Research		N	Oral exam	Y	For higher grade		
	Experimental work		Ν	Report		Ν	(other)				
2.8. Monitoring student work	Essay		N	Seminar paper	Y		(other)				
	Preliminary exam		N	Practical work		N	(other)				
	Project		Ν	Written exam		N	ECTS credits (total)		3		
	1. Maximum numbe	r of po	oints b	y activity type	:	-		•			
	Class attendance 5										
	Seminar paper presentation (95): Prepared presentation 20										
	Presentation 35										
	Answering questions 40										
	Total 100										
2.9. Assessment methods and criteria	2. Grading scale: 90 - 100 (excellent - 5) 80 - 89 (very good- 4) 70 - 79 (good - 3) 60 - 69 (sufficient - 2) < 60 (fail - 1)										
	Oral examt students who are unsatisfied with the achieved grade can register for the and ever										
	The grade achieved on the oral exam is final, even if it is lower than the previously achieved one.										
	To pass the course, s	tudent	ts hav	e to:							
2.10. Student	 attend all lectur present a given 	es tonic ((250 g	study)							
responsibilities	 present a given topic (case study) achieve a minimum of 60 points in total 										
							Number of	Availahi	lity via		
2.11. Required literature			Title				copies in the library	other r	nedia		
(available in the library and/or via other media)	VUJKOVIĆ I., GALIĆ K	., VERE	ΞŠ Μ.,	Ambalaža za p	akirar	ije		YES, Labo for Fo	oratory ood		
	chapters 2, 4, 6, 8, 12	i udzb 2, 14.	enik,	IECIUS, Zagrei	5 2007	•,	10	Packa 400 cc	ging opies		
2.12. Optional literature	• ROBERTSON, G. 2013	L., Fo	od Pao	ckaging, Princip	oles an	id Pra	ctice, Marcel Dekke	er, Inc., Ne	w York		
2.13. Exams	Exam dates are publi	shed ii	n Stud	omat.							
2.14. Other	-	_	-								

1. GENERAL INFORMATION							
1.1. Course lecturer(s)	<u>Mario Ščetar, PhD, Assistant Professor</u> <u>Kata Galić, PhD, Full Professor</u> <u>Mia Kurek, PhD, Assistant Professor</u>	1.8. Semester when the course is delivered	summer				

1.2. Course title	Shelf Life of Packaged Foodstuffs	1.9. Number of ECTS credits allocated	3			
1.3. Course code	53298	1.10. Number of contact hours (L+E+S+e-learning)	15 + 0 + 15 + 0			
1.4. Study programme	Graduate University Study Programme Food Engineering, Graduate University Study Programme Food Safety Management, Graduate University Study Programme Nutrition, Graduate University Study Programme Molecular Biotechnology	1.11. Expected enrolment in the course	20			
1.5. Course type	optional B	1.12. Level of application of e-learning (level 1, 2, 3), percentage of online instruction (max. 20%)	2. 0 %			
1.6. Place of delivery	Р5	1.13. Language of instruction	Croatian i English			
1.7. Year of study when the course is delivered	second	1. 14. Possibility of instruction in English	Y			
2. COURSE DESCRIPTION						
2.1. Course objectives	The objective of the course is to learn stu that influence the food shelf-life. Main pr determination of shelf-life of packed food determination of food shelf-life.	dents about food shelf-life defifr inciples and legislation frame rel d. Methods (direct and indirect) a	ition and factors ated to the ind protocol for			
2.2. Enrolment requirements and/or entry competences required for the course	-					
2.3. Learning outcomes at the level of the programme to which the course contributes	 Graduate University Study Programme Fc select and purchase raw materials control of raw materials and pro do highly-complex jobs in microbio development laboratories of foo apply ethical principles, legal regrequirements of the profession use and value scientific and occurrent and profession enhancement Graduate University Study Programme Fc define principles and strategy of system in food industry establish, manage, control and s and manage its potential risks manage or participate in interdist methods with the aim of improvitable manage or participate in interdist methods with the aim of improvitable apply ethical principles, legal regrequirements of the profession use and value scientific and occurrent and profession enhancement Graduate University Study Programme M manage or participate in interdist methods with the aim of improvitable apply ethical principles, legal regrequirements of the profession use and value scientific and occurrent and profession enhancement Graduate University Study Programme M manage particular laborator industry and other institution biochemical, microbiologica 	 Graduate University Study Programme Food Engineering select and purchase raw materials and packaging materials, and conduct quality control of raw materials and products do highly-complex jobs in microbiological, physical and chemical control and development laboratories of food industry apply ethical principles, legal regulations and standards related to specific requirements of the profession use and value scientific and occupational literature with the aim of lifelong learning and profession enhancement Graduate University Study Programme Food Safety Management define principles and strategy of product quality, organize and manage quality system in food industry establish, manage, control and supervise food safety system in the production chair and manage its potential risks manage or participate in interdisciplinary teams, which create or implement new methods with the aim of improving food safety and quality system from field to table manage or participate in interdisciplinary teams, which create or implement new methods with the aim of improving food safety and quality system from field to table apply ethical principles, legal regulations and standards related to specific requirements of the profession use and value scientific and occupational literature with the aim of lifelong learning and profession enhancement 				

	 evaluate food distribution systems (hospitals, schools) in order to improve the 								
	quality of analyse c	tood p	repara e and i	tion and nutrititiv	e value	e ot me vined b	als w research methods	:	
	 use and v 	 use and value scientific and occupational literature with the aim of lifelong learning 							
	and profe	and profession enhancement							
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 explain the influence of packaging material and packaging method on the food shelf-life define barrier properties of food packaging material (gas permeability, water vapour permeability) and their influence on the degradation of packed foodstuff define external parameters and their influence on the packed food shelf-life argue the choice of food shelf-life testing method and its applicability with regard to packed food product explain consequences of food/packaging interaction and the possibility to prove this interaction identify and explain the desirable and undesirable characteristics of the shelf-life of certain pakaging material for a specific food product present and explain the protocol for determination of the food shelf-life of the selected food product in the appropriate (adequate) food packaging material explain and argue the possibilities of increasing the validity of the packaged food product 								
2.5. Course content (syllabus)	General shelf life analysis requirements. Effect of packaging material on product shelf-life. Shelf-life protocols. Challenge study; Accelerated shelf life testing; Confirmatory storage study; On-going shelf life monitoring. Factors affecting permeation characteristics of packaging materials. Barrier characteristics of packaging materials. Packaging permeation on: gases, water vapour. Permeability ratio (material selectivity). Food-package interaction (corrosion, migration: global, specific). Shelf-life with regard to: moisture gain, moisture loss. Evaluation of the rate of oxidation of foods packaged in a semipermeable pouch. The kinetic model. Determination of shelf-life of food stored in frige and refrigerator. Recomended gas content for food packed in the modified atmosphere with regard to product: fresh fruits and vegetables: respiration rate, rate of etilene production. Shelf-life determination: case studies. Tasks definition and allocation. Seminars presentation								
	X lectures			🗵 independent			2.7. Comments:		
2.6. Format of instruction	 ☑ lectures ☑ seminars and workshops □ exercises □ on-line in entirety □ partial e-learning □ field work 			assignments multimedia and the internet laboratory work with mentor (other)					
	Class attendance	Y		Research		Ν	Oral exam	Y	
	Experimental work		N	Report		Ν	(other)		
2.8. Monitoring student work	Essay		N	Seminar paper	Y		(other)		
	Preliminary exam		N	Practical work		N	(other)		
	Project		Ν	Written exam		Ν	ECTS credits (total)	:	3
2.9. Assessment methods and criteria	 Maximum numl Class attendance Seminar paper p Oral exam Total Grading scale: 90 - 100 (excellent 80 - 89 (very good 70 - 79 (good - 3) 60 - 69 (sufficient 	ber of p e present - 5) 1 - 4) - 2)	ation 1	5 points 5 points 50 points <u>45 points</u> 00 points					

	0 - 59 (fail - 1)				
2.10. Student responsibilities	 Fo pass the course, students have to: attend all lectures give a presentation of a given theme (case study) achieve a minimum of 35 points from the presented theme (case study) achieve a minimum of 25 points on the oral exam achieve a minimum of 60 points in total 				
	Title	Number of copies in the library	Availability via other media		
2.11. Required literature (available in the library and/or via other media)	VUJKOVIĆ I., GALIĆ K., VEREŠ M., Ambalaža za pakiranje namirnica, Sveučilišni udžbenik, TECTUS, Zagreb 2007.; chapters 2, 4, 6, 8, 12, 14.	10	YES, Laboratory for Food Packaging, 400 copies		
	STEEL, R. (Ed.) Understanding and measuring the shelf-life of food, Woodhead Publiching Limited and CRC Press LLC,0YES, WEB2004., pp. 1 - 4482004.				
2.12. Optional literature	• ROBERTSON, G. L., Food Packaging, Principles and Practice, Marcel Dekker, Inc., New York 2013.				
2.13. Exams	Exam dates are published in Studomat.				
2.14. Other	-				

1. GENERAL INFORMATION						
1.1. Course lecturer(s)	<u>Jurica Žučko, PhD, Assistant</u> <u>Professor</u>	1.8. Semester when the course is delivered	summer			
1.2. Course title	Nutrigenomics	1.9. Number of ECTS credits allocated	4			
1.3. Course code	66827	1.10. Number of contact hours (L+E+S+e-learning)	20 + 20 + 10 + 0			
1.4. Study programme	Graduate university study programme Nutrition	1.11. Expected enrolment in the course	40			
1.5. Course type	optional A	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	1. 20 %			
1.6. Place of delivery	Р6	1.13. Language of instruction	Croatian and English			
1.7. Year of study when the course is delivered	first	1. 14. Possibility of instruction in English	Y			
2. COURSE DESCRIPTION						
2.1. Course objectives	The objective of the course is to intro decipher interaction between our ger nutrients, and to explain technology b genetics and evolution as well as new and health such as epigenome and mi	duce students to the basics of variou netic makeup and environmental fact pehind it. The course will also cover k er concepts involved in controlling o icrobiome.	is "omics" used to tors, including basic concepts of ur genetic makeup			
2.2. Enrolment requirements and/or entry competences required for the course	-					
2.3. Learning outcomes at the level of the programme to which the course contributes	 understand and have knowledge of general skills in basic and applied disciplines understand and acquire knowledge of general skills in particular interdisciplinary disciplines through elective modules 					

	 analyse and evaluate conditions to apply the appropriate method of food quality assessment and the strategies for the improvement of dietary habits with the goal of prevention and improvement of national health or the one of targeted population groups 							
	 analyse, comp 	are and int	erpret the results o	btained	l by re	search methods		
	present and po	• present and popularize particular contemporary trends in the field of nutrition science						
	to scientific, p	rotessional rinciplos	and laymen circles	d ctand	arde ro	lated to choosific roo	uiromor	nto
	 apply ethical p of the professi 	 apply ethical principles, legal regulations and standards related to specific requirements of the profession 						
	use and value	scientific a	nd occupational lite	erature	with tł	ne aim of lifelong le	arning ar	nd
	profession ent	nancement		· ·				
	 define basic conditioned and set of the se	ingle nucle	genetics and nutrige	enomics hs as dr	s empr iving fo	asising population a	genetic	
	 categorise me 	thods for D	NA sequencing, and	alyse cu	irrent i	methods of DNA sec	quencing	g
2.4. Expected learning	and genetic te	sting	1 0,	,				,
outcomes at the level of	explain scope	of nutriger	etics and nutrigend	mics, r	eview	existing data on nut	rition-ge	ene
the course (3 to 10	interactions							
learning outcomes)	 propose ethica 	al, legal and	d social questions in	regard	to nut	trigenomics testing,	taking ir	nto
	search online	literature d	to privacy and use	on pers	rch tvr	pes and controlled y	vocabula	irv
	used in biome	dicine		003 300	i cii cyr		ocabala	' y
	data retrieval							
2.5. Course content	 basic concepts 	in nutrige	nomics					
(syllabus)	 Influence facto 	ors						
· · · · · ·	Omics							
	 Food and gene Valectures 	🗆 independent assignments			27 Commontes			
	Seminars and w	\square multimedia and the			2.7. comments.			
	exercises		internet					
2.6. Format of instruction	\Box online in entirety	□ laboratory						
	🖾 partial e-learning		u work with mentor					
	☐ field work	0	□ (other)					
	Class attendance	N	Research	Y		Oral exam		N
	Experimental work	Ν	Report		N	(other)		
2.8. Monitoring student work	Essay	Ν	Seminar paper	Y		(other)		
	Preliminary exam	N	Practical work		Ν	(other)		
	Project	Ν	Written exam	Y		ECTS credits (total)	4	
	Depending on stud	ent's choic	e:					
	Written exam only	– 100% of	points					
	Written exam 70 % and seminar paper 30 % of points.							
	me total number of points is 50 and they are allocated according to the chosen assessment method							
2.9. Assessment methods	The grade is formed as a sum of all gathered points divided by 30 and multiplied by 100.							
and criteria	whereby the final g	grade is for	med as follows:					
	< 60 % fail							
	\geq 60 % sufficient							
	≥.70 % good							
	\geq 90 % excellent							
	To pass the course,	, students l	nave to:					
2.10. Student reconnsibilities	 successful 	ly do all th	e exercises in practi	cal wor	k and :	seminars and pass t	he writte	en
2.10. Student responsibilities	exam							
	achieve a minimum of 60% of total points							

2.11. Required literature (available in the library	Title	Number of copies in the library	Availability via other media				
	Internal script	0	YES, Merlin				
2.12. Optional literature	 M. Lucock: Molecular Nutrition and Genomics: Nutrition Wiley-Blackwell (2007) R. Brigelius-Flohé, H.G. Joost: Nutritional Genomics: Imp VCH (2006) 	 M. Lucock: Molecular Nutrition and Genomics: Nutrition and the Ascent of Humankind, Wiley-Blackwell (2007) R. Brigelius-Flohé, H.G. Joost: Nutritional Genomics: Impact on Health and Disease, Wiley VCH (2006) 					
2.13. Exams	Exam dates are published in Studomat.						
2.14. Other	-						

1. GENERAL INFORMATION					
1.1. Course lecturer(s)	Antonio Starčević, PhD, Associate Professor Jurica Žučko, PhD, Assistant Professor Janko Diminić, PhD, Assistant Professor	1.8. Semester when the course is delivered	summer		
1.2. Course title	Bioinformatics	1.9. Number of ECTS credits allocated	4		
1.3. Course code	53249	1.10. Number of contact hours (L+E+S+e-learning)	20 + 10 + 10 + 0		
1.4. Study programme	Graduate university study programme Molecular Biotechnology	1.11. Expected enrolment in the course	40		
1.5. Course type	compulsory	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	1. 20 %		
1.6. Place of delivery	lecture hall 6	1.13. Language of instruction	Croatian and English		
1.7. Year of study when the course is delivered	first	1.14. Possibility of instruction in English	Y		
2. COURSE DESCRIPTION	•				
2.1. Course objectives	This course will ensure the theoretica biology. In order to achieve this in the most common bioinformatic algortim of biological sequence public reposito independent bioinformatic analyses of	I and practical education in the field given timeframe, students will get t ms and interpret their results. They v ries and finally they will be able to p of genes and gene clusters.	of computational to learn how to use vill obtain overview erform		
2.2. Enrolment requirements and/or entry competences required for the course	-	<u> </u>			
2.3. Learning outcomes at the level of the programme to which the course contributes	 integrate knowledge acquired from the fields of microbiology, microbe physiology, molecular biology, genetics and bioinformatics with the aim of producing traditional and modern biotechnological products apply knowledge acquired in order to construct genetically modified organisms of desired traits participate in biomedical and related biomolecular researches on account of basic knowledge of molecular and cellular biology and genetics, bioinformatics, immunology and human physiology select corresponding model organism for conducting of particular biological tests or scientific researches use scientific literature in English, and present the existing results to experts and 				

	• present, valor	ize and	l popula	arize modern acco	omplishme	nts and courses	of develop	ment
	of molecular b	oiotech	nology	: :: :	·			
	 participate act biotechnology 	and re	n scient Plated s	inc paper discuss	ion from tr	le field of molec	ular	
	 act in accorda 	nce wit	th ethic	al principles and	acquire ne	w knowledge an	d skills, as	a part
	of lifelong lear	of lifelong learning and profession promotion, including PhD studies in molecular						
	biotechnology	biotechnology and other bio-sciences						
	define bioinformatics and its area of application							
	 name and nun 	nber m	najor bio	oinformatic data s	sources		ahaa	
2.4 Expected learning	 number and describe major bioinformatic tools for public database searches construct logical quory for targeted data acquisition (genes, proteins,) from si 						from singl	۵
outcomes at the level of the	organism, mul	ltiple o	rganisn	ns, gene loci, expr	ression site	s etc.	nom singi	C
course (3 to 10 learning	name major e	xample	es of mo	odern (next gen) s	sequencing	technologies ar	nd to discus	SS
outcomes)	their strength:	s/weak	nesses	compared to San	ger sequer	ncing method		
	 categorize pro 	oteins b	based o	n their respective	protein fa	milies		
	 discuss terms define concent 	and co	ncepts	of proteomics an	d functiona	al genomics		
	Basic bioinform	matics	yiogen	У				
	Bioinformatics	s in ger	nomics					
2.5. Course content (syllabus)	Bioinformatics	s in pro	oteomic	S				
	Algorithms in	bioinfo	ormatics	S				
	⊠ lectures			⊠ independent		2.7. Comme	nts:	
	Seminars and wo	orksho	ps	assignments	nd tha			
2.6 Format of instruction	🖾 exercises				na the			
	□ online in entirety							
	⊠ partial e-learnin	g		u work with me	entor			
	☐ field work			🗆 (other)				
	Class attendance	Y		Research	Y	Oral exam		Ν
	Experimental work		N	Report	Y	(other)		
2.8. Monitoring student work	Essay		N	Seminar	Y	(other)		
	Preliminary			Deseties laws als	~	(-++)		
	exam		N	Practical work	Y	(other)		
	Project	Y		Written exam	Y	ECTS credits (total)		4
	Maximum number	r of poi	ints by	activity type				
	1. Final exam			70				
	2. Seminar paper			20				
	Total			100				
2.9. Assessment methods								
and criteria	Grading scale:							
	< 60 % fail (1)							
	\geq 70 % good (3))						
	\geq 80 % very good (4)	4)						
	≥ 90 % excellent (5)						
	To pass the course	, stude	nts hav	e to:				
2.10. Student responsibilities	 successful 	lly do a	all the e	xercises in practic	cal work an	d seminars		
	 achieve a 	mm	uniore		ber of poin	Number of		
			Title			copies in the	Availabil	ity via
2.11. Required literature						library	other m	iedia
and/or via other media)	Jean-Michel Claver	ie, Ced	ric Not	redame, Bioinfor	matics	<u> </u>	YES, libr	aries,
	ISBN: 978-0-470-08	20100 8985-9	1 (2006	y whey Publishing	s, inc.,	U	Interr	net

	http://www.ncbi.nlm.nih.gov/sites/gquery	0	YES, online
	http://www.bioinformatics.org/	0	YES, online
2.12. Optional literature	-		
2.13. Exams	Exam dates are published in Studomat.		
2.14. Other	-		

1. GENERAL INFORMATION					
1.1. Course lecturer(s)	<u>Ksenija Durgo, PhD, Full Professor</u> <u>Ana Huđek, mag. ing.</u>	1.8. Semester when the course is delivered	winter		
1.2. Course title	Genetics of Industrial Organisms	1.9. Number of ECTS credits allocated	3		
1.3. Course code	53262	1.10. Number of contact hours (L+E+S+e-learning)	20 + 15 + 0 + 0		
1.4. Study programme	Graduate university study programme Molecular Biotechnology	1.11. Expected enrolment in the course	20		
1.5. Course type	optional A	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	2. 0 %		
1.6. Place of delivery	lectures in P5, exercises in the LBMG	1.13. Language of instruction	Croatian		
1.7. Year of study when the course is delivered	first	1.14. Possibility of instruction in English	Y		
2. COURSE DESCRIPTION					
2.1. Course objectives	The latest discoveries about finding a biomolecules will inspire innovative ic	nd designing a gene <i>de novo</i> for the _l leas in young experts.	production of new		
2.2. Enrolment requirements and/or entry competences required for the course	-				
2.3. Learning outcomes at the level of the programme to which the course	Doprinos ishodima učenja programa				
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 analyze mixed bacterial culture and respond to stress, bacterial growth in the extended stationary phase and formation of different mutants. explain the possibilities of communication between bacteria and the creation of biofilmskreirati različite postupke za analizu metagenoma i objasniti značaj komparativne genomike i metagenomskih knjižnica explain how to modify gene by chemical and / or physical mutagenic agents, locally directed mutagenesis and in vitro suppression of amber mutations explain the difference between directed evolution, rational design of microorganisms in vivo by mixing DNA molecules and genomic engineering using the CRISPR-Cas9 systemkategorizirati ne kodirajuće molekule RNA i kreirati najpogodnije za funkcionalnu genomiku te terapeutsku primjenu compare the known transgenic technology methods and propose their application for the needs of molecular biotechnology and pharmaceutical industryobrazložiti razliku u nomenklaturi gena prokariotskih i eukariotskih organizama 				
2.5. Course content (syllabus)	 interpret methods of preservation and maintenance of microorganisms and cell lines Properties of industrial organisms Epigenetics of industrial organisms Microbial diversity and metagenomics Metabase analysis How to change a gene? Methods of directed evolution Transport and animals 				

	 Application of non-coding RNA molecules Nomenclature of industrial organism genes 							
2.6. Format of instruction	 ☑ lectures □ seminars and workshops ☑ exercises □ online in entirety □ partial e-learning □ field work 		 independent assignments multimedia and the internet laboratory work with mentor (other) 		2.7. 2.7. Comn	nents:		
	Class attendance	Y		Research		Ν	Oral exam	N
	Experimental work	Y		Report	Y		(other)	
2.8. Monitoring student work	Essay		N	Seminar paper		Ν	(other)	
	Preliminary exam		Ν	Practical work		Ν	(other)	
	Project		Ν	Written exam	Y		ECTS credits (total)	3
2.9. Assessment methods and criteria	 2. Grading scale: < 60 % fail (1) ≥ 60 % sufficient (2 ≥ 70 % good (3) ≥ 80 % very good (≥ 90 % excellent (5 	 The written exam consists of five desriptive questions, each graded with one point. Grading scale: < 60 % fail (1) ≥ 60 % sufficient (2) ≥ 70 % good (3) ≥ 80 % very good (4) 						
2.10. Student responsibilities	To pass the course • successfu hand in a • attend all and two f • achieve a	, stude Ily succ writter lecture or lecture minim	nts hav essfully n repor es (a ma ures) um of 6	ve to: y do all the exerci t consisting of int aximum of one ur 50% of points on t	ses in p roducti njustifie the wril	oractica on, res ed abse eten ex	al work in practi sults and conclu ence is allowed f cam	cal work and sions or exercises,
							Number of	Availability
			IITIE	5			library	via other media
2.11. Required literature	GIO 1 Script: Višnja cultures and bacte growth phase	a Bačur rial gro	n-Družin wth in	na (2005) Mixed b the extended sta	bacteria tionary	I	0	YES, Merlin and/or web pages
and/or via other media)	GIO 2 Script: Višnja response	a Bačur	n-Družin	na (2013) Bacteria	al stress	5	0	YES, Merlin and/or web pages
	Višnja Bačun-Druži Industrial Organisr	na, An n Gene	a Huđe tics, Pr	k, Ksenija Durgo (actical Work, Scri	2015) pt		0	YES, Merlin and/or web pages
2.12. Optional literature	 Krebs J.E. et a Alberts, B. et a USA. Brown, T. A. (2) 	l. (2014 al. (200 2002) (1) Lewir 2) Mole Genome	n's GENES XI, Jone ecular Biology of es. <u>BIOS Scientific</u>	es & Ba the Cell Publish	rtlett F I <u>, Garl</u> ners, L	Publishers, USA and Publishing, td; Oxford, UK.	New York,
2.13. Exams	Exam dates are pu	blishea	l in Stud	domat.				
2.14. Other	-							

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	<u>Ksenija Durgo, PhD, Full Professor</u> <u>Ana Huđek, mag. ing.</u>	1.8. Semester when the course is delivered	summer
1.2. Course title	Ecogenetic Studies	1.9. Number of ECTS credits allocated	2

1.3. Course code	53225	1.10. Number of contact hours (L+E+S+e-learning)	12 + 0 + 12 + 0					
1.4. Study programme	Graduate university study programme Molecular Biotechnology	1.11. Expected enrolment in the course	5-10					
1.5. Course type	optional B	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	2. 0 %					
1.6. Place of delivery	Lectures for Croatian students in P6, for foreign students in P6 or the LBMG	1.13. Language of instruction	Croatian and English					
1.7. Year of study when the course is delivered	first	1.14. Mogućnost izvođenja na stranom jeziku	Y					
2. COURSE DESCRIPTION								
2.1. Course objectives	The objective of the course is to intro contaminants at the molecular level, ecosystems as a whole. Students will environmental contaminant by apply relationship between the structure ar physical agents on genetic material ar in ecotoxicological research such as m biomarkers and indicators of certain m short-term and long-term exposure of on their stability and biodegradation.	duce students with the toxic effects and at the level of individuals, popu be able to define the mutagenic act ing previously acquired knowledge a nd effect of chemical compounds, bi nd will be able to explain the princip nodeling, biomonitoring, determinat mechanisms of toxicity, as well as th f organisms to environmental conta	of environmental lations and ivity of a particular about the ological and les of methods used cion of specific e consequences of minants depending					
2.2. Enrolment requirements and/or entry competences required for the course	Basic knowledge in the field of biology, chemistry, physics, biochemistry and microbiology							
2.3. Learning outcomes at the level of the programme to which the course contributes	 use equipment and instruments in molecular-genetic laboratories perform biological, microbiological analyzes identify, analyze and remove con microbiological, biochemical and choose an appropriate model boor research participate in advisory and legisla guide individual units in laborato industries and other institutions microbiological, molecular-genet use scientific literature in English transfer knowledge and skills to t actively participate in the discuss biotechnology and related bioscie behave in accordance with ethical lifelong education and advancem field of molecular biotechnology 	in chemical, biochemical, microbiolo al, immunological and molecular-ge mon problems that occur in experi- molecular-genetic laboratories dy to carry out a specific biological t netive bodies in the field of molecular ries of biotechnology, food and pha based on the knowledge of modern ic and instrumental methods to adequately present existing resu their colleagues ion of scientific papers in the field of ences al principles and to acquire new kno- tent of the profession, including doc and other bio-sciences	ogical and enetic tests and mental work in est or scientific biotechnology rmaceutical biochemical, lts to experts and to f molecular wledge and skills for toral studies in the					
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 describe the types of toxic agents for toxicity at the molecular level ecosystem as a whole describe the consequences of she environmental contaminants explain the relationship between respect to the physicochemical cl absorption, metabolism, distribut discuss theoretical assumptions a of endocrine disruptors on the ar 	s in the environment and the mecha , and at the level of the individual, p ort-term and long-term exposure of the concentration and effect of tox haracteristics of the agent, their ava tion, elimination, bioaccumulation a and concepts, and experimental evic himal or human organism. define en	nisms responsible oppulation and the organisms to ic agents with ilability during and biomagnification dence of the effects docrine disruptors					

	 identify the hypotheses and theoretical assumptions on which the scientific papers were made, and to analyze the scientific methods, results and conclusions published in the relevant works through seminar expositions develop communicative skills on scientific concepts, hypotheses, results and interpretation of results through seminar dissemination 								
2.5. Course content (syllabus)	 Introduction to Ecogenetic Studies Absorption Metabolism Distribution Elimination Chemical compounds in the environment Dose-response Endocrine disruptors Mutations and cancerogenesis Types of mutagens Physical agents Biological agents Bioconversion of toxic substances in the environment 								
2.6. Format of instruction	 ☑ lectures ☑ seminars and workshops ☑ exercises □ online in entirety ☑ partial e-learning ☑ field work □ independent assignments □ multimedia and the internet □ laboratory ☑ work with mentor □ (other) 						2.7. 2.7. Comm	nents:	
2.8. Monitoring student work	Class attendance Experimental	Y	N	Research Report		N N	Oral exam (other)	Y	N
	Essay		N	Seminar paper	Y		(other)		
	Preliminary exam		N	Practical work		N	(other)		
	Project		N	Written exam	Y		(total)		2
2.9. Assessment methods and criteria	1. Maximum number of points by activity type 1. Class attendance 10 2. Seminar paper 15 3. Final exam 75 Total 100 2. Grading scale: <								
2.10. Student responsibilities	To pass the course • successfu seminars • attend all • achieve a	, stude Ily succ lecture minim	nts hav essfully es (a ma um of 6	ve to: y do all the exerc aximum of two u 50% of total point	ises in p njustifi ts	oractio ed abs	cal work in pract sences is allowed	ical work a	and
2.11. Required literature			Title				Number of copies in the library	Availab via ot med	ility 1er ia
(available in the library and/or via other media)	Ksenija Durgo, Eco	genetic	: Studie	es (internal script)		0	YES; Me and w page	erlin eb es

	P. Williams, R. James, S. Roberts (2000). Principles of toxicology, Environmental and industrial applications	0	YES; Merlin and web pages
2.12. Optional literature	 S.G. Gilbert (2012). A Small Dose of Toxicology. Healthy W J. Timbrell (2002). Principles of Biochemical Toxicology. Ta 	orld Press aylor and Francis	5
2.13. Exams	Exam dates are published in Studomat.		
2.14. Other	-		

1. GENERAL INFORMATION							
1.1. Course lecturer(s)	Vladimir Mrša, PhD, Full Professor Branko Kozulić, PhD Renata Teparić, PhD, Associate Professor Igor Stuparević, PhD, Assistant Professor Antonija Grbavac, PhD Mateja Lozančić, mag. ing. Ana Novačić, mag. ing.	1.8. Semester when the course is delivered	summer				
1.2. Course title	Biochemical Analysis	1.9. Number of ECTS credits allocated	6				
1.3. Course code	53248	1.10. Number of contact hours (L+E+S+e-learning)	30 + 45 + 0 + 0				
1.4. Study programme	Graduate university study programme Molecular Biotechnology	1.11. Expected enrolment in the course	oko 30				
1.5. Course type	compulsory	1.12. Razina primjene e-učenja (1, 2, 3 razina), postotak izvođenja predmeta <i>on line</i> (maks. 20 %)	1. 0 %				
1.6. Place of delivery	lectures in P3, laboratory exercises in the LB (6th floor)	1.13. Language of instruction	Croatian				
1.7. Year of study when the course is delivered	first	1.14. Possibility of instruction in English	Y				
2. COURSE DESCRIPTION		-					
2.1. Course objectives 2.2. Enrolment requirements	Acquirement of practical knowled determination of concentration, in biotechnology processes.	ge and skills in using different biochemic ntegrity, and activity in following and eva	al methods for aluating				
required for the course	-						
2.3. Learning outcomes at the level of the programme to which the course contributes	 integrate knowledge acquired from the fields of microbiology, microbe physiology, molecular biology, genetics and bioinformatics with the aim of producing traditional and modern biotechnological products participate in biomedical and related biomolecular researches on account of basic knowledge of molecular and cellular biology and genetics, bioinformatics, immunology and human physiology use equipment and instruments in chemical, biochemical, microbiological and molecular-genetic laboratories conduct biological, microbiological, immunological and molecular-genetic tests and analyses recognize, analyse and eliminate common problems which occur during experimental work in microbiological, biochemical, and molecular-genetic laboratories 						
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 establish a system of analytic macromolecules during the b assay proteins, carbohydrates frequently used analytical me comprehention of their advar 	al assessment of concentrations of biolo iotechnological production process s, nucleic acids, and lipids in different su thods, with critical evaluation of each m ntages and limitations	gical bstrates by most iethod and				

	 determine integrity and biological activity of macromoleculs in different substrates apply enzyme tests for determination of concentration of individual metabolites 									
2.5. Course content (syllabus)	Lectures: Chemical and physico-chemical assays of macromolecules: Proteins. Carbohydrates. Lipids. Nucleic acids. Assays of activity and biological effect of macromolecules. Quantitative analysis using enzymes, examples. Methods for testing integrity of biomacromolecules. Analytical methods applicable in living cells. Cell counting. Immunochemical methods. Quantitative analysis using polymerase chain reaction (PCR). Strategy in following biotechnology processes by biochemical methods. Practical courses: Different protein assays. Carbohydrate assays. Lipid assays. Nucleic acids assays. Application of enzymic tests for quantitative analysis. RIA. ELISA. Immunoblot. "Real-time" PCR. Implementation of biochemical analytics in biotechnology									
2.6. Format of instruction	 lectures seminars and we exercises online in entirety partial e-learnin field work 	 ☑ lectures □ seminars and workshops ☑ exercises □ online in entirety □ partial e-learning □ field work □ independent assignments □ multimedia and the internet □ Seminars □ multimedia and the internet □ aboratory □ work with mentor □ (other) 								
	Class attendance		N	Research		N	Oral exam	Y		
2.8. Monitoring student work	Experimental work	Y		Report	Y		(other)			
	Essay		N	Seminar paper		N	(other)			
	Preliminary exam		Ν	Practical work	Y		(other)			
	Project		N	Written exam	Y		ECTS credits (total)		6	
2.9. Assessment methods and criteria	Student assessmer points on the exam Grades: 23 - 27 points - suf 28 - 32 points - goo 33 - 37 points - ver 38 - 43 points - exo	nt is car n is 43. ficient od (3) ry good cellent (ried ou (2) (4) (5	it through a writt	en exai	m. The	e total achievable	e number	of	
2.10. Student responsibilities	To pass the course	, stude all labo	nts hav	e to: exercises						
	 pass the v 	vritten	exam							
2.11. Required literature (available in the library			Title	3			Number of copies in the library	Availab via otl med	ility ner ia	
and/or via other media)	edia) J.M. Berg, J.L. Tymoczko, L. Stryer, <i>Biokemija</i> , Školska knjiga, 15									
2.12. Optional literature	Guide to prote Academic Pres	<i>in purif</i> ss Inc.,	<i>fication</i> San Die	(Deutscher M.P. ego, 1990.	ured.)	Metho	ods in Ezymology	/ 182,		
2.13. Exams	Exam dates are pu	blished	in Stud	lomat.						
2.14. Other	-									

1. GENERAL INFORMATION				
1.1. Course lecturer(s)	Vladimir Mrša, PhD, Full Professor	1.8. Semester when the course is delivered	summer	
1.2. Course title	Biochemical Function of Vitamins	1.9. Number of ECTS credits	-	
1.2. Course title	and lons in Food and Nutrition	allocated	5	
1.2 Course code	F261F	1.10. Number of contact hours		
1.3. Course code	22072	(L+E+S+e-learning)	45 + 0 + 0 + 0	

Link Ludy programme Nutrition programme Nutrition produce produce produce 1.5. Course type optional A 1.12. Level of application of the super online instruction (max. 20%) 1.31. Language of instruction (max. 20%) 1.0 %. 1.6. Place of delivery P4 1.13. Language of instruction (max. 20%) Croatian	1.4. Study programme	Graduate university study 1.11. Expected enrolment in the									
1.5. Course type optional A Image: A part of application of element of equiced 1, 2, 3), or contage of online instruction (max. 2009) 1.1 1.6. Place of delivery P4 1.13. Language of instruction (max. 2009) Croatian 1.7. Year of study when the course is delivered ifrast 1.13. Construction (Tab. 2005) Y 2. COURSE DESCRIPTION Acquirement of required construction on their influence on health. Y Image: Construction (Construction) 2.1. Course objectives Acquirement of required and have knowledge of general skills in basic and applied disciplines Y 2.2. Enrothment requirements and/or entry competences related to the role of the course - - 2.3. Learning outcomes at the learning outcomes at the level of the course - - 9. understand and have knowledge of general skills in partice of the door market, improve construction and macquire knowledge of general skills in partice riter/disciplinary disciplines through lective modules - 2.3. Learning outcomes at the level of the course construction and market knowledge of general skills in partice riter/disciplinary disciplines through lective modules - - 2.4. Expected learning outcomes at the level of the course construction and market knowledge of general skills in partice riter/disciplinary disciplines through lective modules - -	1.4. Study programme	programme Nutriti		course	course						
1.5. Course type optional A laming (level 1, 2, 3) → 1 / 2 / 2 / 2 / 2 / 2 / 2 / 2 / 2 / 2 /					1.12. Leve	l of app	licatio	n of e-			
All control type Openation type Openation type Provide the set of the	1.5. Course type	ontional A			learning (evel 1, 2	2, 3),		1.		
16. Place of delivery P4 113. Language of instruction Croatian 17. Yaar of study when the course is delivered first 1.1.4. Possibility of instruction in English Y 2. COURSE DESCRIPTION Acquirement of required competences related to the role of vitamins and lons in food and nutrition and their influence on health. Y 2.1. Course objectives Acquirement of required competences related to the role of vitamins and lons in food and nutrition and their influence on health. - 2.2. Enrolment requirements and/or entry competences - - equired for the course - - 2.3. Learning outcomes at the level of the programme to which the course - - contributes - - - 2.4. Expected learning outcomes at the level of the programme to which the course communication and monitoring of consumers behaviour on the food market, improve communication and parkits and communication of food and diet apple/ments, and analysis and communication of food and diet outprove of role of dividual vitamins in human metabolism outcomes) - - - 2.4. Expected learning outcomes at the level of the exploit on the level of of vitamins / co-argunge in energy metabolism and role of vitamins / co-argunges in energy metabolism and role of vitamins / co-argunges in energy metabolism and role of vitamins / co-argunges in energy metabolism and role of vitamins / co-argunges in energy		optional/			percentag	e of onl	line ins	struction	0 %		
1.6. Piace of delivery P4 1.13. Language of instruction Croatian 2.7. Year of study when the first 1.14. Despiblity of instruction in English Y 2. COURSE DESCRIPTION Acquirement of required competences related to the role of vitamins and ions in food and nutrition and their influence on health. Y 2.2. Enrolment requirements and/or entry competences related to the role of vitamins and ions in food and nutrition and their influence on health. - 2.3. Learning outcomes at the level of the programme to which the course communication and and aque knowledge of peneral skills in basic and applied disciplines of the profession - 2.4. Expected learning outcomes at the level of the programme to which the course communication and monitoring of consumes behaviour on the flood market, improve communication and monitoring of consumes behaviour on the flood and flood and flood auplication conditions, advise and make decisions related to problem-solving in the field of nutrition 2.4. Expected learning outcomes at the level of the learning outcomes at the level of the grogramme to avery of roles of individual vitamins in human metabolism - 2.4. Expected learning outcomes at the level of the role of individual vitamins for health - - 2.5. Course content (splash) - - - 2.6. Format of instruction - - - - 2.5. Course content (splash) - - -					(max. 20%	<u>6)</u>	-				
1.7. Year of study when the course is delivered first 1.14. Possibility of instruction in prish Y 2. COURSE DESCRIPTION Acquirement of required competences related to the role of vitamins and ions in food and nutrition and their influence on health. . 2.1. Course objectives Acquirement of required competences related to the role of vitamins and ions in food and nutrition and their influence on health. . 2.2. Enorminen requirements and/or entry competences required for the course - . 2.3. Learning outcomes at the level of the programs on national levels, which refer to human diet, improve food monitoring systems and strategy programs on national levels, which refer to human diet, improve communication and monitoring of consumers behaviour on the food market, improve food distribution for the healthy and the ili, improve food quality assessment and nutrition and maintains in human metabolism 2.4. Expected learning outcomes 1 - - - 2.4. Expected learning outcomes (3 to 10 learning) - - - 0.4. Expected learning outcomes (3 to 10 learning) - - - 2.5. Course content (syllabu) - - - - 2.6. Expected learning outcomes (3 to 10 learning) - - - - 2.6. Expected learning outcomes (3 to 10 learning) - - - - <	1.6. Place of delivery	P4			1.13. Lang	guage of	instru	iction	Croatia	n	
Course objectives Acquirement of required competences related to the role of vitamins and ions in food and nutrition and their influence on health. 2.2. Course DESCRIPTION Acquirement of required competences related to the role of vitamins and ions in food and nutrition and their influence on health. 2.2. Enrolment requirements and/or entry competences required for the course - required for the course - 2.3. Learning outcomes at the level of the programme to which the course - 2.4. Expected learning outcomes at the level of the programme to which the course contributes - 2.4. Expected learning outcomes at the level of the programme to which the course contributes - 2.4. Expected learning outcomes at discuss the role of individual vitamins in human metabolism outcomes at the level of the level of the programme to discuss the role of individual vitamins in human metabolism outcomes at the level of th	1.7. Year of study when the	first			1. 14. Pos	1. 14. Possibility of instru			Y		
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2.1. Course objectives Acquirements of required competences related to the role of vitamins and ions in tood and nutrition and their influence on health. 2.2. Enrolment requirements and/or entry competences - equired for the course - 2.3. Learning outcomes at the level of the programme to wheely of basic and specific disciplines of the profession - 2.3. Learning outcomes at the level of the programme to which the course - - commets and applicative knowledge of general skills in basic and applied disciplinary disciplinary disciplinary disciplinary disciplinary disciplinary of the programme to which the course - to which the course - - - contributes - - - - 2.4. Expected learning outcomes at the level of the programme to apply, define application conditions, advise and make decisions related to problem-solving in the field of nutrition - - 2.5. Course content (syllabus) - - - - - 2.6. Format of instruction - - - - - - 2.6. Format of instruction - - - - - - - - - - - - - - - -	2. COURSE DESCRIPTION										
2.2. Enrolment requirements and/or entry competences - required for the course - 2.3. Learning outcomes at the level of the programme to which the course of the programme to applements, and analysis and communication and mealth status, improve production and processing of food and food supplements, and analysis and communication of food and diet 2.4. Expected learning outcomes at the level of the programme of individual vitamins in human metabolism - 0 discuss the role of individual vitamins in human metabolism - 2.5. Course content (syllabus) - - 2.5. Course content (syllabus) - - - 2.6. Format of instruction Gas attendance of nudividual vitamins in and role of vitamin A. Survey of ions in human organism. General importance in nutrition. Survey of roles of vitamin A. Metabolism and role of vitamin A. Metabolism and role of vitamin A. Survey of ions in human organism. General importance in nutritions. Metabolism of Ca ²⁺ and Me ²⁺ ions. Metabolism of Na and K ²⁺ ions. Metabolism of Ca ²⁺ and Me ²⁺ ions. Metabolism of Ca ²⁺ and Fe ²⁺ ions. Metabolism of Na and K ²⁺ ions. Metabolism of Ca ²⁺ and Me ²⁺ ions. Metabolism of A ²⁺ and K ²⁺ ions. Metabolism of Ca ²⁺ and Re ²⁺ ions. Metabolism of A ²⁺ and K ²⁺ ions. Metabolism of	2.1. Course objectives	Acquirement of rec nutrition and their	Acquirement of required competences related to the role of vitamins and ions in food a nutrition and their influence on health.								d
and/or entry competences - required for the course - 2.3. Learning outcomes at the level of the programmer to which the course contributes - 2.3. Learning outcomes at the level of the programmer to which the course contributes - 2.4. Expected learning outcomes at the level of the programmer to which the course communication and monitoring of consumers behaviour on the food market, improve food duality assessment and nutritional and health status, improve food quality assessment and nutritional and health status, improve production and processing of food and food supplements, and analysis and communication of food and diet 2.4. Expected learning outcomes) - 0.4. Giscuss the role of individual vitamins in human metabolism - - 0.4. Expected learning outcomes) - 0.5. Course content (syllabus) - A.Expected learning outcomes) - 0.4. Expected learning outcomes) - 0.5. Course content (syllabus) - 2.5. Course content (syllabus) - 2.5. Course content (syllabus) - 0.5.	2.2. Enrolment requirements										
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 understand and have knowledge of general skills in basic and applied disciplines understand and have knowledge of basic and specific disciplines of the profession understand and acquire knowledge in order to improve food monitoring systems and strategy programs on national levels, which refer to human diet, improve communication and monitoring of consumers behaviour on the food market, improve food distribution for the healthy and the ill, improve food quality assessment and nutritional and health status, improve production and processing of food and food supplements, and analysis and communication of food and diet apply, define application conditions, advise and make decisions related to problem-solving in the field of nutrition discuss the role of individual vitamins in human metabolism discuss the role of individual vitamins for health discuss the role of individual ions for health discuss the role of vitamins / Leabolism and role of vitamins. General importance in nutrition. Survey of roles of vitamins / Co-enzymes in energy metabolism. Bl. B2. B6. Biotin. 2.5. Course content (syllabus) Z.6. Format of instruction asses importance of individual vitamins of Leabolism and role of vitamin A. Metabolism of Ca²⁺ and Mg²⁺ ions. Metabolism of Fa²⁺ and Fe²⁺ ions. Metabolism of Fa²⁺ and Fe²⁺ ions. Metabolism of a role of ions. Metabolism of a role of vitamin A. Metabolism of other anions. Metabolism of Lear and Netare anions. Metabolism of Fa²⁺ and Fe²⁺ ions. Metabolism of Fa²⁺ and Fe²⁺ ions. Metabolism of Ca²⁺ and Mg²⁺ ions. Metabolism of Ca²⁺ and Mg²⁺ ions. Metabolism of Ca²⁺ and Fe²⁺ ions. Meta	required for the course										
Solution		 understand ar 	nd have l	knowledg	e of general s	skills in l	basic a	nd applied	disciplin	es	
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2.9. Assessment methods and criteria	Assessment is carried out through a written exam consisting of three to five questions. Each answer is graded on a five-point scale and the final grade is the mean value of grades from all questions. No questions may be graded with a "fail" grade.								
2.10. Student responsibilities	To pass the course, students have to: • pass the written exam	Fo pass the course, students have to: • pass the written exam							
2.11. Required literature	Title	Number of copies in the library	Availability via other media						
(available in the library and/or via other media)	J.M. Berg, J.L. Tymoczko, L. Stryer, <i>Biokemija</i> , Školska knjiga, Zagreb, 2013.; (parts related to course syllabus)								
	David S. Robinson: Food - Biochemistry and nutritional 0 value, 1987, Longman, Harlow, UK.								
2.12. Optional literature	 <u>http://www.genome.jp/kegg/pathway/map/map01190.</u> <u>http://www.healthcyclopedia.com/nutrition-and-metab</u> <u>minerals.html</u> <u>http://www.liferesearchuniversal.com/minerals.html</u> <u>http://odp.webwombat.com.au/WW413833.HTM</u> 	<u>html</u> olism-disorders/	/vitamins-and-						
2.13. Exams	Exam dates are published in Studomat.								
2.14. Other	-								

1. GENERAL INFORMATION								
1.1. Course lecturer(s)	Maja Benković, PhD, Assistant Professor Davor Valinger, PhD, Assistant Professor	1.8. Semester when the course is delivered	summer					
1.2. Course title	Powder Technology	1.9. Number of ECTS credits allocated	3					
1.3. Course code	39801	1.10. Number of contact hours (L+E+S+e-learning)	20 + 0 + 10 + 0					
1.4. Study programme	All FFTB undergraduate university study programmes	1.11. Expected enrolment in the course	15					
1.5. Course type	optional B	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	1. 0 %					
1.6. Place of delivery	LMRA	1.13. Language of instruction	Croatian					
1.7. Year of study when the course is delivered	third	1.14. Possibility of instruction in English	Y					
2. COURSE DESCRIPTION								
2.1. Course objectives	The course objective is to acquaint the students with the definition of powders and powder technology and to explain to which extent and why the powders are used. The students should also be able to explain the advantages and the disadvantages of powder use as raw materials and end products. Furthermore, the students are acquainted with basic particle and powder properties and the technological processes in the production and handling of powders: milling, mixing, sampling, drying, agglomeration, tableting and encapsulation. The student will be able to use the acquired theoretical skills to choose the adequate equipment for powder sampling, mixing, drying and other powder handling and production processes							
2.2. Enrolment requirements and/or entry competences required for the course	-							
2.3. Learning outcomes at the level of the programme	Undergraduate university study progr	ramme Food Technology						

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2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes) list the physical properties of powders (powder bulk properties) and explain their importance and methods of analysis list and explain the chemical properties of powders define powder rheology, basic types and mechanisms of powder flow explain the principles and use of agglomeration, tableting and encapsulation explain and understand the mechanisms of powder sampling explain and understand the basic principles of powder sampling explain and understand the basic principles, particle properties and particle size determination to powder technology – basic principles, particle properties and particle size determination to powder flow Chemical properties of powder flow Chemical properties of powder flow explain and understand the basic principles of powder handling in the industrial facilities The module consists of the following topics: Introduction to powder technology – basic principles, particle properties and particle size determination methods Bulk properties and industrial powder flow Chemical properties of powders Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 3 2.6. Format of instruction Extures 2.7. Comments: 		 define powders, explain what and the immerstance for the second s	at are powders comprised of, w	what are their characteristics
 2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes) I list the physical properties of powders (powder bulk properties) and explain their importance and methods of analysis I list the physical properties of powders of powders define powder rheology, basic types and mechanisms of powder flow explain the principles and use of agglomeration, tableting and milling and list the equipment used for mixing and milling explain and understand the mechanisms of powder sampling define nanopowders and explain the risks of powder sampling define nanopowders and explain the risks of powder handling in the industrial facilities The module consists of the following topics: Introduction to powder technology – basic principles, particle properties and particle size determination methods Bulk properties and industrial powder flow Chemical properties of powders Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 3 		and the importance for the	nuusiry	icle properties and particle size
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes) list the physical properties of powders (powder bulk properties) and explain their importance and methods of analysis list and explain the chemical properties of powders define powder rheology, basic types and mechanisms of powder flow explain the principles and use of agglomeration, tableting and encapsulation explain and understand the mechanisms of mixing and milling and list the equipment used for mixing and milling explain and understand the basic principles of powder sampling define nanopowders and explain the risks of powder handling in the industrial facilities The module consists of the following topics: Introduction to powder technology – basic principles, particle properties and particle size determination methods Bulk properties and industrial powder flow Chemical properties of powders Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 2 Seminar 3 		 exhibit formal knowledge at characterization methods 	in understanding of basic parti	icie properties and particle size
 2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes) Iist and explain the chemical properties of powders define powder rheology, basic types and mechanisms of powder flow explain the principles and use of agglomeration, tableting and encapsulation explain and understand the mechanisms of mixing and milling and list the equipment used for mixing and milling explain and understand the basic principles of powder sampling define nanopowders and explain the risks of powder handling in the industrial facilities The module consists of the following topics: Introduction to powder technology – basic principles, particle properties and particle size determination methods Bulk properties of powders Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 2 Seminar 3 2.6. Format of instruction 		 list the physical properties of 	f powders (powder bulk prope	orties) and explain their
outcomes at the level of the course (3 to 10 learning outcomes) I list and explain the chemical properties of powders define powder rheology, basic types and mechanisms of powder flow explain the principles and use of agglomeration, tableting and encapsulation explain and understand the mechanisms of mixing and milling and list the equipment used for mixing and milling explain and understand the basic principles of powder sampling explain and understand the basic principles of powder handling in the industrial facilities The module consists of the following topics: Introduction to powder technology – basic principles, particle properties and particle size determination methods Bulk properties and industrial powder flow Chemical properties of powders Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 3 Seminar 3	2.4. Expected learning	importance and methods of	analysis	rics) and explain their
course (3 to 10 learning outcomes) • define powder rheology, basic types and mechanisms of powder flow • explain the principles and use of agglomeration, tableting and encapsulation • explain and understand the mechanisms of mixing and milling and list the equipment used for mixing and milling • explain and understand the basic principles of powder sampling • explain and understand the basic principles of powder sampling • define nanopowders and explain the risks of powder handling in the industrial facilities The module consists of the following topics: • Introduction to powder technology – basic principles, particle properties and particle size determination methods • Bulk properties and industrial powder flow • Chemical properties of powders • Milling and sampling • Powder mixing • Agglomeration and encapsulation • Nanopowders and powder handling risks • Seminar 1 • Seminar 2 • Seminar 3	outcomes at the level of the	 list and explain the chemical 	properties of powders	
 explain the principles and use of agglomeration, tableting and encapsulation explain and understand the mechanisms of mixing and milling and list the equipment used for mixing and milling explain and understand the basic principles of powder sampling define nanopowders and explain the risks of powder handling in the industrial facilities The module consists of the following topics: Introduction to powder technology – basic principles, particle properties and particle size determination methods Bulk properties and industrial powder flow Chemical properties of powders Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 3 2.6. Format of instruction 	course (3 to 10 learning	 define powder rheology, bas 	sic types and mechanisms of p	owder flow
 explain and understand the mechanisms of mixing and milling and list the equipment used for mixing and milling explain and understand the basic principles of powder sampling define nanopowders and explain the risks of powder handling in the industrial facilities The module consists of the following topics: Introduction to powder technology – basic principles, particle properties and particle size determination methods Bulk properties and industrial powder flow Chemical properties of powders Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 3 2.6. Format of instruction Metures 	outcomes)	• explain the principles and us	e of agglomeration, tableting	and encapsulation
2.5. Course content (syllabus) • explain and understand the basic principles of powder sampling • define nanopowders and explain the risks of powder handling in the industrial facilities 7.5. Course content (syllabus) • Introduction to powder technology – basic principles, particle properties and particle size determination methods • Bulk properties and industrial powder flow • Chemical properties of powders • Milling and sampling • Owder mixing • Powder mixing • Agglomeration and encapsulation • Nanopowders and powder handling risks • Seminar 1 • Seminar 3 • Seminar 3		• explain and understand the	mechanisms of mixing and mil	ling and list the equipment
 explain and understand the basic principles of powder sampling define nanopowders and explain the risks of powder handling in the industrial facilities The module consists of the following topics: Introduction to powder technology – basic principles, particle properties and particle size determination methods Bulk properties and industrial powder flow Chemical properties of powders Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 3 2.6. Format of instruction 		used for mixing and milling		
 define nanopowders and explain the risks of powder handling in the industrial facilities The module consists of the following topics: Introduction to powder technology – basic principles, particle properties and particle size determination methods Bulk properties and industrial powder flow Chemical properties of powders Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 2 Seminar 3 2.6. Format of instruction 		• explain and understand the	basic principles of powder sam	npling
2.5. Course content (syllabus) The module consists of the following topics: • Introduction to powder technology – basic principles, particle properties and particle size determination methods • Bulk properties and industrial powder flow • Chemical properties of powders • Milling and sampling • Powder mixing • Agglomeration and encapsulation • Nanopowders and powder handling risks • Seminar 1 • Seminar 2 • Seminar 3 2.6. Format of instruction		 define nanopowders and ex 	plain the risks of powder hand	ling in the industrial facilities
 Introduction to powder technology – basic principles, particle properties and particle size determination methods Bulk properties and industrial powder flow Chemical properties of powders Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 2 Seminar 3 2.6. Format of instruction 		The module consists of the follow	ving topics:	
 Size determination methods Bulk properties and industrial powder flow Chemical properties of powders Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 2 Seminar 3 Iectures 2.6. Format of instruction 		 Introduction to powder tech 	nology – basic principles, part	icle properties and particle
 2.5. Course content (syllabus) Chemical properties of powders Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 2 Seminar 3 2.6. Format of instruction 		size determination methods		
 2.5. Course content (syllabus) Milling and sampling Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 2 Seminar 3 2.6. Format of instruction 		Bulk properties and industri	al powder flow	
 2.5. Course content (syllabus) Powder mixing Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 2 Seminar 3 2.6. Format of instruction I lectures 2.7. Comments: 		Chemical properties of power Milling and campling	Jers	
 Agglomeration and encapsulation Nanopowders and powder handling risks Seminar 1 Seminar 2 Seminar 3 2.6. Format of instruction I lectures 2.7. Comments: 	2.5. Course content (syllabus)	Ivining and sampling Powder mixing		
 Nanopowders and powder handling risks Seminar 1 Seminar 2 Seminar 3 2.6. Format of instruction I lectures 2.7. Comments: 		Agglomeration and encapsu	lation	
 Seminar 1 Seminar 2 Seminar 3 2.6. Format of instruction I lectures 2.7. Comments: 		 Nanopowders and nowder h 	andling risks	
 Seminar 2 Seminar 3 2.6. Format of instruction I lectures 2.7. Comments: 		Seminar 1		
• Seminar 3 2.6. Format of instruction ⊠ lectures 2.7. Comments:		Seminar 2		
2.6. Format of instruction 🛛 lectures 2.7. Comments:		Seminar 3		
	2.6. Format of instruction	⊠ lectures		2.7. Comments:

	 seminars and workshops exercises online in entirety partial e-learning field work 			 □ independent assignments □ multimedia and the internet ☑ laboratory □ work with mentor □ (other) 						
	Class attendance	Y		Research		N	Oral exam		Y	
	Experimental work		N	Report		N	(other)			
2.8. Monitoring student work	Essay		N	Seminar paper	Y		(other)			
	Preliminary exam		N	Practical work	Y		(other)			
	Project		Ν	Written exam	Y		ECTS credits (total)		3	5
2.9. Assessment methods and criteria	Class attendance is graded with 0.25 points per lecture. By attending lectures a maximum of 2.5 can be achieved. Seminar paper is graded with a maximum of 2.5 points. Seminar and practical (laboratory) work assignments are not graded, but they are a prerequisite to taking the written exam. Written exam: The written exam consists of 10 questions conceptualized in the following way: eight questions covering the theoretical part of classes (lectures) two questions covering the practical part of classes (practical part and seminars) Each question brings two points. The total grade is the sum of points achieved through class attendance, seminar paper and written exam. Grading scale according to total number of points: 20 - 22 points: excellent (5) 21 - 25 points: sufficient (2) If students are dissatisfied with the grade achieved on the written exam, they can take the							ıd e		
2.10. Student responsibilities	To pass the course finish lect write and solve the pass the e	, stude ures hand i practic exam	nts hav n the se al work	re to: eminar paper assignments						
			Title			c	Number of copies in the library	Avai oth	lability er me	/ via dia
	Bauman, I Praho	vi- Teo	rija na l	nrvatskom			0	YES, FFTB	Merlin web p	and Dage
2.11. Required literature (available in the library and/or via other media)	Bauman, I Prahovi- Teorija na hrvatskom0FF3, Mermin and FFTB web pageBarbosa-Canovas et al: Food Powders. KluwerAcademic/Plenum Publishers, New York, 2005: 								า for าtal ng	

	- Chapter 9 (pp. 221 – 244)							
	- Chapter 12 (pp. 323 – 352)							
2.12. Optional literature	 Fayed, M.E., Otten, L. (2005) Handbook of Powder Sciences and Technology. Chapman & Hall, London. Seville, J.P.K. (2007) Processing of Particulate Solids. Chapman & Hall, London. Kaye, B.H. (2010): Powder Mixing, Chapman & Hall, London, 2010 							
	 <u>SCIENTIFIC PAPERS:</u> Benković, M., Bauman, I. (2011) Oblaganje čestica u prehrambenoj industriji. Croatian Journal of Food Technology, Biotechnology and Nutrition 6 (1-2), 13-24. Benković, M., Bauman, I.(2011) Agglomeration of cocoa powder mixtures – influence of process conditions on physical properties of the agglomerates Journal on 							
	 Processing and Energy in Agriculture 15(1), 46-49. Benković, M., Belščak-Cvitanović, A., Bauman, I., Komes, D. (2013) Physical properties of non – agglomerated cocoa drink powder mixtures containing various types of sugars and sweeteners. Food and Bioprocess Technology, 6 (4), 1044-1058. Bauman, I. (2001) Solid-Solid Mixing with Static Mixers, Chemical and Biochemical 							
	 Engineering Quarterly, 15(4) 159-165. Benković, M., Jurinjak Tušek, A., Belščak-Cvitanović, D., Bauman, I. (2015) Artificial neural network mod chemical properties of cocoa powder mixtures durin science and technology 64(1), 140-148. 	A., Lenart, A., Do delling of change ng agglomeratio	omian, E., Komes, es in physical and n. Journal of food					
	 Benković, M., Srečec, S., Špoljarić, I., Mršić, G., B. instant coffee beverages - influence of functional ing storage time on physical properties of newly forr powders. Journal of the science of food and agricultu Benković, M., Belščak-Cvitanović, A., Bauman, I., Kor 	auman, I. (2015 gredients, packa nulated, enrich ure 95(13), 2607 nes. D. (2013) P	5) Fortification of ging material and ed instant coffee 7-2618. hysical properties					
	 of non-agglomerated cocoa drink powder mixtures of and sweeteners. Food and Bioprocess Technology, 6 Benković, M., Srečec, S., Špoljarić, I., Mršić, G., Bau commonly used food powders and their mixtures. F 6(9), 2525-2537. 	containing vario (4), 1044-1058. man, I. (2013) F Food and Biopro	low properties of sugars					
2.13. Exam dates	Exam dates are published in Studomat.							
2.14. Other	-							

1. GENERAL INFORMATION							
1.1. Course lecturer(s)	<u>Lidija Barišić, PhD, Associate Professor</u> Veronika Kovač, PhD, Assistant <u>Professor</u>	1.8. Semester when the course is delivered	winter				
1.2. Course title	The Fundamentals of Bioorganometallic Chemistry	1.9. Number of ECTS credits allocated	2				
1.3. Course code	53305	1.10. Number of contact hours (L+E+S+e-learning)	15 + 23 + 0 +0				
1.4. Study programme	Graduate University Study Programme Food Engineering, Graduate University Study Programme Food Safety Management, Graduate University Study Programme Bioprocess Engineering	1.11. Expected enrolment in the course	Broj studenata				
1.5. Course type	optional A	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	- 0 %				
1.6. Place of delivery	Lectures in lecture hall 2 or 4, exercises in the LOC	1.13. Language of instruction	Croatian				

1.7. Year of study when the course is delivered	second				1.14. Po in Englis	ssibility h	of inst	ruction	Y		
2. COURSE DESCRIPTION											
2.1. Course objectives	The course objective is to introduce students about the possibilities for application of bioorganometallic compounds in pharmacology, biotechnology and related disciplines.										
2.2. Enrolment requirements and/or entry competences required for the course											
2.3. Learning outcomes at the level of the programme to which the course contributes	 Graduate University Study Programme Food Engineering understand basic principles of research work understand the importance of environment protection and know the systems and methods of environment protection do highly-complex jobs in microbiological, physical and chemical control and development laboratories of food industry manage or work in an interdisciplinary team, which conceptualizes and conducts experiments in the field of food technology use and value scientific and occupational literature with the aim of lifelong learning and profession enhancement Graduate University Study Programme Food Safety Management convey their knowledge and conclusions to both professionals and the general public, in a clear and well-reasoned manner use and value scientific and occupational literature with the aim of lifelong learning and profession enhancement 										
	Graduate Universit use and value profession enh 	y Stud scienti nancen	y Progra fic and nent	amme B occupat	ioproces ional lite	s Engino rature	eering with th	e aim of lif	elong lea	irning	and
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 describe the structural and functional role of metal ions in biological systems analyse the advantages of application of bioorganometallics [conjugates of organometallics and biomolecules (DNA, carbohydrates, steroids, amino acids, peptides)] in cancer and infectious disease treatment, bioanalysis, molecular recognition, enzyme catalysis and toxicology designing and synthesizing of electroactive and bioactive organometallic conjugates evaluate the potential pharmacological and biotechnological application of 										
2.5. Course content (syllabus)	 An introductio Conjugates of a The role of bio Organometallia Metalloenzyma Metal pro-drug 	n to th organc organc c comp es, gs.	e bioor ometalli ometall oounds	ganome ic comp ic comp as indic	tallic che ounds an ounds in ators of [mistry. d biomo metalo NA hył	olecule -immu oridiza	es. noassays. tion.			
2.6. Format of instruction	 Metal pro-drugs. Iectures seminars and workshops exercises online in entirety partial e-learning field work Independent assignments multimedia and the internet Iaboratory work with mentor 			2.7. Comments:							
	Class attendance		Ν	Resear	ch		Ν	Oral exam	ı		Ν
2.8. Monitoring student work	Experimental work	Y		Report	:	Y		Seminarsl izlaganje PowerPoi prezentac	ko uz nt Siju	Y	
	Essay		N	Semina paper	ar		Ν	(other)			
	Preliminary exam		N	Practio	al work	Y		(other)			

	Project		Ν	Written exam		Ν	ECTS credits (total)		2
2.9. Assessment methods and criteria	Maximum number Exercises (practical Seminar paper press Grading scale: < 60 % fail (1) $\ge 60 \%$ sufficient (2) $\ge 70 \%$ good (3) $\ge 80 \%$ very good (4) $\ge 90 \%$ excellent (5)	r of poin work) sentation) 4)	ts by a	activity type: h PowerPoint)	10 20				
2.10. Student responsibilities	 To pass the course, students have to: successfully do all the exercises in practical work attend lectures and seminars (a maximum of one unjustified absence is allowed) achieve a minimum of six points with exercises achieve a minimum of 12 points for the seminar paper presentation achieve a minimum of 18 points in total 								
2.11. Required literature (available in the library			Title			(Number of copies in the library	Avai oth	lability via Ier media
and/or via other media)	G. Jaouen (Editor), Labeling, Medicine	Bioorgaı , John W	nome [.] /iley &	tallics: Biomolecu Sons, Weinheim	ules, 1, 2006.				
2.12. Optional literature	 G. Jaouen and M. Salmain (Editors), Bioorganometallic Chemistry. Applications in Drug Discovery, Biocatalysis, and Imaging, Wiley-VCH Verlag GmbH & Co. KGaA, Boschstr. 12, 69469 Weinheim, Germany, 2015 G. Simonneaux (Editor), Bioorganometallic Chemistry (Topics in Organometallic Chemistry), Springer-Verlag Berlin Heidelberg, 2006. P. Štepnička (Editor), Ferrocenes: Ligands, Materials and Biomolecules, John Wiley & Sons, Chichester, 2008 								
2.13. Exams	Exam dates are pu	blished ii	n Stud	lomat.					
2.14. Other	-								

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	<u>Lidija Barišić, PhD, Associate</u> <u>Professor</u> <u>Monika Kovačević, PhD</u>	1.8. Semester when the course is delivered	winter
1.2. Course title	Peptidomimetics and Pseudopeptides	1.9. Number of ECTS credits allocated	3
1.3. Course code	53304	1.10. Number of contact hours (L+E+S+e-learning)	15 + 20 + 4 + 0
1.4. Study programme	Graduate university study programme Molecular Biotechnology, Graduate University Study Programme Food Engineering, Graduate University Study Programme Food Safety Management, Graduate University Study Programme Bioprocess Engineering	1.11. Expected enrolment in the course	12
1.5. Course type	optional B	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	0 %
1.6. Place of delivery	Lectures in lecture hall 2 or 4, exercises in the LOC	1.13. Language of instruction	Croatian

1.7. Year of study when the	second	1.14. Possibility of instruction in	Y					
course is delivered		English						
2. COURSE DESCRIPTION								
2.1. Course objectives	limitations of the natural peptides (their flexibility enables the interactions with different receptors leading to the undesired side effects, they are subjected to the proteolytic activity of the peptidases in gastrointestinal tract and serum, the high molecular mass and polarity hinder the transport through cell membrane and blood-brain barrier) by using their synthetic mimetics.							
2.2. Enrolment requirements and/or entry competences required for the course	-							
2.3. Learning outcomes at the level of the programme to which the course contributes	 Graduate University Study Programmation understand basic principles of restand carry out prodecomplation do highly-complex jobs in microbid evelopment laboratories of food manage or work in an interdisciple experiments in the field of food tare use and value scientific and occup profession enhancement Graduate University Study Programmation participate in biomedical and relation human physiology use equipment and instruments i genetic laboratories use scientific literature in English, and convey their knowledge and present, valorize and popularize rof molecular biotechnology participate actively in scientific pation biotechnology and related science act in accordance with ethical priof lifelong learning and profession biotechnology and other bio-scientific and well-reasoned manne use and value scientific and occup profession enhancement 	e Food Engineering search work uction of new products iological, physical and chemical cont d industry inary team, which conceptualizes an echnology pational literature with the aim of life e Molecular Biotechnology ited biomolecular researches on acco ilar biology and genetics, bioinforma n chemical, biochemical, microbiolog , and present the existing results to e skills to their peers modern accomplishments and course aper discussion from the field of mol es nciples and acquire new knowledge n promotion, including PhD studies in nces e Food Safety Management clusions to both professionals and th r pational literature with the aim of life	rol and d conducts elong learning and punt of basic tics, immunology gical and molecular- experts and laymen, es of development ecular and skills, as a part n molecular e general public, in elong learning and					
	use and value scientific and occup profession enhancement	pational literature with the aim of lif	elong learning and					
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 protession enhancement analyse and argue how to overcome the disadvantages of the natural peptides (proteolytic instability, polarity, conformational freedom) by using adequately designed mimetics analyse and identify peptide and non-peptide structures that mimic the secondary structural element (helix, sheet or turn) involved in molecular recognition design and synthesis of ferrocene peptides as potential mimetics of peptide secondary structural elements perform the conformational analysis of ferrocene peptidomimetics in solution by using standard spectroscopic techniques (IR, NMR and CD) with the aim to define their secondary structure predict and evaluate the potential pharmacological and biotechnological application of 							

2.5. Course content (syllabus)	 Natural peptides: the role and structure. Mimetics of alpha-helix. Mimetics of turn. Mimetics of beta-sheet. Ferrocene peptidomimetics. Carbohydrate peptidomimetics. Petidomimetics as artificial sweeteners. Structure and function of natural peptide mimetics (hormones, N-acetylglucosamine, apolipoproteins, etc) Conformational analysis in solution by using the spectroscopic techniques (IR, NMR and CD spectroscopy). 									
2.6. Format of instruction	 ☑ lectures ☑ seminars and workshops ☑ exercises □ online in entirety □ partial e-learning □ field work 		 □ independent assignments □ multimedia and the internet ☑ laboratory □ work with mentor □ (other) 			2.7. Comme	nts:			
	Class attendance		Ν	Research		Ν	Oral exam			Ν
2.9. Monitoring student work	Experimental work	Y		Report	Y		Seminarsko izlaganje uz PowerPoint prezentaciju	I	Y	
2.8. Monitoring student work	Essay		Ν	Seminar paper		Ν	(other)			
	Preliminary exam		N	Practical work	Y		(other)			
	Project		Ν	Written exam		N	ECTS credits (total)			3
2.9. Assessment methods and criteria	Maximum number Exercises (practical Seminar paper pre Grading scale: < 60 % fail (1) $\ge 60 \%$ sufficient (2) $\ge 70 \%$ good (3) $\ge 80 \%$ very good (4) $\ge 90 \%$ excellent (5)	r of po i l work) sentati ?) 4)	ints by	activity type: h PowerPoint)	10 20					
2.10. Student responsibilities	To pass the course successfu attend lec achieve a achieve a achieve a	, stude lly do a ctures a minim minim minim	ents hav all the e and sen um of s um of 1 um of 1	ve to: xercises in praction ninars (a maximul six points with exe L2 points for the s L8 points in total	cal wor m of or ercises semina	k ie unj r pape	ustified absender presentation	ce is all	lowed)
2.11. Required literature (available in the library and/or via other media)			Title				Number of copies in the library	Avai oth	labilit er me	y via dia
2.12. Optional literature 2.13. Exams	 Trabocchi, A. Guarna, Peptidomimetics in Organic and Medicinal Chemistry: The Art of Transforming Peptides in Drugs, 2014 John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex, PO19 8SQ, United Kingdom. E. Ko, Ji.Liu, K. Burgess, Minimalist and universal peptidomimetics, <i>Chemical Society</i> <i>Reviews</i> 2011, <i>40</i>, 4411–4421. L. Gentilucci, A. Tolomelli, F. Squassabia, Peptides and Peptidomimetics in Medicine, Surgery and Biotechnology, <i>Current Medicinal Chemistry</i> 2006, <i>13</i>, 2449-2466. A. Grauer, B. König, Peptidomimetics – A Versatile Route to Biologically Active Compounds, <i>European Journal of Organic Chemistry</i> 2009, 5099–5111. 									

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1. GENERAL INFORMATION							
1.1. Course lecturer(s)	Lidija Barišić, PhD, Associate Professor Senka Djaković, PhD, Associate Professor Veronika Kovač, PhD, Associate Professor Jasmina Lapić, PhD, Assistant Professor Monika Kovačević, PhD Alma Filipović, dipl. ing.	1.8. Semester when the course is delivered	summer				
1.2. Course title	Organic Chemistry	1.9. Number of ECTS credits allocated	6				
1.3. Course code	37908	1.10. Number of contact hours (L+E+S+e-learning)	30 + 30 + 15 + 0				
1.4. Study programme	Undergraduate university study programme Food Technology	1.11. Expected enrolment in the course	96				
1.5. Course type	compulsory	1.12. Level of application of e-learning (level 1, 2, 3), percentage of online instruction (max. 20%)	1. 0 %				
1.6. Place of delivery	Lectures in P2, seminars in P4, Laboratory exercises in the LOC	1.13. Language of instruction	Croatian				
1.7. Year of study when the course is delivered	first	1. 14. Possibility of instruction in English	Y				
2. COURSE DESCRIPTION							
2.1. Course objectives2.2. Enrolment requirements and/or entry competences	The course aims is to acquire basic knowledge of organic chemistry and mastery of practical laboratory techniques used in synthesis, isolation and purification of organic compounds. The course program will provide students with the basic knowledge necessary for the monitoring and learning of biochemistry and related subjects.						
required for the course							
2.3. Learning outcomes at the level of the programme to which the course contributes	 apply knowledge and skills from basi the field of food technology identify, analyse, solve simple proble physical-chemical control laboratorie collect and interpret results of laboratorie develop learning skills which are need conscience about the need of lifelon 	c, applied and engineering scient ems, and do complex jobs in micro es of food industry atory food analyses eded to continue studying at grad g learning	ific disciplines in obiological and uate levels and				
 conscience about the need of lifelong learning conscience about the need of lifelong learning recognize and name selected organic compounds (from simple hydrocarbons to compounds containing functional groups) interpret the influence of structure on the physico-chemical properties and reactivity of selected organic molecules describe and explain basic stereochemical concepts in simple examples of organic compounds predicted and interpret the mechanisms of addition, substitution and elimination reactions on selected examples of organic compounds classify selected biomolecules (carbohydrates, nucleic acids and lipids) and describe their chemical properties and reactivity according to the given instruction, independently perform the simple purification and isolation procedures and the synthesis of organic compounds using conventional laboratory techniques 							
2.5. Course content (syllabus)	 Organic-chemical reactions. Resonance. Stereochemistry. 						

	 Alkene and alkyne. Electrophilic addition reactions on unsaturated carbon. Alkyl halides. Nucleophilic substitution reactions on saturated carbon. Alkyl halides. Elimination reaction. Aldehydes and ketones. Nucleophilic addition reactions on carbonyl group. Carboxylic acids and derivatives. Nucleophilic substitution reactions on carbonyl group. Carboxylic acids and derivatives. Nucleophilic substitution reactions on carbonyl group. Acylation of enolate anions. P-Carbanion. Aromatic compounds. Electrophilic aromatic substitution. Heterocyclic aromatic systems. Carbohydrates. Lipids. 									
2.6. Format of instruction	 ☑ seminars and workshops ☑ exercises □ online in entirety □ partial e-learning □ field work 		 multimedia and the internet laboratory work with mentor (other) 							
	Class attendance		N	Research		Ν	Oral exam	Y		
	Experimental work	Y		Report	Y		(other)			
2.8. Monitoring student work	Essay		N	Seminar paper		N	(other)			
	Preliminary exam	Y		Practical work	Y		(other)			
	Project		Ν	Written exam	Y		ECTS credits (total)	e	5	
2.9. Assessment methods and criteria	ProjectNWritten examY(total)6The maximum number of points is 100:•Written exam: 60 points,•Oral exam: 30 points•Laboratory exercises: 10 points.The prerequisite to taking the oral exam is achieving a minimum of 36 points (60%) on the written part. To pass the oral part, students must achieve a minimum of 18 points (60%).Partial examsFour exam terms are scheduled.The first exam term is divided on two partial written exams and an oral exam. Students who achieve a minimum of 60% (36 points) on both partial exams can take the oral exam covering the entire syllabus.Students who do not take partial exams or do not achieve a minimum of 60% (36 points) on both partial exams, take the written and oral exam consisting of the entire course content in three subsequent exam periods (two in the summer and one in autumn).If the written part is passed, and the oral one failed, student retake the written exam on one of the subsequent exam periods.Grading scale:•< 60 points									
2.10. Student responsibilities	To pass the course successfu attend lec achieve a achieve a achieve a achieve a achieve a	, stude lly do a ctures a minim minim minim	nts hav II exerce and sen um of 3 um of 4 um of 6 um of 6	ve to: cises in practical v ninars (a maximu 36 points on the v L8 points on the c 5 points with the 50 points in total	vork ar m of or vritten oral exa exercis	id pass ne unju exam im es	the final prelimina stified absence is a	ry exan llowed)	n)	

	Title	Number of copies in the library	Availability via other media			
	S. H. Pine, Organska kemija (prijevod I. Bregovec i V. Rapić). Školska knjiga, Zagreb,1994.	22				
	V. Rapić, Nomenklatura organskih spojeva, III. izmijenjeno i obnovljeno izdanje, Školska knjiga, Zagreb, 2004.	6				
2.11. Required literature	V. Rapić, Postupci priprave i izolacije organskih spojeva, II. obnovljeno i dopunjeno izdanje, Školska knjiga, Zagreb, 2008.	9				
2.11. Required literature (available in the library and/or via other media)	Nomenklatura ugljikohidrata i glikolipida: HDKI i HKD preporuke 2001., uređivački odbor Ž. Kurtanjek et al., Hrvatsko društvo kemijskih inženjera i tehnologa, 2001.	25				
	Glosar razrednih imena organskih spojeva i reaktivnih međuprodukata temeljen na strukturi: preporuke IUPAC 1995.: preporuke HDKI i HKD 2005., prijevod: D. Škare, T. Portada, L. Frkanec, Hrvatsko društvo kemijskih inženjera i tehnologa, 2005.	4				
	Osnovno stereokemijsko nazivlje: preporuke IUPAC 1996., priredio G.P. Mos, preveo M. Žinić, Hrvatsko društvo kemijskih inženjera i tehnologa, 2001.	3				
2.12. Optional literature	 P. Y. Bruice, Organic Chemistry. 4th Edition, Prentice Hall, 2004. L. G. Wade, Organic Chemistry. 6th Edition, Prentice Hall, 2006. J. McMurry, Fundamentals of Organic Chemistry. 7th Edition, Thomson, 2008. D. Klein, Organic Chemistry, 2nd Edition, John Wiley & Sons, 2012. 					
2.13. Exam dates	Exam dates are published in Studomat.					
2.14. Other	-					

1. GENERAL INFORMATION						
1.1. Course lecturer(s)	Mladen Brnčić, PhD, Full Professor Damir Ježek, PhD, Full Professor Sven Karlović, PhD, Assistant Professor Tomislav Bosiljkov, PhD, Assistant Professor Filip Dujmić, PhD, Assistant Professor	1.8. Semester when the course is delivered	summer			
1.2. Course title	Ultrasound in Food Engineering	1.9. Number of ECTS credits allocated	5			
1.3. Course code	66830	1.10. Number of contact hours (L+E+S+e-learning)	30 + 10 + 20 + 0			
1.4. Study programme	Graduate university study programme Food Engineering	1.11. Expected enrolment in the course	30			
1.5. Course type	optional B	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	1. 0 %			
1.6. Place of delivery	LUO	1.13. Language of instruction	Croatian			
1.7. Year of study when the course is delivered	second	1. 14. Possibility of instruction in English	Y			
2. COURSE DESCRIPTION						
2.1. Course objectives	Introducing students of Food Technology with ultrasound applications in food processing and ultrasound as an analytical method in Food Engineering. Getting to know the principles of ultrasonic devices ultrasound parameters and mechanism of action					
2.2. Uvjeti za upis predmeta i / ili ulazne kompetencije potrebne za predmet (ako postoje)	-					

2.3. Learning outcomes at the level of the programme to which the course contributes	 apply knowledge and skills from basic, applied and engineering scientific disciplines in the field of food technology mainly ultrsound apply acquired knowledge and skills from food engineering practically in the conduct of technological processes of food production and processing apply and integrate the acquired knowledge and skills and participate in quality control work (quality control of production and food using ultrasound) conceptualize and organize work and manage smaller technological production units of ultrasound food systems identify problems in production and communicate them to their superior and subordinates summarize conclusions based on research results from the field of ultrasound food technology present plant, research, laboratory and business results in verbal and written form, using professional terminology present contemporary trends in food technology and popularize the profession develop learning skills which are needed to continue studying at graduate levels and conscience about the need of lifelong learning
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 independently use ultrasonic equipment in various applications of food engineering explain mechanical effects of the cavitation mechanism in liquid systems define ultrasound settings for certain applications describe the knowledge acquired by practical work in laboratory conditions during work on high intensity ultrasound devices investigate the application of high intensity ultrasound in food engineering for drying, extraction, homogenisation, purification, sieving, extrusion and inactivation of microorganisms apply ultrasound as an non destrucive analytical method define energy savings by applying ultrasound compared to classical technologies describe use of Ultrasound in Food Engineering as an environmentally acceptable method
2.5. Course content (syllabus)	 Definition of acoustics, acoustic areas and separately abouth ultrasound. Innovativity of non-thermal technologies in production and in general food processing. Basic principles of innovative non-thermal technologies in food processing. The role of ultrasound as a new innovative food processing technology 4 hours Definitions of ultrasonic parameters. Basic parts of ultrasonic setup. Basic principles and mechanisms of ultrasound as food processing technology. Influence of different ultrasound parameters (frequency, cycle, amplitude) on food processing. Output parameters and its values during and after ultrasound treatment (temperature, intensity, power, amplitude). 4 hours. Raw materials (food) suitable for ultrasonic treatment. Application of ultrasound in processing of nus-products and waste materials from the food industry. 2 hours Use of ultrasound as extraction technique of bioactive compounds. 2 hours Application of ultrasound in inactivation of microorganisms (independently and in complete processing). 2 hours. Application of ultrasound in homogenization and emulsification. 2 hours. Application of airborn high-intensity ultrasound in the food industry (defoaming, cutting, sieving). 2 hours. Application of airborn high-intensity ultrasound in the food industry (defoaming, cutting, sieving). 2 hours. Application of airborn high-intensity ultrasound in the food industry (defoaming, cutting, sieving). 2 hours. Low intensity ultrasound in the food industry (non destructive ultrasound). Principles of work, various lineup. Mechanism of influence on sampleaction. Input and output parameters. 3 hours Aplication of low intensity ultrasound in food industry (Determination of undesirable foreign bodies; Determination of liquid column level; Determination of flow rate in pipelines). 3 hours

	Evercices									
	 Geometry of different ultrasonic setups with directly immersed sonotrode (power generators, transducers, probes, volume of samples). Ultrasonic bath geometry (volumes, number of probes, multi-frequency mode) - 3 hours Samples selections (raw materials) for treatment with ultrasonic setup with directly immersed sonotrodes. Determination of particle size distribution of the treated sample before and after processing 3 hours Samples selections (raw materials) for treatment with multi-frequency ultrasonic bath. Determine particle size distribution of the treated sample before and after processing 2 hours Selection of samples (raw material) for sieving. Conventional sieving. Sieving assisted by ultrasound. Determine particle size distribution of the treated sample before and after processing 2 hours Calculations of the input and output parameters for the ultrasound. Calculate energy consumption by ultrasound processing. Comparison with conventional tochnologies. Material and energy before a bauer. 									
	2. Preparat	ion of s	semina	r work for the sel	ected u	ltraso	und applicat	ion in fo	od	
2.6. Format of instruction:	engineering - 18 hours. Image: Seminars and workshops Image: Seminars and workshops						2.7. Comments:			
	Class attendance	Y		Research		N	Oral exam		Y	
	Experimental work	Y		Report		N	(other)			
2.8. Monitoring student work	Essay		N	Seminar paper	Y		(other)			
	Preliminary exam		N	Practical work	Y		(other)			
	Project		N	Written exam		Ν	ECTS credi (total)	its 5		5
2.9. Assessment methods and criteria	The prerequisite for 60% or lectures an justified with docto The final grade is g	or takin d semi or's not iven ba	g the w nars an te. ased on	vritten exam is ma d 100% of exercis the oral exam (7	andato ses). Ab 0%) an	ry class sence d semi	s attendance caused by il nar paper (3	e (a min llness m 80%).	imum (ust be	of
2.10. Student responsibilities	To pass the course • attend cla exercises) • pass the c	, stude isses re ; abser oral exa	nts hav gularly nce cau im	e to: (a minimum of 6 sed by illness mu	0% or l st be ju	ecture stified	s and semin with doctor	ars and 's note	100% (of
			Title			N CO	umber of pies in the library	Avail oth	ability er med	via lia
2.11. Required literature (available in the library and/or via other media)	Koubaa, M., Roselló-Soto, E., Šic Žlabur, J., Režek Jambrak, A., Brnčić,M., Grimi, N., Boussetta,N., Barba, F.J. (2015) Current and New Insights in the Sustainable and Green Recovery of Nutritionally Valuable Compounds from Stevia rebaudiana Bertoni. Journal of Agricultural and Food Chemistry, 63, 6835-6846						YES, WEB, data basis, NUL, Laboratory for Thermodynamics			asis, tory mics
	Povey, J.W.M., Ma Processing. Blackie	son, T acade	J. (1998 mic and	8) Ultrasound in F d professional, Lo	ood ndon.			YES, L Therm	aborat for odyna	tory mics
	Ninčević Grassino / Dent M., Rimac Bri	A. <i>,</i> Brnð nčić S. (čić M., V (2016)	Vikić-Topić D., Ro Ultrasound Assist	ca S., ed				YES,	

	Extraction and Characterization of Pectin from Tomato	WEB, data basis,
	Waste. <u>Food Chemistry</u> , 198, 93-100.	NUL, Laboratory for
		Thermodynamics
	Dujmić F., Brnčić M., Karlović S., Bosiljkov T., Ježek D., Tripalo B., Mofardin I. (2013) Ultrasound-Assisted Infrared Drying of Pear Slices: Textural Issues, Journal of Food Process Engineering, 36, 397–406.	YES, WEB, data basis, NUL, Laboratory for Thermodynamics
	Zinoviadou K.G., Galanakis, C.M, Brnčić, M., Grimi, N., Boussetta, N., Mota, M.J., Saraiva, J., Patras, A., Tiwari, B.K., Barba, F.J. (2015) Fruit juice sonication: Implications on food safety, physicochemical and nutritional properties. Food Research International, 77 (4) 743-752. (ISSN: 0963-9969)	YES, WEB, data basis, NUL, Laboratory for Thermodynamics
	Roselló-Soto, E., Galanakis, C.M., Brnčić, M., V. Orlien, Trujillo F. J., Mawson, R., Knoerzer, K., Tiwari, B.K., Barba, F.J. (2015) Clean Recovery of Antioxidant Compounds from Plant Foods, By-Products and Algae Assisted by Ultrasounds Processing: Modeling approaches to optimize processing conditions. Trends in Food Science & Technology. 42, 134-149.	YES, WEB, data basis, NUL, Laboratory for Thermodynamics
2.12. Optional literature	 Leadley, C., Williams, A. (2002). Power ultrasound – current for food processing. Campden & Chorleywood Food Resear 	t and potential applications ch Association Group, UK.
2.13. Exams	Exam dates are published in Studomat.	
2.14. Other	-	

1. GENERAL INFORMATION							
1.1. Course lecturer(s)	Ksenija Durgo, PhD, Full Professor Ana Huđek, mag. ing.	1.8. Semester when the course is delivered	summer				
1.2. Course title	Mechanisms of Evolution	1.9. Number of ECTS credits allocated	3				
1.3. Course code	53256	1.10. Number of contact hours (L+E+S+e-learning)	20 + 0 + 15 + 0				
1.4. Study programme	Graduate university study programme Molecular Biotechnology	1.11. Expected enrolment in the course	10				
1.5. Course type	optional A	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	2. 0 %				
1.6. Place of delivery	lectures in P5, exercises in the LBMG	1.13. Language of instruction	Croatian				
1.7. Year of study when the course is delivered	first	1.14. Possibility of instruction in English	Υ				
2. COURSE DESCRIPTION			-				
2.1. Course objectives	This course is directed toward studying the evolution of prokaryotic and eukaryotic genomes, including their size, composition, variability and organization. An understanding of the evolutionary process that leads to differences in genomes will shed light on how species themselves differentiate. Students are introduced to the basics of taxonomy and evolutionary systematics as well as to phylogeny and methods of research. Evolutionary inventions and innovations, followed by vertical and horizontal gene transfer are studied						
2.2. Enrolment requirements and/or entry competences required for the course	-						
2.3. Learning outcomes at the level of the programme							

to which the course											
contributes	 explain the evolutionary tree and the three domains of life on Earth and explain the 										
	difference between the last universal common ancestor (LUCA) and the last eukaryotic										
	 common ancestor (LECA) compare processes during the evolution of prokaryotic cells and the formation of the 										
	first eukaryoti explain the dif 	c cell ferenc	e hetw	een the basic pro	resses	ofevo	lution variation nat	tural			
	selection (sele	ction),	geneti	c deflection, gene	etic flux	and h	ereditary genetic va	riants such			
	 as mutations, explain the or 	recomi igin of	binatio the viru	n and transfer gei is through three l	nes and	d geno eses it	mes ben the connection	hetween			
2.4. Expected learning	the virus and t	the orig	gin of the D	he three domains	, and the	o expla daily	ain, through existing	viruses,			
course (3 to 10 learning	 compare the e 	effects	of seled	ctive amplification	n throu	gh inn	ovation, amplification	on and / or			
outcomes)	divergence an	d dupli	ication	during the occurr	ence o	f new	genes in prokaryote	s and			
	 explain the ev 	olution	n of gen	e regulatory netw	vork in	bacte	rial genomes, ortiolo	ogic and			
	parental gene	s, struc	ture ar	nd evolution of tra	ans-act	ing ele	ements, cis-acting el	ements			
	 explain the en 	dosim	is biotic tl	heory of evolution	n of eu	karyot	ic cells and to link th	e moving			
	genetic eleme	nts and	d the ev	volution of the ma	ammal	ian gei	nome				
	 explain the dif plan in molect 	ilar filo	e betw geny, t	een the cladograf he choice of supp	n and i oort for	r phylo	gram and explain tr genetic trees and pr	ogram for			
	phylogenetic a	analysis	5								
	 Evolution and Basic Evolution 	nistory nary Pr	or life	S							
2.5. Course content (syllabus)	Population genetics and evolution										
	Taxonomy, systematics and phylogeny										
	 Evolution of the gene Evolution of the genome 										
	 Origin of the virus 										
	Evolution of prokaryotes										
	 Evolution of eukaryotes Experimental evolution 										
	⊠ lectures			⊠ independent			2.7. 2.7. Comment	nments:			
	□ seminars and w	orksho	ps	assignments	nd the						
2.6. Format of instruction	⊠ exercises			internet							
	□ online in entiret	y a		□ laboratory							
	\Box field work	Б		\Box work with m	entor						
	Class attendance	Y		Research	Y		Oral exam	N			
	Experimental	v		Report		N	(other)				
	work			Seminar							
2.8. Monitoring student work	Essay		N	paper		N	(other)				
	exam	Y		Practical work		N	(other)				
	Project		Ν	Written exam	Y		ECTS credits (total)	3			
	1. The written exar	n cons	ists of f	ive desriptive que	estions	, each	graded with one poi	nt.			
	2. Grading scale:										
2.9. Assessment methods	< 60 % fail (1)	• •									
	≥ 50 % suπicient (2 ≥ 70 % good (3))									
	\geq 80 % very good (4)									
	≥ 90 % excellent (5)									

2.10. Student responsibilities	 To pass the course, students have to: successfully do all the exercises in practical work and hand in a written report consisting of an introduction, results and conclusions attend all lectures (a maximum of one unjustified absence is allowed for exercises, and two for lectures) achieve a minimum of 60% of points on the written exam 								
	Title	Number of copies in the library	Availability via other media						
2.11. Required literature (available in the library and/or via other media)	Višnja Bačun-Družina (2017): Mehanizmi evolucije, Script	0	YES, Merlin and/or web pages						
	Ana Huđek, Višnja Bačun-Družina, Ksenija Durgo (2018) Mechanisms of Evolution, Practical Work, Script		YES, Merlin and/or web pages						
2.12. Optional literature	 Fox C.W. and Wolf J.B. (2006) Evolutionary Genetics: Concepts and Case Studies, Oxford University Press, UK Krebs J.E. et al. (2014) Lewin's GENES XI, Jones & Bartlett Publishers, USA Primrose S. B., Twyman R.M. (2007) Principles of Gene Manipulation and Genomics, Wiley-Blackwell, Oxford, UK 								
2.13. Exams	Exam dates are published in Studomat.								
2.14. Other	-								

1. GENERAL INFORMATIO	N						
1.1. Course lecturer(s)	Josip Ćurko, PhD, Assistant Professor Marin Matošić, PhD, Full Professor Vlado Crnek, mag. ing.	1.8. Semester when the course is delivered	summer				
1.2. Course title	Mineral, Spring and Table Water	1.9. Number of ECTS credits allocated	3				
1.3. Course code	53668	1.10. Broj sati u semestru (P+V+S+T)	15 + 22 + 0 + 0				
1.4. Study programme	Graduate university study programme Food Safety Management	1.11. Expected enrolment in the course	10				
1.5. Course type	optional A	1.12. Level of application of e-learning (level 1, 2, 3), percentage of online instruction (max. 20%)	1. 5 %				
1.6. Place of delivery	Lectures in P3, laboratory exercises in the laboratoryu on the 3rd floor, field exercises in Jamnica d.d.	1.13. Language of instruction	Croatian				
1.7. Year of study when the course is delivered	second	1.14. Mogućnost izvođenja na stranom jeziku	Υ				
2. COURSE DESCRIPTION		-	-				
2.1. Course objectives	Objective of the course is to familiarize waters. Through the course student wil microbiological composition and basics of natural waters. Through acquired ski trade and quality assurance of mineral,	student with characteristics of m l acquire skills to distinguish physion of hydrogeological characteristic lls, students will be competent for spring and table waters.	nineral, spring and table sical-chemical and cs and bottling processes or working in production,				
2.2. Enrolment requirements and/or entry competences required for the course	-						
2.3. Learning outcomes at the level of the programme to which the course contributes	 establish, manage, control and supervise food safety system in the production chain, and manage its potential risks define principles and strategy of product quality, organize and manage quality system in food industry establish, manage, control and supervise food production processes 						

2.4. Expected learning	 do complex food analyses in microbiological and physical-chemical control and research laboratories independently analyse, make conclusions and present results of conducted analyses independently solve problems in new or unknown situations independently study and interpret results, and make conclusions and solutions manage or participate in interdisciplinary teams, which create or implement new methods with the aim of improving food safety and quality system from field to table apply ethical principles, legal regulations and standards related to specific requirements of the profession define and explain differences between natural mineral, spring, table and tap water based on 514 least regulations 										
outcomes at the level of the course (3 to 10 learning outcomes)	 discuss about h compare differ describe applic perform sanita 	 discuss about health and nutritive effects from consumption of mineral water compare different packing materials used for bottling describe applicable technologies for natural water treatment perform sanitation of water cooler 									
2.5. Course content (syllabus)	 Classification of Physical, chem National and in Nutritional, phi Basic requirem Packing materi Modern proces Environmental 	 Classification of mineral, spring and table waters Physical, chemical and microbiological characteristics National and international legislation Nutritional, pharmacological and clinical characteristics Basic requirements for production and trade for spring, mineral and table waters Packing materials Modern processes of safe bottling of spring, mineral and table waters 									
2.6. Format of instruction:	 ☑ lectures □ seminars and workshops ☑ exercises □ on-line in entirety □ partial e-learning ☑ field work □ Independent assignments □ multimedia and the internet □ laboratory □ work with mentor □ (ather) 				2.7. Comments	:					
	Class attendance	Y		Research		Ν	Oral exam		Y		
2.8. Monitoring student	Experimental work Essay		N N	Report Seminar paper	Y	N	(ostalo upisati) (other)				
WOLK	Preliminary exam		N	Practical work	Y		(other)				
	Project		N	Written exam		N	ECTS credits (to	otal)	3	3	
2.9. Assessment methods and criteria	Seminar paper: 30% Practical work: 30% Oral exam: 30%										
2.10. Student responsibilities	To pass the course, s successfully attend all le make a sem pass the or	 To pass the course, students have to: successfully do all the exercises in practical work and seminars attend all lectures (a maximum of three unjustified absences is allowed) make a seminar paper pass the oral exam 									
2.11. Required literature			Title	1			Number of copies in the library	A	vailabilit [,] other me	y via dia	
(available in the library and/or via other media)	I. Mijatović, M. Mato	ošić: T	ehno	logija vode (inte	ernal s	cript)	0	YES,	Merlin a pages	nd web	
	Dege, Nicholas, ed. ⁻ Wiley & Sons, 2011.	Techn	ology	of bottled wate	er. Joh	n	0	YES,	Merlin a pages	nd web	
2.12. Optional literature	-										
2.13. Exams	Exam dates are publ	lished	in Stu	ıdomat.							
2.14. Other	-										

1. GENERAL INFORMATION								
1.1. Course lecturer(s)	Marin Matošić, PhD, Full Professor Josip Ćurko, PhD, Assistant Professor Vlado Crnek, mag. ing.1.8. Semester when the course is deliveredsummer							
1.2. Course title	Membrane Bioreactors in Environment Protection	3						
1.3. Course code	53729	1.10. Number of contact hours (L+E+S+e-learning)	15 + 15 + 7 + 0					
1.4. Study programme	Graduate university study programme Food Safety Management	1.11. Expected enrolment in the course	10					
1.5. Course type	optional A	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	1. 5 %					
1.6. Place of delivery	Pierottijeva 6	1.13. Language of instruction	Croatian					
1.7. Year of study when the course is delivered	second	1. 14. Possibility of instruction in English	Y					
2. COURSE DESCRIPTION								
2.1. Course objectives	Course gives an overview of use of membrane bioreactors in wastewater treatment. Through the course students will acquire skills necessary technologicaly design a membrane bioreactor and operate membrane filtration. Acquired skills can be used to evaluate suitability of membrane bioreactor for treatment of a specific wastewater, choose an appropriate mebrane type and design and operate the treatment process							
2.2. Enrolment requirements and/or entry competences required for the course	-							
2.3. Learning outcomes at the level of the programme to which the course contributes	 establish, manage, control and supervise food production processes independently analyse, make conclusions and present results of conducted analyses independently solve problems in new or unknown situations independently study and interpret results, and make conclusions and solutions make decisions and solve problems in due time have the ability to integrate results, make judgements based on incomplete or restricted information and manage complex food safety systems apply ethical principles in relationships to coworkers and employer apply ethical principles, legal regulations and standards related to specific requirements of the profession 							
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 profession enhancement operate membrane bioreactor for wastewater treatment choose aprropriate membrane type for a membrane bioreactor caclulate volume of the bioreactor, amount of air for aeration and excess sludge production based on characteristics and amount of wastewater choose an optimal working regime for a membrane bioreactor to mitigate mebrane fouling compare membrane bioreactor technology with other biological processes for wastewater treatment 							
2.5. Course content (syllabus)	 Principle and characteristics o Membranes for MBR Wastewater characterization Designing an MBR Wastewater treatment in MB 	R						
2.6. Format of instruction	 ☑ lectures ☑ seminars and workshops ☑ exercises □ on-line in entirety 	 ☑ independent 2.7. Command □ multimedia and the internet 	ents:					

	 □ partial e-learning □ field work 			□ laboratory □ work with mentor □ (other)						
	Class attendance	Y		Research		Ν	Oral exam		Y	
	Experimental work	Y		Report		N	(other)			
2.8. Monitoring student work	Essay		N	Seminar paper	Y		(other)			
	Preliminary exam		N	Practical work		N	(other)			
	Project	Y		Written exam		N	ECTS credits (tota	al)	3	i
2.9. Assessment methods and criteria	 Maximum number of points by activity type: Making a membrane bioreactor seminar project 70% Final exam (oral) 30% Grading scale: < 50 fail (1) 50 - 60 sufficient (2) 60 - 75 good (3) 75 - 90 very good (4) ≥ 90 excellent (5) 									
2.10. Student responsibilities	 To pass the course, students have to: attend all lectures (a maximum of three justified absences is allowed) Successfully do all laboratory exercises (a maximum of three justified absences is allowed) make a membrane bioreactor seminar project mass the oral exam 									
2.11. Required literature (available in the library	Title					Number of copies in the library	Availa othe	bility r me	y via dia	
and/or via other media)	M. Matošić, Membra internal script	nski bi	oreak	tori u zaštiti o	koliša,		0	YES,	Mer	lin
2.12. Optional literature	 Judd, S. (2006) The MBR book, Elsevier Ltd., Oxford, UK Henze, M., van Loosdrecht, M.C.M., Ekama, G., Brdjanovic, D. Biological Wastewater treatment, IWA Publishing, 2008, London, UK 3. Metcalf&Eddy (2003) Wastewater Engineering - Treatment and Reuse (4th edition) McGraw-Hill New York 									
2.13. Exams	Exam dates are publi	shed ii	n Stud	lomat.						
2.14. Other	-									

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	<u>Natka Ćurko, PhD, Assistant</u> <u>Professor</u> Karin Kovačević Ganić, PhD, Full <u>Professor</u> <u>Marina Tomašević, PhD</u>	1.8. Semester when the course is delivered	summer
1.2. Course title	Production of Predicate and Sparkling Wines	1.9. Number of ECTS credits allocated	3
1.3. Course code	53744	1.10. Number of contact hours (L+E+S+e-learning)	20 + 8 + 7 + 0
1.4. Study programme	Graduate University Study Programme Food Engineering, Graduate University Study Programme Bioprocess Engineering, Graduate University	1.11. Expected enrolment in the course	18

	Study Programme Nutrition, Graduate University Study Programme Molecular Biotechnology						
1.5. Course type	optional B	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	1. 0 %				
1.6. Place of delivery	Lectures and seminars in P4, excercises as field work	1.13. Language of instruction	Croatian				
1.7. Year of study when the course is delivered	first	1. 14. Possibility of instruction in English	Ν				
2. COURSE DESCRIPTION							
2.1. Course objectives	Production of "special wines" in world production takes a significant place. These wines are technologically more demanding to produce because they seek knowledge that is applied in the usual production processes, as well as the specificity depending on the type of wine. In this segment, it is particularly important to define wine by the regional rules. Students will learn to recognize the differences in production technology and the organoleptic specificities of different wines, and also will be closer to the "production philosophy" with special emphasis on the critical points of the production. After completing the course, students will be able to upgrade their knowledge from other basic wine-making courses, and will be prepared to overcome the technological problems in cuch production						
2.2. Enrolment requirements and/or entry competences	-						
2.3. Learning outcomes at the level of the programme to which the course contributes	 Graduate University Study Programme recognize the importance of all settechnology applied, production a preservation on chemical compose quality assurance) analyse and assist in creating legatinvolved in food production give a final opinion about the restmicrobiological analyses of raw me Graduate University Study Programme recognize problems in production interpret laboratory analysis resul present plant, research, laborator professional terminology Graduate University Study Programme understand and have knowledge understand and have knowledge understand and acquire knowledge disciplines through elective modulated to biology, genetics and biology, genetics and biology, genetics and biology, genetics and biotechnological product 	e Food Engineering egments of food production (raw ma nd packaging conditions , effect of p sition of food products, potential effe al regulations from the standpoint of ults of conducted physical, chemical naterials and final products e Bioprocess Engineering , make corrective decisions ts y and business results in verbal and y e Nutrition of general skills in basic and applied of basic and specific disciplines of th ge of general skills in particular inter iles e Molecular Biotechnology on the fields of microbiology, microb bioinformatics with the aim of products	terial features, rocessing and ects of packaging, The subject and written form, using disciplines e profession disciplinary e physiology, cing traditional and				
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 explain the legal framework for the production of predicate and sparkling wines explain microbiological risks that emerges during wine production understand the technology of Sherry, Port and Madeira production and know how to evaluate the organoleptic characteristics of these wines evaluate organoleptic profile of Prošek and interpret physical/chemical composition of Prošek explain organoleptic characteristics of Tokay and predicate wines 						

	 evaluate pote understand in sparkling wine 	 evaluate potential of young wine to be used in sparkling wine production understand influence of secondary fermentation in bottles and wine aging in bottles on sparkling wine quality evaluate organoleptic characteristics of sparkling wines 								
2.5. Course content (syllabus)	 Regulations, le and sparkling Wine technology fo characteristics Technology fo Technology fo Technology fo comparison to 	r produ r produ r produ r produ r produ r produ	h an er h an er uction c uction c uction c cal wine	cifications and que nphasis on microl of fortified wines of Prošek with its of Tokay and prec of sparkling wines e production	biology (Sherry specific licate w	, Port : c chara vines s speci	in the product and Madeira) acteristics fic characteris	tion of with it	predic s spec	ate
2.6. Format of instruction	 ☑ lectures □ seminars and workshops ☑ exercises □ on-line in entirety □ partial e-learning □ field work □ (other) 						2.7. Comme	nts:		
	Class attendance	Y		Research		Ν	Oral exam			Ν
	Experimental work		N	Report		Ν	(other)			
2.8. Monitoring student work	Essay		Ν	Seminar paper		Ν	(other)			
	Preliminary exam	Y		Practical work	Y		(other)			
	Project		Ν	Written exam	Y		ECTS credits (total)	;	3	3
2.9. Assessment methods and criteria	Assessment will be of 10 questions fro grade obtained thr Grading scale: < 12 points - fail (1 12 - 14 points - suf 14 - 16 points - goo 16 - 18 points - ver 18 - 20 points - exc	e carrie m whic ough t ficient od (3) y good cellent	d out tl ch stud he writ (2) (4) (5)	hrough two writte ents can achieve ten exam can be	en parti a maxii increas	al exa num c ed by	ms. The writte of 20 points (1 one grade on	en exar 0 time: the ora	m cons s 2). Tl al exar	ຈists າe n.
2.10. Student responsibilities	To pass the course successful attend all achieve a	, stude lly do a lecture minim	nts hav III the e es (a ma um of 1	ve to: exercises in praction aximum of three L2 points (60%) po	cal wor unjustif pints or	k and s ied ab n partia	seminars sences is allo al exams	wed)		
			Title			c	Number of opies in the library	Avail oth	ability er me	/ via dia
	Boulton, R. B., Sige (1995) Principles a Hall, New York, pp	lton, V nd prac 65-98,	. L., Bis ctice of 102-18	son, L. F., Kunkee winemaking, Cha 31, 244-273, 448-	e, R. E. apman 8 470	&	0	YES	6, Mer	lin
2.11. Required literature (available in the library and/or via other media)	Jackson, R. S. (2008 Applications, 2nd. 354, 434-481	d) Wine ed., Ac	e Scieno ademic	ce: Principles and Press, New York	., pp 28	1-	0	YES	5, Mer	lin
	Mencarelli, F. & To Fortified Wines: Gr Vinification, 1st ed pp 29-71, 189, 215	nutti, F ape Bi ., John -277, 2	P. (2013 ochemi Wiley 8 285-327	3) Sweet, Reinford istry, Technology & Sons, Ltd, Chich 7	ced and and nester.,		0	YES	6, Mer	lin

2.12. Optional literature	 Halliday J. & Johnson, H. (2013) The Art and Science of Wine, 1st ed., Octopus publishing group, London, pp. 112-136, 175-191. Jackson, R. (2002) Wine Tasting: A Professional Handbook, 1st ed., Academic Press, New York, pp. 219-224.
2.13. Exams	Exam dates are published in Studomat.
2.14. Other	-

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Zoran Herceg, PhD, Full Professor Anet Režek Jambrak, PhD, Associate Professor Kata Galić, PhD, Full Professor Tomislava Vukušić, PhD, Assistant Professor Višnja Stulić, mag. ing.	1.8. Semester when the course is delivered	winter
1.2. Course title	Food Process Engineering 2	1.9. Number of ECTS credits allocated	5
1.3. Course code	53280	1.10. Number of contact hours (L+E+S+e-learning)	20 + 30 + 15 + 0
1.4. Study programme	Graduate university study programme Food Safety Management	1.11. Expected enrolment in the course	52
1.5. Course type	compulsory	1.12. Level of application of e-learning (level 1, 2, 3), percentage of online instruction (max. 20%)	1. 0 %
1.6. Place of delivery	P2, LFPE (room 29)	1.13. Language of instruction	Croatian
1.7. Year of study when the course is delivered	first	1. 14. Possibility of instruction in English	Ν
2. COURSE DESCRIPTION			
2.1. Course objectives2.2. Enrolment requirements	The main course objective is to enable stu preservation techniques and to use the a appropriate processes in the developmen	udents to apply various innovation ppropriate devices as well as to at of new food industry products	ve food apply the s.
and/or entry competences required for the course	-		
2.3. Learning outcomes at the level of the programme to which the course contributes	 know key aspects of food production recognize the importance of all segment technology applied, production and preservation on chemical composition packaging, quality assurance) know new food processing technique control of food conceptualize and carry out improve select and purchase new equipment implementation in order to improve conceptualize and carry out producti present modern food technology tree 	a and food industry ients of food production (raw m packaging conditions , effect of p on of food products, potential ef es and processes and methods u ment of existing technological p and production lines, and work company's business ion of new products nds and expansion of production	aterial features, processing and fects of used for quality rocedures on their
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 explain and present the specifics of r concept of minimally processed food know and apply innovative technique preservation create material and energy balances 	new food processing methods ar l es and processes in food process of innovative processes	nd define the

	 analyze th composition 	e impa	act of a	applied proc	essing a	and con	servation on t	he ch	emical		
	 recommer 	nded n	iew pr	oduction pro	ocess p	aramete	ers to improve	prod	uction and		
	improve e	xisting	; techn	ology proce	sses						
	 propose the 	ne pur	chase	of new proc	ess equ	iipment	and production	on line	es in order to		
	improve tl	ne bus	iness o	of the compa	any						
	select the	specif	ic pack	kaging mater	rial nee	ded to f	ood package o	obtair	ned by new		
	processing Material and e	g meth	ioas balanc	o of thorma	Inroco	scos (na	stourization s	torilia	ation		
	evaporation).	Cooling	and f	reezing proc	cesses:	materia	l and energy b	alanc	e. Basic		
	membrane sep	aratio	n – he	at and mass	transfe	er (equij	oment and app	olicati	ion) Extrusion -		
	heat and mass	transf	er. Eff	ect on foods	. Heat	process	ng by direct a	nd rad	diated energy.		
	Dielectric heat	ing – t	heory,	equipment,	applica	ations. (Dhmic heating	- the	ory, equipment,		
	applications. In	frarec	l heati	ng - theory,	equipm	nent, ap	plications. Pro	cessii	ng foods using		
2.5. Course content (syllabus)	puised electric	neia -	theor	y, equipmen	it. Proc	essing t de using	ultrasound - t	n nyc beory	rostatic		
2.5. Course content (synabus)	Processing foo	ds usir	ng puls	ed light - the	eorv. e	auipmei	nt. Specific pre	epara	tions of food.		
	Packaging of food – theory, types of packaging materials, interaction							ns between packaging			
	and foods, env	ironm	ental o	consideratio	ns. Foo	d handl	ing, storage an	d dis	tribution.		
	Practices and s	emina	rs:			c .	. ,				
	Extrusion (field	work), Heat	t and mass tr	ranster	of extru	ision (seminar), Intr	ared heating of		
	hav warehouse	e or ui s (field	work	Problems of	of hand	illing equ	uinments and	Ju (IIE distril	butions of foods		
	(seminar)		work					aistin			
	⊠ lectures			⊠ indepen	ndent		2.7. Comme	nts:			
	🗵 seminars an	d		assignmen	ts						
	workshops	🗆 multime	edia an	d the							
2.6. Format of instruction	🛛 exercises	internet									
	□ on-line in entirety 			⊠ laboratory							
	□ partial e-learning			\Box work with mentor							
				□ (otner)							
	attendance	Y		Research		Ν	Oral exam	Y			
	Experimental			. .			()				
	work	Y		керог	Ŷ		(other)				
2.8. Monitoring student work	Essay		Ν	Seminar paper	Y		(other)				
	Preliminary	Y		Practical		N	(other)				
	exam			work							
	Project		N	Written	v		ECIS		5		
	FIOJECC		IN	exam			(total)		5		
	Class attendan	ce		2			· · · /				
	Written exams	or ora	al exan	n 80							
	Exercises			6							
	Seminar assign	ments	5 (3)	12							
2.9 Assessment methods and	TOLAI			100							
criteria	Grading scale:										
	< 60 % fail (1)										
	≥ 60 % sufficier	nt (2)									
	≥ 70 % good (3)									
	≥ 80 % very go > 90 % exceller	0a (4) ht (5)									
	To pass the co	urse s	tuden	ts have to.							
	 succes 	ssfully	do all	the exercise	es in pra	actical w	ork and semin	ars			
2.10. Student responsibilities	 make 	, all lab	orator	y exercises r	reports						
	 make 	all ser	ninar a	assignments							
	 attend 	d lectu	res (al	osences are	tolerate	ed, but i	nfluence the g	(rade))		

	 achieve a minimum of 60% of points on each 	partial exam o	r pass the oral exam
2.11. Required literature	Title	Number of copies in the library	Availability via other media
via other media)	Z. Herceg, Procesi konzerviranja hrane - novi postupci, Golden marketing, Tehnička knjiga, Zagreb, 2009.	9	
2.12. Optional literature	 R. Paul Singh, Dennis R. Heldman: Introduction to San Diego, California, USA, 2001. P.J. Fellows: Food processing technology, principl Woodhead Publishing Limited and CRC Press LLC, 	Food Enginee es and practice Boca Raton, U	ring, Academic Press, e, second edition, SA, 2000 .
2.13. Exams	Exam dates are published in Studomat.		
2.14. Other	-		

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Duška Ćurić, PhD, Full Professor Dubravka Novotni, PhD, Assistant Professor Nikolina Čukelj, PhD, Assistant Professor Bojana Voučko, dipl. ing.	1.8. Semester when the course is delivered	winter
1.2. Course title	Chemistry and Technology of Cereals	1.9. Number of ECTS credits allocated	10
1.3. Course code	53289	1.10. Number of contact hours (L+E+S+e-learning)	60 + 45 + 15 + 0
1.4. Study programme	Graduate university study programme Food Engineering	1.11. Expected enrolment in the course	20
1.5. Course type	optional A	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	1. 5 %
1.6. Place of delivery	lectures and seminars in P5, exceercises in the LCCT, field excercises – visits to Podravka, Mlinar, Bivita and Kraš	1.13. Language of instruction	Croatian
1.7. Year of study when the course is delivered	first	1.14. Mogućnost izvođenja na stranom jeziku	Y
2. COURSE DESCRIPTION		-	-
2.1. Course objectives	On completion of this course, students v biochemical properties of commercially chemical and physicochemical propertie cereals.	vill understand: chemical composi important cereals; Effects of proce s of cereal products; Technology c	tion, functional and essing on the of processing of
2.2. Enrolment requirements and/or entry competences required for the course	Click here to enter text.		
2.3. Learning outcomes at the level of the programme to which the course contributes	 know key aspects of food production recognize the importance of all segn technology applied, production and preservation on chemical composition quality assurance) select and purchase raw materials and raw materials and products supervise and manage the quality m production conceptualize and carry out improve 	n and food industry nents of food production (raw mat packaging conditions, effect of pr on of food products, potential effe nd packaging materials, and condu anagement system for production ement of existing technological pro	terial features, ocessing and octs of packaging, uct quality control of processes in food ocedures

	 select and pur 	chas	e new e	quipment and prod	uction l	ines, a	and work on their		
	implementatio	on in	order t	o improve company	's busin	ess			
	 conceptualize 	and	carry ou	It production of new	v produ	cts do	highly-complex job	s in	
	microbiologica	al, ph	ysical a	nd chemical control	and de	velop	ment laboratories of	food	
	 make conclusi 	ions a	about se	election and purchas	sing of r	aw m	aterials, packaging a	nd	
	equipment				•				
	• give a final op	inion	about	the results of condu	cted ph	ysical,	chemical and micro	biolog	ical
	analyses of rav	w ma	terials a	and final products					
	 make decision manage a teau 	ns abc	out devi	a team, which is in a	charge	produ of a n	action Articular business ac	tivitv i	n
	food industry	orar	related	institution	charge	orap		civity i	
	 present mode 	rn fo	od tech	nology trends					
	• use and value	scier	ntific an	d occupational litera	ature w	ith the	e aim of lifelong lear	ning ai	nd
	profession en	hance	ement						
	 perform analy identified key 	/ses o	of main	quality parameters	of cerea	al pro	ducts		
	 Identified key define stens i 	aspe n cer	ects of g	rain storage ling					
2.4. Expected learning	 describe chan 	in ceri	hat occ	ur during cereals nr	ncessin	σ			
outcomes at the level	 select techno 	logy (of bread	dmaking, pasta prod	uction.	Þ biscui	ts and crackers. and	snack	
of the course (3 to 10	production.	-07		0, 110, 110, 110, 110, 110, 110, 110, 1	,		·····		
learning outcomes)	develop new	cerea	al produ	icts					
	 apply legislati 	on ar	nd norn	ns related to specific	require	ement	s for cereal process	ing	
	use scientific	and p	professi	onal literature for th	ie purp	ose of	lifelong learning		
	1. Introduction t	o cer	eal che	mistry and technolog	gy chomic [,]	al com	position of cereal g	ainc	
	 Grain morphology, microscopic structure and chemical composition of cereal grains; Cereal enzymes. Determination of foreign matter. hectolitre mass. grain vitreousness. 								
	sedimentation value, and wet gluten content.								
	4. Dough rheology – fundamental and empirical. Measurement of dough rheology on								
	farinograph and extensograph.								
	5. Storage of cereals. Determination of flour amylase activity on amylograph and by falling								
	number meth	od.	. I.a. I.a. al.		11				
	6. Dry milling of	cerea	als. Indu	istry visit – silo and i	mill. Vicio of v	wheat	broad dotorminatio	n of h	road
2.5. Course content	vield and spec	ific v	olume	ig test, sensory and	ysis of v	viieat	breau, determinatio		reau
(syllabus)	8. Criteria of flou	ir qua	ality. Ba	kery industry visit.					
	9. Specific criteri	a of f	, flour an	d cereal products qu	uality. B	aking	tests. Partial exam.		
	10. Bread-making	tech	nologie	s, steps and equipm	ent. Ba	ke-off	technology. Industr	y visit	-
	biscuit produc	tion.	Semina	irs 		- C -			
	11. Bread quality	parar	neters	and staling. Bread in	nprover	's. Sol	irdougn. Biscuits sta	ndard	
	12. Puff pastry, la	mina	ted, phy	lo and short dough	. Deterr	ninati	on of pasta quality k	ov sens	orv
	method. Dete	rmina	ation of	oat flakes water ab	sorptio	n.			
	13. Pasta product	ion. I	ndustry	visit – oat flakes fac	ctory. S	emina	rs.		
	14. Soft wheat pro	oduct	ts – bisc	uits, crackers and ca	akes. Se	minar	S.		
	15. Production of	snac	k tood a	and breakfast cereal	s. Semi	nars.			
	10. Partial exam.			□ independent as	ianmo	atc	27 Commontes		
	Seminars and w	orksl	hons	\Box multimedia and	tho	its	2.7. Comments:		
		101 K31	lop3	internet	uie				
2.6. Format of instruction	\Box on-line in entire	νtv		⊠ laboratory					
	□ partial e-learnir	ng		\Box work with ment	or				
	\boxtimes field work	.0		🛛 (other)	-				
	Class		N	Decearab		NI	Oral avera	v	
	attendance		N	кеsearch		N	Urai exam	Y	
2.8. Monitoring student	Experimental		N	Report		N	(other)		
WUIK	work								
	Essay		Ν	Seminar paper	Y		(other)		

	Preliminary		N	Practical work	Y		(other)		
	Project		N	Written exam	Y		ECTS credits (total)	-	10
	1. Maximum num 1. Partial exam 2. Partial exam 2 Seminar paper Exercises Total	ber o 20 20 40 20 100	of point	s by activity type:					
2.9. Assessment methods and criteria	2. Partial exams In the exam period partial exams, taki Passing prior parti	d, the ing th al exa	e failed ne exam ams is r	partial exam is taker n in the exam period not a prerequisite fo	n. If stud is consid r taking f	ents derec the s	do not pass the o d to be the first e ubsequent ones.	course via xaminatio	ı on.
	3. Grading scale: < 60 % fail (1) ≥ 60 % sufficient (2 ≥ 70 % good (3) ≥ 80 % very good (≥ 90 % excellent (5	2) (4) 5)							
2.10. Student responsibilities	To pass the course successfu with exer attend all achieve a give an or with the s achieve a	e, stud illy do cises l lectu mini ral pr semir	dents h o all the ures (a mum o resenta nar pap mum 6	ave to: e exercises in practic maximum of two un if 12 points on each tion of a seminar pa er 0 points in total	al work a justified partial e per and a	and a abse xam achie	achieve a minimu ences is allowed) eve a minimum of	m of 12 p f 24 point	ooints :s
2.11 Paguirad literatura							Number of	Availab	oility
(available in the library			т	itle			copies in	via ot	her
and/or via other media)							the library	med	ia
2.12. Optional literature	 Hoseney, R.C. Minnesota, SA Bozzini A. i sur Minnesota, SA Manley, D. (20 Limited and CF Klarić, F. (prev Biblioteka Krul Technologie de Kulp i Ponte (2 	(1994 ND. (198 ND. 000) T RC Pr vodite h za ž er Ba 2010)	4) Princ 88) Dur Fechnol ess LLC lj) 2012 ivot, Tl ckware Handb	ciples of Cereal Scien rum Wheat Chemistr logy of Biscuits, Crac , Cambridge CB1 6A 2: Tehnologije proizv IM ZIP doo Zagreb ; i enherstellung, Gildek look of Cereal Science	ce and T y and Te kers and H, Englau yodnje pe Original: puchverla te and Te	Fechro echno I Coo nd ar ekars Schu ag Gr echno	nology. AACC, St. P blogy, AACC, St. P kies, Woodhead nd Boca Raton Fl kih i slastičarskih inemann, C., Trei mbH&Co.KG, Deu blogy. Marcel Del	Paul, Paul, Publishin 33431 US proizvoc J, G. (200 itschland kker.	g ;A ła, !9):
2.13. Exams	Exam dates are pu	ıblish	ed in Si	tudomat.					
2.14. Other	Obavijesti o predavanjima, vježbama i ispitima se objavljuju na mrežnoj stranici http://moodle.srce.hr/2016-2017/course/view.php?id=12861								

1. GENERAL INFORMATION			
1.1. Course lecturer(s)	Ivan Krešimir Svetec, PhD, Full Professor Anamarija Štafa, PhD, Assistant Professor Marina Svetec Miklenić, PhD, Assistant Professor Bojan Žunar, PhD	1.8. Semester when the course is delivered	summer
1.2. Course title	Genetic Engineering	1.9. Number of ECTS credits allocated	4

1.3. Course code	39804	1.10. Number of contact hours (L+E+S+e-learning)	27 + 27 + 0 + 0
1.4. Study programme	Undergraduate university study programme Biotechnology	1.11. Expected enrolment in the course	60
1.5. Course type	compulsory	1.12. Level of application of e- learning (level 1, 2, 3), percentage of online instruction (max. 20%)	2. 5 %
1.6. Place of delivery	Lectures in P1 and P2; Exercises in the Laboratory for Biology and Microbial Genetics	1.13. Language of instruction	Croatian
1.7. Year of study when the course is delivered	third	1.14. Possibility of instruction in English	Υ
2. COURSE DESCRIPTION			
2.1. Course objectives	The objective of the course is to fam genetic engineering and to transfer implement individual methods and to and purification, DNA electrophores restriction and modification enzyme of E. coli. PCR. RAPD. restriction ma	niliarize students with the principles ar the knowledge and skills required for techniques on their own. These includ is and isolation of DNA from the gel, a es, construction of recombinant plasmi poping and construction and analysis of	nd methods of students to e: DNA isolation pplication of ids, transformation gene bank.
2.2. Enrolment requirements	To enrol in this course, the following	g courses must be completed:	
and/or entry competences required for the course	 Molecular Genetics Biochemistry 1 		
2.3. Learning outcomes at the level of the programme to which the course contributes	 define and explain the principle physics, chemisty, biochemistry and molecular genetics, and ap select and apply in practice bas biotechnological and genetic er select and use laboratory equip conduct analyses and biotechnomicrobiological, molecular-generic recognize and solve simple proleinterpret routine laboratory and report on laboratory, productio using specific professional term develop knowledge and skills w primarily on graduate studies or solve simple proleinterpret routine studies or solve simple proleinterpret for the solve simple proleinterpret professional term 	es of basic scientific disciplines, such as and biology with particular emphasis ply these skills and knowledge to the f ic biochemical engineering knowledge agineering processes ment and appropriate computer tools ological procedures in chemical, bioche etic, process and development laborat olems in these laboratories alyses in biotechnology in plant and business results in verbal a inology thich are needed to continue studies o f Bioprocess Engineering and Molecula	a mathematics, on microbiology ield of biote and skills, manage emical, ories, and and written way, n higher levels, ar Biotechnology
2.4. Expected learning outcomes at the level of the course (3 to 10 learning outcomes)	 explain the importance and app support the explanations by con- explain basic concepts related to recombinant DNA, cloning, GM vector, inserts, transformations bank apply enzymes for cleavage and enzymes, DNA ligases, DNA and and kinase, for the purpose of of construction of gene bank and point electrophoresis, restriction ana "TaqMan probes"), RAPD, RFLP (dideoxy), S1 mapping, Souther isolation in singlestranded form and PCR) explain the principle and proceed some vectors such as plasmids, plan and propose strategies for yeast S. cerevisiae explain the principle and proceed modification and cloning of anity 	plication of genetic engineering in biot increte examples to genetic engineering such as genetic Os, genes, transgenes, cDNAs, ORFs, c 5, homologous / heterologous expressi d modification of nucleic acids such as l RNA polymerases, RNase and DNase, constructing and analysing recombinar genetic material analysis e and application of the following metil lysis of DNA, isolation of DNA from gel , VNTR, AFLP, SSCP, DGGE, FISH, DNA s n blotting, Northern blotting, two hyb and targeted mutagenesis in vitro (by dure of cloning and construction of a g viral vectors, phagmids, cosmids, BAC the introduction of targeted genetic r dure for the genetic modification of pl mals	echnology and modification, lones, cloning, on, libraries / gene restriction and phosphatase at plasmids, hods: DNA , PCR, qPCR (using sequencing rid system, plasmid y Kunkel method genomic bank in s, PACs and YACs nodification in ants and genetic

	 plan and carry restriction ana and RFLP 	out the co alysis of pla	onstruction of the plasmid or DNA fragme	asmid a ent and	nd the perfor	e gene bank, carry o m methods such as	ut PCR, F	 plan and carry out the construction of the plasmid and the gene bank, carry out restriction analysis of plasmid or DNA fragment and perform methods such as PCR, RAPD and RFLP 				
	• interpret the r	esults of n	nolecular genetic and	alysis								
2.5. Course content (syllabus)	 scope and implications for human society; comparison of classic breeding methodology and methods of genetic engineering; specific examples of expression of human proteins in E. coli Restriction enzymes and recombination "in vitro" nucleic acid electrophoresis Enzymes for modification of nucleic acids (ligases, polymerases, nucleases, kinases, phosphatases, transferases) Methods of PCR, qPCR, RAPD and targeted mutagenesis in vitro Vectors and hosts in genetic engineering and the construction and search of a gene bank Labelling of nucleic acids and application of hybridization methods Methods for detection and analysis of DNA polymorphisms DNA sequencing and postgenomic research Genetic engineering of S. cerevisiae yeast Genetic modifications of plants and animals 					tion ogy eins bank						
						2.7. Comments:						
2.6. Format of instruction	 ☑ lectures □ seminars and weights ☑ exercises □ online in entiret ☑ partial e-learnin □ field work 	orkshops y g	 ☐ independent assignments ☐ multimedia and the internet ⊠ laboratory ☐ work with mentor ⊠ rasprava na forumu u sustavu Merlin 			Students attend lectures in the first half of the semester, and practical laboratory exercises in the second half. During classes, students have a chance to answer questions and participate in Merlin forum discussions about topics from genetic engineering and with this activity they get additional "bonus points" affecting the final grade.						
	Class attendance	Y	Research		Ν	Oral exam	Y					
	Experimental work	Y	Report		Y	3 partial exams	Y					
2.8. Monitoring student work	Essay	N	Seminar paper		N	Participating in Merlin forum discussions	Y					
	Preliminary exam	Ν	Practical work		N	(other)						
	Project	N	Written exam	Y		ECTS credits (total)	2	4				
2.9. Assessment methods and criteria	examNWritten examYECTS credits (total)ProjectNWritten examYECTS credits (total)Students can pass the course through three partial exams (two covering lectures and covering exercises), each one bringing a maximum of 100 points. Students can take th successive partial exam if they achieve a minimum of 10 points on the previous one. If addition, with forum activities (answering questions and discussion) during lectures ar exercises, students can collect "bonus points". A maximum of 60 bonus points can be collected and these points are added to points achieved on partial exams. Based on th of achieved points on the first exam period (3rd partial exam) a final grade is formed according to the following:GRADEPOINTS excellent (5)Qood (3)211 - 240 181 - 210				nd one the c. In s and be n the t ed	otal						

	If students achieve a Sufficient, Good or Very good grade on take the oral exam to increase their grade (the exam will be period). If students achieve a Fail grade, they can take make- entire syllabus. In this case, the grade is formed according to not taken in consideration: GRADE POINTS excellent (5) 91 - 100 very good (4) 81 - 90 good (3) 71 - 80 sufficient (2) 61 - 70 fail (1) 0 - 60 Exams can contain eliminatory questions (basic knowledge o should have been acquired before enrolling in this course). A	the first exam p held before the -up exam period this table and b f biology and bio fter the written	eriod, they can successive exam s covering the oonus points are ochemistry that exam, students
	can be asked to take the oral exam (in case of problems with and/or in case of lacking a few points for a higher grade).	the eliminatory	questions
2.10. Student responsibilities	 To pass the course, students have to: attend all lectures (a maximum of one unjustified al attend all exercises and actively participate in carryi achieve the minimal number of points needed for a 	osence is allowe ing out assignme sufficient grade	d) ents (see section 2.9)
	Title	Number of copies in the library	Availability via other media
2.11. Required literature	Anamarija Štafa, Ivan Krešimir Svetec, Zoran Zgaga, Skripta za vježbe iz Genetičkog inženjerstva		YES, Merlin
and/or via other media)	Metode u molekularnoj biologiji, Andreja Ambriović Ristov, IRB, 2007		YES, Laboratory
,			-
	Anthony JF Griffiths, An Introduction to Genetic Analysis, 2000		YES, Merlin
	Anthony JF Griffiths, An Introduction to Genetic Analysis, 2000 Alberts, B., Molecular Biology of the Cell, 2002		YES, Merlin YES, Merlin
2.12. Optional literature	 Anthony JF Griffiths, An Introduction to Genetic Analysis, 2000 Alberts, B., Molecular Biology of the Cell, 2002 Primrose S.B. i Twyman R.M. (2006) Principles of gene n edition, Blackwell Publishing, Oxford. Brown T.A. (2006) Gene cloning and DNA analysis, 5th e Oxford. Ausubel, F.M., Brent R., Kingston R.E., Moore D.D., Seidr (2002) Short protocols in molecular biology, 5th ed. Vols J. Sambrook, E. F. Fritsch, T. Maniatis. Molecular cloning Cold Spring Harbor, New York, 2001. 	nanipulation and dition, Blackwel man J.G., Smith . s 1 and 2. Willey g: A laboratory r	YES, Merlin YES, Merlin d genomics, 7th I Publishing, J.A. i Struhl K. and Sons. manual. 3rd ed.,
2.12. Optional literature 2.13. Exam dates	 Anthony JF Griffiths, An Introduction to Genetic Analysis, 2000 Alberts, B., Molecular Biology of the Cell, 2002 Primrose S.B. i Twyman R.M. (2006) Principles of gene n edition, Blackwell Publishing, Oxford. Brown T.A. (2006) Gene cloning and DNA analysis, 5th e Oxford. Ausubel, F.M., Brent R., Kingston R.E., Moore D.D., Seidr (2002) Short protocols in molecular biology, 5th ed. Vols J. Sambrook, E. F. Fritsch, T. Maniatis. Molecular cloning Cold Spring Harbor, New York, 2001. Exam dates are published in Studomat. 	nanipulation and dition, Blackwel man J.G., Smith . s 1 and 2. Willey g: A laboratory r	YES, Merlin YES, Merlin d genomics, 7th I Publishing, J.A. i Struhl K. and Sons. manual. 3rd ed.,

1. GENERAL INFORMATION					
1.1. Course lecturer(s)	Ivan Krešimir Svetec, PhD, Full Professor Anamarija Štafa, PhD, Assistant Professor Marina Svetec Miklenić, PhD, Assistant Professor	1.8. Semester when the course is delivered	winter		
1.2. Course title	GMOs in Food Production	1.9. Number of ECTS credits allocated	3		
1.3. Course code	53261	1.10. Number of contact hours (L+E+S+e-learning)	20 + 0 + 15 + 0		
1.4. Study programme	Graduate university study programme Molecular Biotechnology	1.11. Expected enrolment in the course	35		

		1.12. Level of application of e-										
1.5. Course type	optional A	learning (level 1, 2, 3),	1.									
		percentage of online	0 %									
1.6. Place of delivery	Lectures and seminars in P3	1 13 Language of instruction	Croatian									
1.7. Year of study when the		1.14. Possibility of instruction	croatian									
course is delivered	first	in English	Y									
2. COURSE DESCRIPTION												
	The objective of the course is to tea	ach students what is GMO from a	scientific and legislative									
	point of view, what are the differences between edible plants produced by classical breeding											
2.1. Course objectives	and GM plants, which procedures are used in classical breeding and which during the											
	is, and what are the principles, proc	cedures, advantages and disadvar	itages of methods for									
	detecting and quantifying GMOs in products and raw materials											
2.2. Enrolment												
requirements and/or entry	Understanding the subject requires the knowledge of molecular genetics and genetic											
competences required for	engineering											
the course	 integrate knowledge acquired f 	from the fields of microhiology m	nicrobo physiology									
	molecular biology, genetics and	bioinformatics with the aim of p	roducing traditional and									
	modern biotechnological products											
	apply knowledge acquired in order to construct genetically modified organisms of desired											
	traits											
	 participate in activities of advisory and legislative bodies in the field of molecular 											
	 manage particular laboratory units in biotechnology, food and pharmaceutical industry 											
 2.3. Learning outcomes at the level of the programme to which the course contributes and other institutions owing to their knowledge of contemporary biochemical, microbiological, molecular genetic and instrumental methods use scientific literature in English, and present the existing results to experts and laboratory units in biotectimology, food and pharmaceutical index and other institutions owing to their knowledge of contemporary biochemical, microbiological, molecular genetic and instrumental methods 												
							 and convey their knowledge and skills to their peers present, valorize and popularize modern accomplishments and courses of developmen molecular biotechnology participate actively in scientific paper discussion from the field of molecular biotechnol and related sciences act in accordance with ethical principles and acquire new knowledge and skills, as a parlifelong learning and profession promotion, including PhD studies in molecular biotechnology and other bio-sciences 					
	mutagenesis, genetic engineering, transgenic organism, transgene, cisgene. heter											
	gene expression, GM product, "pharming"											
	• distinguish between the principle and methods and evaluate and discuss the advantages											
	and disadvantages of genetic engineering and classical breeding											
	 based on concrete examples, argue the reasons for GMUs use from the point of view of producers and consumers and compare US_ELL and RH policies with the application of 											
	GMOs in food production											
2.4. Eveneted leaveing	 conclude whether certain claims about the ecological and economic consequences of 											
2.4. Expected learning	breeding certain GM plants are true and to support the answers with argumentation											
course (3 to 10 learning	based on the knowledge of a particular biosynthetic pathway, propose the genetic											
outcomes)	modification that will result in a desired physiological change such as increased concentration of a metabolite, change in starch structure, fatty acid composition, atc											
	 conclude which genetic modification could have a positive or negative impact on certain 											
	technological and nutritional properties of certain plants (e.g. wheat, potatoes, oilseeds)											
	• conclude and argue whether certain applications of GM-microorganisms are subject to the											
	GMO Law in the Republic of Croatia											
	 argue it some toodstuffs could be a GM product and to conclude whether, under the GMO Act, it should be labelled as a CM product. 											
	explain the principle procedure and application of methods for detection and											
	quantification of GMOs											

	 review and present the original scientific paper covering a topic about the GMO issue in an understandable way or review and present an application for registration of a GM plant to colleagues, answer their questions and ask questions and participate in the discussion 								
2.5. Course content (syllabus)	 Introduction to the course and the distribution of GMOs worldwide Plant genomes, polyploid and hybrid plants Transformation of plant cells and cell culture Characteristics of GM plants Dilemma about GM plants and the use of GM-microorganisms in food production Methods for detection and quantification of GMOs, final discussion and conclusions 								
2.6. Format of instruction	 ☑ lectures ☑ seminars and workshops ☑ exercises □ online in entirety ☑ partial e-learning □ field work 		 □ independent assignments □ multimedia and the internet □ laboratory □ work with mentor ⊠ rasprava na forumu u sustavu Merlin 		2.7. 2.7. Comments: In the first half of classes, students attend lectures. In the second half they attend seminars and practical laboratory exercises. During classes, students have the opportunity to ask questions and participate in discussions about GMO themes on Merlin, gaining bonus points that affect the final grade.				
	Class attendance Experimental work		N N	Research Report		N N	Oral exam discussion durin seminar	Y ng Y	
2.8. Monitoring student work	Essay		N	Seminar paper	Y		(other)		
	Preliminary exam		N	Practical work		N	(other)		
2.9. Assessment methods and criteria	Maximum number of points by activity type 1. Written exam 40 2. Seminar paper 10 4. Oral exam 50 Total 100 Grading scale: < 60 % fail (1)								
2.10. Student responsibilities	 To pass the course, students have to: attend all lectures (a maximum of one unjustified absence is allowed) give a presentation of a seminar paper and attend all seminars achieve the minimal number of points needed for a sufficient grade (as described under 2.9) 								
2.11. Required literature (available in the library and/or via other media)	Title			Number of copies in the library	Availabili other m	ty via edia			
	Food and Agriculture Organization of the United Nations				YES, Me	erlin erlin			
	International Service for the acquisition of Agri-Biotech Applications				YES, Me	erlin			

2.12. Optional literature	 Plant biotechnology and genetics: principles, techniques and applications. Ed. Neal C. Stewart. John Wiley & Sons, Hobken, 2008. Plant biotechnology: the genetic manipulation of plants. A. Slater, N. W. Scott, M. R. Fowler, 2nd ed. Oxford University Press, Oxford, 2008. 	
2.13. Exams	Exam dates are published in Studomat.	
2.14. Other	-	

English for Specific Purposes 2

Course Coordinator Dijana Njerš

ECTS points:

1

Program: preddiplomski **Course number**: 74367; 74369; 74371

Course Description

COURSE CONTENT

- English for Specific Purposes vs General English lectures and examples
- Most frequent grammar mistakes made in scientific writing lectures and examples plus exercises
- Foreign plurals (of Latin and Greek origin) in ESP and scientific English, lecture and examples plus exercises
- Key words and key sentences in ESP/scientific texts lectures plus exercises
- Translation exercises in short ESP texts English to Croatian and vice-versa group and/or individual exercises
- Understanding short films in food technology, biotechnology and nutrition in English
- Discussing film content in English
- Asking and answering questions in English
- Writing a short summary in English
- Revision

LEARNING OUTCOMES

- acquire ESP vocabulary in the specific field of study: food technology, biotechnology and nutrition
- translating short ESP texts from English to Croatian and vice-versa
- asking and answering questions in English about ESP texts and short videos within the field of study
- discussing short ESP videos and texts in English
- write a short summary in English

English for Specific Purposes 3

Course Coordinator Diana Njerš, Prof.

ECTS points: 3 Course Description Program: preddiplomski Course number: 39859

COURSE CONTENT

The module is based on understanding and reading authentic scientific and occupational/vocational articles from the fields of science relevant for study courses. Based on these articles the skills of listening, reading, speaking and writing in English are improved. Grammar is reviewed on the basis of these texts.

The students choose by themselves a topic that is of special interest for their work or study and write a seminar work. The seminar paper is worked out in the following manner: students search different sources (such as libraries, books, scientific magazines, Internet) and compose a corpus for their work. All the materials should be written in authentic English, (not translations). Then the students produce a glossary, a summary and notes (usually in the PowerPoint programme). After checking with the lecturer, student(s) present their paper in front of an auditorium composed of other students in the classroom and the lecturer. The presentation should take around 15-20 minutes, during which other students take notes, write down comments and questions. After the presentation questions are asked by other students, comments are offered and discussion is welcome. It is evident that this involves an interactive approach, and invites a dynamic exchange of thoughts, and prepares students for real-life situations they will find themselves in in their future work.

LEARNING OUTCOMES

- writing CV
- building up on the expert/occupational vocabulary within the field of study
- writing and abstract of expert or scientific articles in English
- searching the Internet and other written sources to find needed expert, scientific or vocational text materials for their presentation in English
- writing a glossary of technical terms in English
- preparing a writen presentation in English within the field of their study
- writing a PowerPoint slide presentation in English with the terminology within the field of their study
- presenting a topic, within their field of study, in English in front of an audience
- taking part in discussion about a topic of their choice from the field of their study in English
- answering to ad hoc questions from the audience related to their presentation within the field of their study

Probiotics and starter cultures

Associates Jasna Novak, PhD

Andreja Leboš Pavunc, PhD

Martina Banić, mag. ing.

Jasna Mrvčić, PhD

Katarina Butorac, mag. ing.

ECTS points: 3

Program: preddiplomski diplomski **Course number**: 173442 (PDN), 173443 (DBPI i DMB), 53725 (DN), 53743 (DPI, DUSH)

Course Description

COURSE CONTENT

1. Pobiotic, prebiotic and sybiotic concept

L: Reasons for establishing a probiotic, prebiotic and synbiotic concept. History of probotics development. Influence of probiotics and prebiotics on the composition and metabolism of the intestinal microbiota. Selection of strains for probiotic application. Probiotics mode of action. Prebiotics mode of action. Immunomodulatoryactivity of probiotic bacteria. Combined application of probiotics and prebiotics – synbiotic.

E: Morphological and physiological characteristics of lactic acid bacteria as probiotics and starter cultures. The role of probiotic bacteria surface proteins in the probiotic concept – application of SDS-PAGE electrophoresis

2. Production and application of probiotics

L: Production of probiotics as living drugs. Industrial application of lactic acid bacteria with bacteriocin activity.

E: Antimicrobial and bacteriocin activity of lactic acid bacteria.

3. Production and application of starter cultures

L: History of starter cultures development. The role of starter cultures in food preservation. General and specific criteria for the selection of starter cultures. Production and application of starter cultures for production of different fermented foods.

E: Production of wet biomass and lyophilized starter and probiotic cultures

LEARNING OUTCOMES

- critically evaluate the influence of probiotics and prebiotics on the composition and metabolism of intestinal microbiota
- critically evaluate the selection of the starter cultures for production of different fermented foods and explain the role of starter cultures in food preservation
- explain the benefits of using concentrated biomass with bacteriocin activity for fermented food production as well as bacteriocin preparations as biopreservatives in food industry
- determine the bacteriocin activity of lactic acid bacteria
- determine the morphological and physiological characteristics of lactic acid bacteria as probiotics and starter cultures
- relate the mode of action of probiotic bacteria with their metabolic activity
- sketch the workflow presenting the selection of lactic acid bacterial strains for probiotic preparations based on strict selective criteria
- perform the isolation and detection of surface proteins of probiotic bacteria using SDS-PAGE electrophoresis
- cultivate, isolate and concentrate lactic acid bacteria biomass and to produce probiotic and starter cultures by lyophilisation
- evaluate microorganisms bacteriocins producers among probiotic strains and starter cultures in order to extend their antimicrobial capacity

LEARNING OUTCOMES

Upon successful completion of this course the students will be skilled to:

- apply obtained knowledge on microbiology and physiology of lactic acid bacteria during selection of probiotic cultures and starter cultures for different fermented products

- perfom growth and isolation of lactic acid bacteria, and additionally to apply different methods for preparation of wet biomass and freeze dried cultures of probiotic and starter cultures bacteria, respectively

-to select potential bacteriocin producing strains among probiotic and starter cultures, respectively

- to set up biotechnological production of bacteriocins in order to increase antimicrobial capacity of probiotic and starter cultures intended for their application as biopreservatives in