JOSIP JURAJ STROSSMAYERA UNIVERSITY OF OSIJEKU
FACULTY OF FOOD TECHNOLOGY OSIJEK

EFFECTIVE CURRICULUM
FOR THE ACADEMIC YEAR 2024/2025

UNIVERSITY GRADUATE STUDY PROGRAMME

FOOD ENGINEERING

Osijek, June 2024

1st year of studies, academic year 2024/2025

SEMESTER	COURSE CODE	COURSE TITLE	L	S	LA	ECTS	COURSE LECTURER	COURSE ASSOCIATES
I	43746	Food Engineering	3		2	5	T. Moslavac, PhD, full prof. D. Šubarić, PhD, full prof.	A. Jozinović, PhD, assoc. prof.
I	88265	Modelling and Management in Food Technology Processes	3	1	1	5	D. Magdić, PhD, full prof.	
I	88266	Unit Operations in Food Engineering	3	1	1	6	M. Planinić, PhD, full prof. A. Bucić-Kojić, PhD, full prof.	G. Šelo, PhD
I	43752	Applied Mathematics	2	1	1	5	K. Sabo, PhD, full prof.	N. Šuvak, PhD, assoc. prof.
I	43751	Introduction to Scientific and Research Work	2	1		4	Đ. Ačkar, PhD, full prof. S. Jokić, PhD, full prof.	
I	43753	Biotechnology in Food Production	3		1	6	V. Krstanović, PhD, full prof.	Kristina Mastanjević, PhD, assoc. prof. N. Velić, PhD, full prof.
		SUBTOTAL:	**16**	**4**	**6**	**31**		
		TOTAL:	**26**					

SEMESTER	COURSE CODE	COURSE TITLE	L	S	LA	ECTS	COURSE LECTURER	COURSE ASSOCIATES
II	43749	Technological Design	3		1	5	D. Velić, PhD, full prof. S. Jokić, PhD, full prof. K. Aladić, PhD, assist. prof.	
II	43762	Company Management	2			3	B. Miličević, PhD, full prof. J. Babić, PhD, full prof. A. Jozinović, PhD, assoc. prof. M. Panjičko, PhD, assist. prof.	
II	43761	Foodborne Hazards	2		2	4	T. Klapec, PhD, full prof. T. Marček, PhD, assoc. prof.	
II	177794 177796	English Language German Language	2			2	A. Šarić, PhD, assoc. prof. L. Budić, MSc A. Šarić, PhD, assoc. prof.	
II	***2981***	Elective Course A-I	4		2	min 14		
II		Elective Course A-II	4		2			
		SUBTOTAL:	**17**		**7**	**28**		
		TOTAL:	**24**					

2nd year of studies, academic year 2024/2025

SEMESTER	COURSE CODE	COURSE TITLE	L	S	LA	ECTS	COURSE LECTURER	COURSE ASSOCIATES
III	43750	New Food Products Development	2	1		4	M. Kopjar, PhD, full prof.	
III	***13677***	Elective Course A-III	4		2	min 21		
III		Elective Course A-IV	4		2			
III		Elective Course A-V	4		2			
III	***15907***	Elective Course B-I	2		2	5		
		SUBTOTAL:	**16**	**1**	**8**	**30**		
		TOTAL:	**25**					

SEMESTER	COURSE CODE	COURSE TITLE	L	S	LA	ECTS	COURSE LECTURER	COURSE ASSOCIATES
IV	***15907***	Elective Course B-II	2		2	min. 10		
IV		Elective Course B-III	2	()	2			
IV	177799	Diploma Thesis		15	5	21		
		SUBTOTAL:	**4**	**15**	**9**	**31**		
		TOTAL:	**28**					

* One of elective B courses student can choose from any study at University

Elective Courses A – *13677* (3rd semester), *2981* (2nd semester)

SEMESTER	COURSE CODE	COURSE TITLE	L	S	LA	ECTS	COURSE LECTURER	COURSE ASSOCIATES
II	43755	Fruit and Vegetable Processing and Preservation	4		2	7	N. Nedić Tiban, PhD, full prof.	
II	43757	Technology of Oils and Fats	4		2	7	T. Moslavac, PhD, full prof.	
II	43758	Wine Technology	4		2	7	A. Pichler, PhD, full prof.	I. Ivić, PhD
II	43759	Meat and Fish Technology	4		2	7	D. Kovačević, PhD, full prof. Krešimir Mastanjević, PhD, full prof.	
III	43754	Technology of Flour Production and Processing	4		2	7	D. Koceva Komlenić, PhD, full prof. M. Jukić, PhD, full prof.	
III	81739	Technology of Carbohydrates and Confectionery Products	4	1	1	7	D. Šubarić, PhD, full prof. J. Babić, PhD, full prof. Đ. Ačkar, PhD, full prof. A. Jozinović, PhD, assoc. prof.	
III	43760	Technology of Milk and Dairy Products	4		2	7	M. Lučan, PhD, assist. prof.	M. Antunović, Mc
III	88267	Technology of Strong Alcoholic Beverages	4		2	7	A. Lončarić, PhD, assoc. prof.	

Elective Courses B - *15907*

SEMESTER	COURSE CODE	COURSE TITLE	L	S	LA	ECTS	COURSE LECTURER	COURSE ASSOCIATES
III, IV	88268	Food Quality and Safety Management	2			4	I. Flanjak, PhD, full prof.	
III, IV	66933	Food Process Equipment Design	2		2	5	D. Velić, PhD, full prof. S. Jokić, PhD, full prof. K. Aladić, PhD, assist. prof.	
III, IV	62317	Food Process Preparation	2		2	5	N. Nedić Tiban, PhD, full prof.	
III, IV	62318	Malting and Brewing Technology	2		2	5	Kristina Mastanjević, PhD, assoc. prof.	
III, IV	62319	Carbohydrate Technology	2		2	5	D. Šubarić, PhD, full prof. J. Babić, PhD, full prof. Đ. Ačkar, PhD, full prof. A. Jozinović, PhD, assoc. prof.	
III, IV	81740	Technology of Confectionery and Related Products	2	1	1	5	D. Šubarić, PhD, full prof. J. Babić, PhD, full prof. Đ. Ačkar, PhD, full prof. A. Jozinović, PhD, assoc prof.	
III, IV	62321	Cereal Storage and Flour Production	2		2	5	D. Koceva Komlenić, PhD, full prof. M. Jukić, PhD, full prof.	
III, IV	62322	Baking Technology	2		2	5	D. Koceva Komlenić, PhD, full prof. M. Jukić, PhD, full prof.	
III, IV	62323	Technology of Pasta and Biscuit Production	2		2	5	D. Koceva Komlenić, PhD, full prof. M. Jukić, PhD, full prof.	
III, IV	62312	Minimally Processed Food	2		2	5	N. Nedić Tiban, PhD, full prof.	
III, IV	62313	Primary Processing of Milk and Fermented Dairy Beverages	2			4	M. Lučan, PhD, assoc. prof.	
III, IV	62314	Autochtonous Dairy Proucts	2			4	M. Lučan, PhD, assoc. prof.	
III, IV	62315	Microbiological and Biochemical Processed in Dairy Industry	2	1		5	M. Lučan, PhD, assoc. prof.	
III, IV	62316	Autochtonous Meat Products	2		2	5	D. Kovačević, PhD, full prof. Krešimir Mastanjević, PhD, full prof.	
III, IV	88269	Functional Foods and Supplements	2	1	1	5	D. Čačić Kenjerić, PhD, full prof.	I. Banjari, PhD, full prof. M. Cvijetić Stokanović, MSc
III, IV	85361	Sensory Analysis	2		2	5	I. Flanjak, PhD, full prof. A. Perl Pirički, PhD, full prof.	B. Bilić Rajs, PhD, assist. prof.

Course description and learning outcomes of courses at the university graduate study programme
Food Engineering

Course title	**Food Engineering**			
Course code	43746	**Course status**	Compulsory	
Study programme	Food Engineering			
Semester	I			
Course lecturer	Tihomir Moslavac, PhD, full prof. Drago Šubarić, PhD, full prof.			
Course associates	Antun Jozinović, PhD, assoc. prof.			
Course content	Physical properties of food, rheology, Newtonian low, fluid types, types and properties of certain Non-Newtonian fluids, rheological parameters, rheological properties of certain food types, determining method of rheological parameters. Thermophysical properties of food, phase transitions, methods of thermic analysis DTA, DSC. Processes, plants and applications of food pasteurization after package filling, pasteurization of liquid groceries. Principles of HTST sterilization method, plants and applications. Procedures and plants for thermic sterilization of food after package filling, autoclave types. Sterilization of pipeline and tanks, aseptic storage of liquid groceries in the tanks. Cooling in the cooler. Principles of controled atmosphere, types and application of controled atmosphere. Procedures and plants for fast food freezing, freezing food storage, changes during storage, changes during freezing and unfreezing. Processes and equipments for liquid groceries concentration by evaporation, freezing. Processes and plants for dehydration of solid and liquid foods, lophylization. Membrane separation processes, definition of specific parameters and their calculations, membrane types and materials, module types, coss-flow membrane processes, application in the food industry. Mehanical separations of solid matters, solid-liquid, solid-gas. Chemical and enzimatic processes in the food industry, neutralisation, hydrogenation structure and hydrolysis if starch, pectin structure and hydrolysis, application in the food industry. Material and power processes account.			
General and specific knowledge acquired in course (objective)	The course objectives is to provide students with knowledge of physical and thermophysical properties of food, parameters of that properties and procedures of their determination, This course also provides the special knowledge of the certain processes, plants and applications in the food industry, pasteurization, sterilization, cooling, freezing, concentration, dehydration, membrane processe and mechanical separation. Basic of chemical and enzymatic processes in the food industry.			
Teaching method	**Lectures**	**Seminars**	**Labs**	
(hrs/week)	3		2	
(total)	45		30	
Examination method	Written and oral examination of the whole subject matter at the end of semester or in form of two written exams during semester and oral at the end of semester			
Credits	5	**Language**	Croatian	
Compulsory reading	1. T. Lovrić: Procesi u prehrambenoj industriji s osnovama prehrambenog inženjerstva, Hinus, Zagreb 2003. 2. D. R. Heldman, R. W. Hartel: Principles of Food Processing, Chapmen and Hall, 1998. 3. J. G. Brennan, J. R. Butters, N. D. Cowell and A. E. V. Lilley: Food Engineering Operations, Third edition, Essevier applied science, 1990. 4. D. R. Heldman: Food Process Engineering, Westport, Connecticut, 1975.			
Recommended reading	1. G. V. Barbosa-Canovas, U. R. Pothakamury, E. Palon, B. G. Swanson: Nonthermal Preservation of Foods, Marcel Dekker, INC. 1998. 2. C. P. Mallett: Frozen Food Technology, Blackie Academic & Prof., 1992. 3. N. D. Frame: Technology of Extrusion Cooking, Blackie Academic & Professional, 1993. 4. M. Mulder: Basic Principles of Membrane Technology, Kluwes Academic Publishiers, 1996. 5. R. P. Borwankar, C. F. Shoemaker: Rheology of Foods, Elsivier Applied Science, 1992.			

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Define physical and termophysical properties of food and instruments used in their determination
2.	List and explain food deterioration, principles and methods used for pasterisation, sterilisation as well as their application and equipment used for the process.
3.	Describe equipment used for cooling in controled atmsphere as well as the pocesses and equipment used for freezing.
4.	Describe processes and equipment used in concentration and explain processes and equipment used in food dehydration.
5.	Describe equipment for membrane separation and their application in food industry.
6.	List mechanical separation processes and explain chemical and enzymatic processes in food industry.
7.	Solve mass and energy balances.
8.	Apply gaind knowledge in problem solving related to food preservation processes.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	0.5	1-8	Lecture attendance	Attendance list	5	10
Labs	0.5	1-8	Active participation	Attendance list and report evaluation	5	10
Continuous knowledge check	1.5	1-8	Preparation for partial written exam or complete written exam	2 partial written exams or single overall written exam	10	30
Final exam	2.5	1-8	Literature studying	Oral exam	30	50
TOTAL	**5**				**60**	**100**

Course title	**Modelling And Management In Food-Technology Processes**		
Course code	88265	**Course status**	Compulsory
Study programme	Food Engineering		
Semester	I		
Course lecturer	Damir Magdić, PhD, full prof.		
Course associates			
Course content	Lectures: Methodology of development and analysis of mathematical and computer models. Numerical methods. Models and method for steady state determination. Basics of computer languages for simulation of steady and dynamic systems. Modelling of chemical and enzymatic reactions. Steady state of pH and evaporation process. Process management. Non-linear dynamic systems: vitamin degradation, changes of sensorical properties, changes of texture properties. Basics of Simplex method. Linear programming method application for optimisation of nutritional models. Optimisation of food composition. Basics of digital image analysis application. Basics of sound application in analysis and modelling. Labs: Model of steady state of chemical and enzymatic reactions. Steady and dynamic state of pH in chemical reactor. Evaporation model. Model of food sterilization and freezing. Examples of food composition and meal optimisation by linear programming method. Digital image analysis application. Modelling by acoustic impulse response method application. Simulation by different computer programs.		
General and specific knowledge acquired in course (objective)	- personal computers and computer programs application in engineering purposes - preparing of mass and energy bilances, mathematical methods application, calculations and statistical analysis of data - optimisation of operations and processes by applying ended models - optimisation of operations and processes by applying different computer programs		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	3	1	1
(total)	45	15	15
Examination method	Seminar paper (evaluation of work and presentation), examination after finishing computer practice, written and oral examination.		
Credits	5	**Language**	Croatian
Compulsory reading	1. D. Magdić: *Numeričke metode.* PTF, Osijek, 2001. 2. Ž. Kurtanjek: *Matematičko modeliranje procesa.* PBF, Zagreb, 2000. 3. D. Magdić: *Računalna analiza slike*, PTF, Osijek, 2001. 4. … *Inženjerski priručnik - ip1*, Školska knjiga, Zagreb, 1996		
Recommended reading	1. V. Čerić: *Simulacijsko modeliranje.* Školska knjiga, Zagreb, 1993. 2. V. Žiljak: *Simulacija računalom.* Školska knjiga-SNL, Zagreb, 1982. 3. J. Božičević: *Temelji automatike 1.* Školska knjiga, Zagreb, 1990. 4. J. Božičević: *Temelji automatike 2.* Školska knjiga, Zagreb, 1990. 5. T. Stuart: *Mathematical modelling of food processing operations*. Elsevier Applied Science Publishers Ltd, London and New York, 1992.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Compare various softwares for simulation and simulation
2.	Apply various softwares in modeling and simulation.
3.	Prepare reports with the results of modeling and optimisation of processes and profit.
4.	Conclude based on information and results obtained by calculation and process simulation.
5.	Explain content and organisation scheme of the modeling and optimisation process.
6.	Evaluate value of proposed model and simulation.
7.	Propose model for equipment design, analysis and process optimisation.
8.	Follow scientific studies in the filed of process engineering.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	2	1, 2, 5-8	Active participation	Attendance list	20	30
Seminars	1	4	Problems solving	Partial written exam	10	15
Computer exercise	1	1-4, 7	Guided solving of the computer tasks	Evaluation of the reports	15	25
Individual tasks	1	1-8	Literature studying	Written and oral exam	15	30
TOTAL	**5**				**60**	**100**

Course title	**Unit Operations In Food Engineering**		
Course code	88266	**Course status**	Compulsory
Study programme	Food Engineering		
Semester	I		
Course lecturer	Mirela Planinić, PhD, full prof. Ana Bucić-Kojić, PhD, full prof.		
Course associates	Gordana Šelo, PhD		
Course content	Lectures: Mechanical-physical operations: Cleaning of raw materials; Size reduction of solids; Classification and separation of solid particles according to their size and physical properties; Sedimentation and decantation; Filtration; Separating by centrifuges; Press; Mixing. Mass and heat transfer operations: Evaporation; Drying (dehydration); Extraction (leaching) and solubility; Crystallisation; Distillation. Absorption. Adsorption and ions exchange. Seminars: Introduction to equipment in food industry Labs: Audio-practices - solution of practical problems.		
General and specific knowledge acquired in course (objective)	The aim of course is to inform students with mechanical-physical processes, and mass and heat transfer processes in food industry		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	3	1	1
(total)	45	15	15
Examination method	Written, and oral if necessary. Parts of exam will be held during the semester. Each part of exam containing two teaching units.		
Credits	6	**Language**	Croatian
Compulsory reading	1. S. Tomas: *Mehaničko fizikalne operacije*. Interna skripta, Osijek, 1999. 2. S. Tomas: *Operacije uz prijenos topline - Uparavanje*. Interna skripta, Osijek, 1999. 3. S. Tomas: *Ekstrakcija (izluživanje) i otapanje, kristalizacija i destilacija*. Interna skripta, Osijek, 1997. 4. S. Tomas: *Sušenje. Apsorpcija plinova*. Interna skripta, Osijek, 1999. 5. S. Tomas: *Mapa aparata – Jedinične operacije*. Interna skripta, Osijek, 2001.		
Recommended reading	1. R. H. Perry, D. W. Green: *Perry's Chemical Engineer's Handbook*. 7nd ed, McGraw-Hill, New York, 1997. 2. J. M. Coulson, et al.: *Chemical Engineering I-V*. Pergamon Press, Oxford. 1999. 3. M. Hraste: *Mehaničke operacije*. Tehnološki fakultet, Zagreb, 1990. 4. J. G. Brennan, et al.: *Food Engineering operations.* 3rd ed., Elsevier Applied Science, London and New York, 1990. 5. A. Ibarz, G.V. Barbosa-Canovas: *Unit Operations in Food Engineering*, CRC Press LLC, Boca Raton, London, New York, Washington D.C., 2003.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Explain purpose and principles of mechanical-physical unit operations including size reduction, particle separation (solids, fluids, gases), mixing/knead, agglomeration and fluidisation.
2.	Sketch and describe equipment for mechanical-physical unit operations and understand their work principles.
3.	Apply gained knowledg to solve problems regarding mechanical-physical unit operations in food industry.
4.	Explain and diferentiate heat and mass transfer mechanisms as well as the principles of concentarting, dehydration and separation of specific compounds.
5.	Sketch and describe equipment used in food industry for unit operations and explain their work principles with focus on heat and mass transfer.
6.	Apply gained knowledge to solve problems regarding mechanical-physical unit operations which include heat and mass transfer.
7.	Recognise possibility of application of a specific unit operation in food industry.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures, seminars	0.5	1-7	Active participation	Attendance list	0	5
Laboratory practice	0.5	1-7	Active participation - problems solving	Attendance list and evaluation of the reports	0	5
Written knowledge check (calculation problems)	2	3, 6	Literature studying	2 partial written exams or single complete written exam	30	40
Written exam (calculation problems)*	2*	3, 6	Literature studying*	Written exam*	30*	40*
Final exam	3	1-7	Literature studying	Oral exam	30	50
TOTAL	**6**				**60**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Applied Mathematics**		
Course code	43752	**Course status**	Compulsory
Study programme	Food Engineering		
Semester	I		
Course lecturer	Kristian Sabo, PhD, full prof.		
Course associates	Nenad Šuvak, PhD, assoc. prof.		
Course content	Interpolation: Lagrange's interpolation polynomial. Newton's interpolation polynomial. Error of approximation. Linear interpolating spline. Cubic interpolating spline. Solving nonlinear equations: Nesting of intervals. Method of simple iterations. Newton method and its generalizations. Least squares problem: Linear least squares problem. Nonlinear least squares problem. Gauss-Newton method. Numerical integration: Trapezoidal rule. Newton-Cotes quadrature formula. Simpson's rule. Numerical solving differential equations: Euler method. Runge – Kutta method. Descriptive statistics: Graphical representation of data. Mean, median and mode, variance, histograms, frequency polygons. Basis of probability: Discrete probability. Brief outline of set theory, combinatorial analysis, Conditional probability, independence, and the random variable. Discrete distributions: binomial, Poisson, and geometrical. Continuous distributions: uniform, exponential, Gaussian. Expected value and variance. The main problems of statistics; sampling, estimations, confidence interval, and tests.		
General and specific knowledge acquired in course (objective)	Students will be introduced to the main ideas and methods of numerical mathematics and descriptive statistics. Theorem demonstration will be avoided except in cases of concrete evidence which automatically indicate method or idea development.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2	1	1
(total)	30	15	15
Examination method	Exam can be taken at the end of all lectures and labs and it is composed of oral and written part. During semester tests will be given which can replace written part of exam. Students can make a seminar paper which has an impact on the final grade.		
Credits	5	**Language**	Croatian
Compulsory reading	[1] R.Scitovski, Numerička matematika, Odjel za matematiku, Osijek, 2000. [2] G.R. Iversen, *Statistics, The Conceptual Approach*, Springer, Berlin, 1997.		
Recommended reading	[1] D.Kincaid, W.Cheney, Numerical Analysis, Brooks/Cole Publishing Company, New York, 1996. [2] J.Stoer, R.Bulirsch, Introduction to Numerical Analysis, 2^{nd} Ed.,Springer Verlag, New York, 1993.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1	List and explain types of errors.
2	Define and determine absolute and relative error of approximation and the number of significant digits of approximation.
3	Describe minimal and sufficient conditions for the existence of a sulution for nonlinear equation and apply various methds for their solving.
4	Explain the problem of interpolation polynomial.
5	To determine linear interpolating spline.
6	Define least squares problem, know and apply methods for solving linear least squares problem.
7	Diferentiate and apply various methods of numerical integration.
8	Demonstrate numerical solving of differential equations on selected examples
9	List methods of data collection and organisation and represent them graphicaly.
10	Define measures of central tendencies and scattering of a data set.
11	Define probability and list basic characteristics of probability.
12	Diferentiate discrete and continuous randm variable.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures attendance	1	1-12	Attendance	Attendance list	0	5
Exercise attendance	1	1-12	Attendance and active participation	Attendance list	0	5
Continuous knowledge check	3	1-12	Literature studying	2 partial or single complete written exam	30	50
Final exam	2	1-12	Literature studying	Oral exam	20	40
TOTAL	7				**50**	**100**

Course title	**Introduction to Scientific and Research Work**		
Course code	43751	**Course status**	Compulsory
Study programme	Food Engineering		
Semester	I		
Course lecturer	Đurđica Ačkar, PhD, full prof. Stela Jokić, PhD, full prof.		
Course associates			
Course content	Lectures: Definition of science. Characteristics of science. Classification of scientific work. Category of scientific research. Methods of research. Overview and presentation of literature. Classification of publications. Computer browsing of literature. Setting of operating hypothesis. Planning and conducting of experiment. Analysing results. Preparation of manuscripts of scientific paper. Writing of thesis and other qualification papers. Congress and other scientific meetings. Scientific projects. Evaluation and classification of scientific paper. Selection procedure of scientific research and teaching profession. Scientific Research Activities Act. Classification and browsing of primary, secondary and tertiary databases. News and latest achievements in Croatian and world science. Seminar: Writing a seminar paper – suggested or choice theme.		
General and specific knowledge acquired in course (objective)	The aim of the course is to provide knowledge of opportunities for scientific work in Croatia. During the course students will be introduced with planning, setting and conducting of experiments, with manuscript preparation of scientific paper and thesis. They are introduced with databases and methodology of browsing databases. They acquire knowledge about selection procedure of scientific research and teaching profession and introduce Research Activities Act basic elements.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2	1	
(total)	30	15	
Examination method	Seminar paper: Oral exam		
Credits	4	**Language**	Croatian
Compulsory reading	1. J. Kniewald: *Metodika znanstvenog rada*. Sveučilište u Zagrebu, Zagreb, 1993. 2. Lj. Baban, K. Ivić, S. Jelinić, M. Lamza-Maronić, A. Šundalić: *Primjena metodologije stručnog i znanstvenog istraživanja*. Ekonomski fakultet, Osijek, 2000. 3. Knežević: *Uvod u znanstveni rad*. Poljoprivredni fakultet, Osijek, 1988. 4. T. Salitrežić: *Uvod u znanstvenoistraživački rad*. Fakultet organizacije i informatike, Varaždin, 1981. 5. M. Žugaj: *Metodologija znanstvenoistraživačkog rada*. Fakultet organizacije i informatike, Varaždin, 1997.		
Recommended reading	1. V. Silobrčić: *Kako sastaviti i objaviti znanstveno djelo*. Jumena, Zagreb, 1989. 2. M. Žugaj, K. Dumičić, V. Dušak: *Temelji znanstvenoistraživačkog rada – metodologija i metodika*. Fakultet organizacije i informatike, Varaždin, 1999. 3. R. Zelenika: *Metodologija i tehnologija izrade znanstvenog i stručnog djela*. Ekonomski fakultet, Rijeka, 2000. 4. M. Q. Patton: *Qualitative Evaluation and Research Method*, 2nd Edition. Sage Publications Newbury Park, London, 1990. 5. G. G. Chowdhury: *Introduction to modern information retrieval*. Facet Publishing, London, 2004.		

LEARNING OUTCOMES

No	LEARNING OUTCOMES
1.	Present the system of higher education and scientific research in the Republic of Croatia
2.	Diferentiate the methods of scientific research
3.	Search scientific databases
4.	Write scientific review without plagiarism
5.	Know the rules of writig the diploma theses

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lecture attendance	0.5	1-5	Oral presentation; Discussion; Active participation	Attendance list	5	10
Seminars	0.5	2-4	Preparation of seminars, Work on specific tasks	Evaluation of seminars ant specific tasks	10	20
Final exam	3	1-5	Literature search; Preparation of scientific review on a selected topic; Discussion	Evaluation of scientific review and oral exam	40	70
TOTAL	**4**				**55**	**100**

Course title	**Biotechnology In Food Production**		
Course code	43753	**Course status**	Compulsory
Study programme	Food Engineering		
Semester	I		
Course lecturer	Vinko Krstanović, PhD, full prof.		
Course associates	Kristina Mastanjević, PhD, assoc. prof. Natalija Velić, full prof.		
Course content	Lectures: Definition and role of biotechnology. Biotechnology and food production. General characterization of bioprocesses (microorganisms, product). Bioreactors /fermentors and living cell as bioreactor. Preparation and sterilisation of industrial media. Microorganism selection and inoculum preparation. Kinetics of cell growth and product formation. Batch and continuous cultivation. Bioprocess regulation and control. *Anaerobic microbial processes*: Ethanol and alcoholic beverages production. Brewing. Wine technology. Lactic acid production. Lactic fermentations (pickled cucumber, cabbage, olives). *Aerobic microbial processes*: Baker's yeast production. Microbial biomass production (bacteria, algae, moulds, edible mushrooms). Starter cultures. Organic acid production: acetic acid, citric acid. Microbial production of amino acids. Microbial production of enzymes and their application in food industry. Labs: Ethanol production using immobilized Saccharomyces cerevisiae. Alcoholic fermentation on industrial media (molasses, starch). Microbial production of lactic acid. Microbial production of acetic acid.		
General and specific knowledge acquired in course (objective)	Obtaining education for planning, preparation and control of food production bioprocesses.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	3		1
(total)	45		15
Examination method	Essay (evaluation of work and presentation), 2 written examinations during the semester and final oral examination.		
Credits	6	**Language**	Croatian
Compulsory reading	1. V. Johanides et al., Industrijska mikrobiologija, PBF, Zagreb, 1984. 2. V. Marić, Biotehnologija i sirovine, Stručna i poslovna knjiga, Zagreb, 2000. 3. V.Marić et al., Biokemijsko inženjerstvo-skripta, PBF, Zagreb, 1991. 4. B.J.B.Wood (edt), Microbiology of Fermented Foods, 2nd edition (volume 1 and 2), Blackie Academic & professional, London, 1998. 5. G. Reed (edt), Prescott & Dunn's Industrial Microbiology, 4th edition, AVI Publishing Company, Westport, Connecticut, 1982.		
Recommended reading	1. J.E.Bailey, D.F.Ollis, Biochemical Engineering Fundamentals McGraw-Hill (1986). 2. M.D.Doran, Bioprocess Engineering Principles, AP, NY, 1995. 3. D.G.Springham et al., Biotechnology- The Science and the Business, HAP, Amsterdam, 1999.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Define biotchnology, biochemical engineering, bioprocess and fermentation.
2.	Define characteristics of bioprocesses, biocatalisators and the most important characteristics of the microorganisms for its application in a bioprocess.
3.	Define and calculate indicators of microorganism growth, substrate use and product growth.
4.	Diferentiate and compare various types of cultivation – batch, continuous and semicontinuous.
5.	Diferentiate sterilisation types and apply gained knowledge to choose type of sterilisation, temperature and duration in dependence on substrate.
6.	Diferentiate and compare the most important aerobic and anaerobic processes with application in biotechnological food production.
7.	Apply gained knowledge in managing and control of industrial etanolic production from starches and fruit syrups, beer production, wine and alcoholic beverages production, acetic acid production and yeasts production.
8.	Diferentiate waste management options in biotchnological food production

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	1	1-8	Attendance; active participation in disscussions	Attendance list and active participation	5	10
Laboratory practice	1	1-8	Active participation	Attendance list and evaluation of the laboratora reports	5	10
Periodic knowledge check	2	1-8	Literature studying	Partial written exam 1 Partial written exam 2	30	50
Written exam*	2*	1-8	Literature studying*	Written exam*	30*	50*
Final exam	2	1-8	Literature studying	Oral exam	15	30
TOTAL	**6**				**55**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**English language**		
Course code	177794	**Course status**	Compulsory
Study programme	Food Engineering		
Semester	II		
Course lecturer	Antonija Šarić, PhD, assoc. prof. Lahorka Budić, MSc		
Course associates			
Course content	Students are introduced to the following topics:functional food, antioxidants in food, methods in food analysis, diet for various age groups, fast food, genetically modified food. Students are introduced to different scientific discourses and rhetorical functions. The emphasis is on the ways of integrating extralinguistic and linguistic knowledge in generating meanings at the sentence and text level. Complex nominal groups, coordinated and subordinated sentences, prepositional and participle phrases are dealt with.		
General and specific knowledge acquired in course (objective)	The course objective is to enable students to comprehend and interpret various scientific discourses via recognizing text organization at the macro and micro level. Students are exposed to very specific lexis in the field of food science and nutrition.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		
(total)	30		
Examination method	The exam is composed of the written and oral part taken at the end of the first and second semester. Students are also given several smaller test during the academic year.		
Credits	2	**Language**	Croatian, English
Compulsory reading	1.L.Obad: *An English Language Workbook for Students of Food Technology III.* Prehrambeno tehnološki fakultet, Osijek, 2003 2.L.Obad:*Radni materijali iz engleskog jezika za studente četvrte godine*.PTF, Osijek, 2003 . 3.Ž.Bujas: *Veliki englesko-hrvatski rječnik*, Globus, Zagreb, 1999.		
Recommended reading	1.C.Hughes&McCarthy: *Exploring Grammar in Context,* CUP, 2000. 2.Ž.Bujas: *Veliki hrvatsko-engleski rječnik*, Globus, Zagreb, 1999.		

LEARNING OUTCOMES

No	LEARNING OUTCOMES
1.	Comprehend and analyse various professional text
2.	To select and explain key informatinon from teh professional discourse
3.	To recognize and apply langauge in writing of professional text
4.	Listen, revide and synthesyze basic information based on audio and video records
5.	To prepare oral and written presentation of a selected professional topic

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lecture attendance	0.20	1-5	Lectures	List of participation	5	10
Continuous knowledge check	0.75	1-5	Literature studying	2 evaluations (written) 2 partial exams (written and oral)	25	40
Seminars	0.30	1-5	Seminar preparation	Public presentation of seminars	5	10
Final exam	0.75	1-5	Literature studying	Final exam (written and oral)	25	40
TOTAL	**2**				**60**	**100**

Course title	**German language**		
Course code	177796	**Course status**	Compulsory
Study programme	Food Engineering		
Semester	2		
Course lecturer	Antonija Šarić, PhD, assoc. prof.		
Course associates			
Course content	The collection of texts enables the students to upgrade the language competence In the field of their profession and specialization. The specialized texts are used to introduce students to language structures at the lexical, morphological and syntactic level to facilitate comprehension. The text selection is done in relation with other courses and involves topics that deal with nutrition, food biochemistry, functional food, food quality, chemistry and technology of food products. Students comprehend the text via global and detailed reading, and unite the knowledge and skills in writing and oral discourse. The emphasis is on specialized lexis and word understanding is related to extralinguistic knowledge.		
General and specific knowledge acquired in course (objective)	The course objective is to master reading skills to facilitate understanding of more complex specialized texts and to expand specialized lexis. Students also upgrade the writing skills through summary writing and question posing relating to essential information.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		
(total)	30		
Examination method	Written exam twice in semester and after the second semester both written and oral exams		
Credits	2	**Language**	Croatian, German
Compulsory reading	1. S. Moro: *Radni materijal iz njemačkog jezika*, (Zbirka tekstova iz literature stručnih kolegija) 2. I. Medić: *Kleine deutsche Grammatik*, Školska knjiga, Zagreb, 1999. 3. T. Marčetić: *Deutsche Grammatik im Ueberblick*, Školska knjiga, Zagreb,1999. 4. M. Uroić, A. Hurm: *Njemačko - hrvatski rječnik*, Školska knjiga, Zagreb, 1994.		
Recommended reading	1. Z. Glovacki-Bernardi: *Osnove njemačke gramatike*, Školska knjiga, Zagreb, 1999. 2. B. Jakić, A. Hurm: *Hrvatsko - njemački rječnik*, Školska knjiga, Zagreb, 1991. 3. G. Wahrig: *Deutsches Woerterbuch*, Bertelsmann Lexikon Verlag, 1997.		

LEARNING OUTCOMES

No	LEARNING OUTCOMES
1.	Comprehend and analyse various professional text
2.	Follow oral presentations from the profession on german language
3.	Reproduce text information ino ral and written form
4.	Listen, revide and synthesyze basic information based on audio and video records

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures attendance	0.20	1-4	Lectures	List of participation	5	10
Continuous knowledge check	0.75	1-4	Literature studying	2 evaluations (written) 2 partial exams (written and oral)	25	40
Seminars	0.30	1-4	Seminar preparation	Public presentation of seminars	5	10
Final exam	0.75	1-4	Literature studying	Final exam (written and oral)	25	40
TOTAL	**2**				**60**	**100**

Course title	**Technological Design**		
Course code	43749	**Course status**	Compulsory
Study programme	Food Engineering		
Semester	II		
Course lecturer	Darko Velić, PhD, full prof. Stela Jokić, PhD, full prof. Krunoslav Aladić, PhD, assist. prof.		
Course associates			
Course content	Introduction into technological design as a complex engineer's activity. Importance and technologist's role in design from an idea until putting the plant into operation. Phases in designing: feasibility study, investment plan, preliminary, main and executional design. Defining of the project task: activities for concluding the investment idea. Market and raw material analysis, analysis of energy and labour sources. Project defining: analysis of technological process. Presentation of possible solutions according to given project task. Choice of capacities (installed, optimal, technical and economical capacity). Selection, calculation and layouts of processing equipment. Presentations that are introduction to practicum. Creation of plant layout that includes arrangement of production plant and infrastructure. Choice, calculation and layout of processing equipment in production area. Scaling up of technological processes and equipment. Supplying of energy sources. Technological fire prevention. Basic principals of civil engineering. Application of personal computers in creation of technological schemes and equipment layout (MS Visio). Development of preliminary project.		
General and specific knowledge acquired in course (objective)	Students are made qualified for the development of Technological project and for defining of project tasks for other projects (civil engineering, mechanical engineering).		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	3		1
(total)	45		15
Examination method	Project task and oral exam. During the practicum, control of individual phases in the making of Preliminary technological project.		
Credits	5	**Language**	Croatian
Compulsory reading	1. A. Lopez-Gomez, G.V. Barbosa-Canovas, Food Plant Design (Food Science and Technology), Marcel Dekker, 2005. 2. Z. B. Maroulis, G. D. Saravacos, Food Process Design (Food Science and Technology), Marcel Dekker, 2003. 3. F. Šef, Ž. Olujić, Projektiranje procesnih postrojenja, SKTH, KUI, Zagreb, 1988. 4. Pravilnik o uvjetima koje moraju ispunjavati prostorije za proizvodnju i promet namirnica i predmeta opće uporabe NN broj 118/99. 5. 5. I. Gulan, Protupožarna tehnološka preventiva, NADING, Zagreb, 1997.		
Recommended reading	1. C. Barker, S., Kimmings, C., Philips, GCSE Design and Technology: Food Technology, Causeway Press, 1996. 2. E. Beer, Priručnik za dimenzioniranje uređaja kemijske procesne industrije, SKTH/KUI, Zagreb, 1994. 3. Zakon o gradnji NN broj 175/03 4. W. D. Seider, J. D. Seader, D. R. Lewin, Proces Design Principles Synthesis, Analysis and Evaluation of Process Flowsheets, J. Wiley & Sons, 2000.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Compare, define and diferentiate basic principles of technological design.
2.	Define and understand engineer role in equipment design.
3.	Describe, analyse and compare possible technological options and define design task.
4.	Draw technological schemes and layouts of industrial plants.
5.	Apply computer software in technological design.
6.	Analyse and prepare balance of mass and energy for a selected technological segment.
7.	Define production standards and analyse process specifications.
8.	Diferentiate and select altrnative technological solutions and evaluate investment.
9.	Properly apply and diferentiate legislatin in the field of food engineering technological design.
10.	Apply and use gained knowledge in technological project preparation.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures, seminars and laboratory practice	2	1-10	Attendance; Active participation; Individual task solving	Attendance list and active participation	0	5
Periodic knowledge check	2	1-10	Literature studying	Partial written exam 1 Partial written exam 2	35	65
Written exam*	2*	1-10	Literature studying	Written exam	35*	70*
Final exam	1	1-10	Literature studying	Oral exam	15	30
TOTAL	**5**				**50**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Company Management**		
Course code	43762	**Course status**	Compulsory
Study programme	Food Engineering		
Semester	II		
Course lecturer	Borislav Miličević, PhD, full prof. Jurislav Babić, PhD, full prof. Antun Jozinović, PhD, assoc. prof. Mario Panjičko, PhD, assist. prof.		
Course associates			
Course content	- The nature of strategy - How to create successful strategies - The sense of traditional wisdom - What systems in stable balance disregard in real life - Where systems with complex recurring connections lead - What unpredictability and self-emerging strategies mean for managers - What constant change and political decisions mean for control - What managers do when applying everyday management - What managers do when applying non-everyday management - Strategic management in perspective		
General and specific knowledge acquired in course (objective)	Acquiring general knowledge on management and leadership, ability to create and make decisions that are important for successful implementation of tasks in the field of business systems functioning.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		
(total)	30		
Examination method	Oral exam. Two control tests during the semester.		
Credits	3	**Language**	Croatian
Compulsory reading	1. Stacey, D.R.: Strateški menedžment i organizacijska dinamika, Mate d.o.o. Zagreb, Zagreb 1993. 2. Žugaj, M., Šehanović, J., Cingula, M.: Organizacija, TIVA Tiskara Varaždin, Varaždin 2004.		
Recommended reading	1. Campbell, D.J.: Organizations and the Business Environment, Butterworth – Acinemann, Linacre House, Jordan Hill, Oxford, 1999.		

LEARNING OUTCOMES

No	LEARNING OUTCOMES
1.	Define basic elements of the company
2.	Define basic skills, role and functions of company management
3.	To analyse influence of internal and external factors influencing company management
4.	To analyse sucessfullness of company management

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	TEACHING METHOD	
					min	max
Lectures	1	1-4	Attendance, Active participation	Attendance list and active participation	0	10
Continuous knowledge check	2	1-4	Literature studying	Partial written exam 1 Partial written exam 2	55	90
Exam*	2*	1-4	Literature studying*	Partial exam*	55*	90*
TOTAL	**3**				**55**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Foodborne Hazards**		
Course code	43761	**Course status**	Compulsory
Study programme	Food Engineering		
Semester	II		
Course lecturer	Tomislav Klapec, PhD, full prof. Tihana Marček, PhD, assoc. prof.		
Course associates	Maja Ižaković, MSc		
Course content	Lectures: -pathogenic biological foodborne agents (viruses, bacteria, helminths...) -chemical contaminants in food (natural components, pesticides, additives, environmental contaminants, toxicants produced during food processing...) -physical hazards (pieces of glass, bone, metal...) in food -adverse effects caused by biological, chemical and physical agents -prevention of food contamination, destruction of pathogenic organisms, chemical and physical decontamination approaches -detection of foodborne hazards and relevant legislation Labs: detection and destruction of pathogenic microorganisms; detection of *Trichinella spiralis* in pork; examination of fish for the presence of *Cryptosporidium parvum*; determination of aflatoxins in grains by HPLC; determination of heavy metals in food by AAS; application of metal detectors in food industry		
General and specific knowledge acquired in course (objective)	This course focuses on sources, adverse health effects, prevention, decontamination, detection and legislation on food safety hazards.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		2
(total)	30		30
Examination method	oral plus two written (mid-term and final) exams		
Credits	4	**Language**	Croatian, English
Compulsory reading	1. U.S. Food & Drug Administration, Center for Food Safety & Applied Nutrition: *The Bad Bug Book*, FDA/CFSAN, Rockville, 2003. 2. T. Klapec: *Osnove toksikologije s toksikologijom hrane*, Interna skripta, Prehrambeno tehnološki fakultet, Osijek, 2002. 3. S. Duraković, F. Delaš, B. Stilinović, L. Duraković: *Moderna mikorobiologija namirnica* - knjiga prva. Kugler, Zagreb, 2002. 4.S.Duraković, F. Delaš, L. Duraković: *Moderna mikrobiologija namirnica* - knjiga druga, Kugler, Zagreb, 2002.		
Recommended reading	1. A. Wallace Hayes (ur.): *Principles and Methods of Toxicology*, Taylor & Francis, Philadelphia, 2001. 2. R.H. Schmidt, G.E. Rodrick (ur.): *Food Safety Handbook*, John Wiley & Sons, Hoboken, 2002.		

LEARNING OUTCOMES

No	LEARNING OUTCOMES
1.	To describe th emost common parasites, diferentiate stages of infection, sources of parasytes and health risks of the parasite presence in food
2.	To describe surces and most common microbiological risks related to food
3.	To describe types, sources and health risks related to physical and chemical food contaminants
4.	Apply apropriate measures to minimise the risks related to varius food contaminants
5.	To detect biological contaminants in food samples
6.	To analyse selected toxic compounds in food samples

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	0.2	1-4	Attendance	Attendance list	0	5
Laboratory practice	0.8	5-6	Laboratory practice	Report	10	15
Final exam	3	1-6	Literature studying	Written or oral exam (Possibility of selection between two partial written exams or single oral exam)	50	80
TOTAL	**4**				**60**	**100**

Course title	**New Food Products Development**		
Course code	43750	**Course status**	Compulsory
Study programme	Food Engineering		
Semester	III		
Course lecturer	Mirela Kopjar, PhD, full prof.		
Course associates			
Course content	The new food product definition. Research and development of the new product. Basics of the inovation analysis and trends in food production. Basics in food inovation. The role of the science, experience and metodology in the new product development. The role of the multidisciplinary teams. Steps (methodology) in new products development. The factors that are important for the new product success. The influence and the role of the management on the new product development.		
General and specific knowledge acquired in course (objective)	This course allows student to individualize his or her knowledge related to the courses got at the undergraduate study.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2	1	
(total)	30	15	
Examination method	Written reports (seminars) during semester and oral examination at the end of courses.		
Credits	4	**Language**	Croatian, English
Compulsory reading	1. R. C. Baker, P. W. Hann, K. R. Robbins, Fundamentals of New Food Product Development, Elsevier, Amsterdam, 1988.		
Recommended reading	Scientific journal: Food Technology (IFT, Chicago, Ill, U.S.A.; www.ift.org)		

LEARNING OUTCOMES

No	LEARNING OUTCOMES
1.	Define new product from the aspectof food industry
2.	To explain the importance of the new food product development from the aspect of foodindustry
3.	To list phases of new food product development and to explain them
4.	To define and explain factors determining the succes of new products on the market
5.	To prepare plann of new ood product development in line with guidelines provided through the course

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lestures attendance	0.5	1-5	Attendance	Attendance list	6	10
Seminars	1.5	1-5	Preparation of seminars	Public presentation of seminars	24	40
Final exam	2	1-5	Literature studying	Oral exam	30	50
TOTAL	**4**				**60**	**100**

Course title	**Fruit And Vegetable Processing And Preservation**		
Course code	43755	**Course status**	Elective
Study programme	Food Engineering		
Semester	II		
Course lecturer	Nela Nedić Tiban, PhD, full prof.		
Course associates			
Course content	Economical, technological and nutritional aspects of fruit and vegetable processing and preservation. Postharvest physiology of fruit and vegetable. Chemical composition of fruits and vegetables (pectins, pigments, carbohydrates, aroma compounds, nutritional fibres, vitamins, minerals, enzymes. Constituent changes during fruit and vegetable storage and processing. Constituent changes during storage and distribution of fruit and vegetable products. Enzymic and nonenzymic browning. Emphasis on preservation and processing methods involving sterilisation, pasterisation, fermentation, freezing, drying (dehydration), ionisation. Semiproducts. Products packaging. Utilisation of by-products. Individual laboratory experimentation. Selected analysis important for raw material and final product.		
General and specific knowledge acquired in course (objective)	This course allows the student to get the knowledge about raw material handling and storage as well as processing in different fruit and vegetable products, and utilization of by-products.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	4		2
(total)	60		30
Examination method	Written reports during courses or final written examination at the end of lectures, and oral examination.		
Credits	7	**Language**	Croatian, English
Compulsory reading	1. T. Lovrić i V. Piližota 1994, Tehnologija konzerviranja i prerade voća i povrća, ur. akademik Milan Maceljski, Nakladni zavod, GLOBUS, Zagreb. 2. A.A. Kader, 1992., Postharvest technology of Horticultural Crops, Sec.Ed., Univ.of California, Division of Agriculture and Natural Resources, Publication 3311. 3. S. Nagy, C. S. Chen, P. E. Shaw, Fruit Juice Processing and Technology, 1993, AGSIENCE Inc., Auburndale, Florida 4. D. Arthey, and P. R. Ashurst, Fruit Processing 1996, Blackie Academic and Profesional, U.K., Chapman and Hall.		
Recommended reading	Selected scientific papers		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Define chemical composition and characteristics of fruit and vegetables and factors influencing quailty of fruits and vegetables and their products.
2.	Explain storage conditions for fruit and vegetables, their semiproducts and final products.
3.	Diferentiate thermal and nonthermal methods of fruit and vegetable preservation.
4.	Explain basic principles of technology for fruit and vegetables processing.
5.	Explain basics of fruit and vegetables products packaging.
6.	Apply gained knowledge and skills obtained by laboratory practice in fruit and vegetables processing.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	1	1-6	Lecture attendance	Attendance list	6	10
Laboratory practice	2	1-6	Active attendance	Attendance list and evaluation of the laboratory reports	12	20
Final exam	4	1-6	Literature studying	Oral exam	42	70
TOTAL	**7**				**60**	**100**

Course title	**Technology Of Oils And Fats**		
Course code	43757	**Course status**	Elective
Study programme	Food Engineering		
Semester	II		
Course lecturer	Tihomir Moslavac, PhD, full prof.		
Course associates			
Course content	Lectures: Oils and fats importance in diet. Trends in oils and fats production and consumption. Composition of oils and fats. Fats biochemistry. Chemical reactions of fats and fatty acids. Properties of oils and fats (chemical and physical properties). Raw materials of oils and fats production (classification, chemical composition).Oilseeds preparation for storage. Storage conditions of oilseeds. Raw materials preparation for processing. Production of animal fats. Production of vegetable oils. Oil extraction by pressing (pre-pressing, full pressing, cold pressing). Solvent extraction. Refining (chemical, physical). By-products of oil refining (lecithin, soapstock). Storage, stability and transport of oils and fats. Deterioration of oils and fats. Oil modification processes (hydrogenation, interesterification, fractionation). Production: sunflower oil, soybean oil, olive oil). Products and application technology of edible oils (margarine, mayonnaise, shortenings). Legal regulation. Labs: Analytical methods in oils and fats technology. Examination methods of oils and fats quality. Property determination methods of oils and fats identification. Oils and fats oxidation degree. Deterioration and sustainability of oils and fats. Rheological properties of oils, fats and products. Laboratory technological practices (oil extraction by pressing and solvent extraction, neutralization, bleaching, winterization, deodorization).		
General and specific knowledge acquired in course (objective)	Upgrade of specific knowledge on previously gained knowledge from nature science and engineering to provide students with an understanding of oils and fats technology production from different raw materials (vegetables and animals). Knowledge of edible oils modification processes. Besides, students gain wide knowledge about quality properties and sustainability of oils, fats and products, chemical composition, deterioration types as well as possibilities of application in production of different products in food and other industries.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	4		2
(total)	60		30
Examination method	Oral or in written examination of the whole subject matter is at the end of semester or in form of two oral exams during semester.		
Credits	7	**Language**	Croatian
Compulsory reading	1. D. Swern: Industrijski proizvodi ulja i masti po Baileyju, Znanje, Zagreb, 1972. 2. W. Hamm, R. J. Hamilton: Edible Oil Processing, Sheffield Academic Press, CRC Press, England, 2000. 3. M. Rac: Ulja i masti (sirovine, kemija i tehnologija jestivih ulja i masti), Privredni pregled, Beograd, 1964. 4. B. O. Matijašević, J. Turkulov: Tehnologija ulja i masti, Univerzitet u Novom Sadu Tehnološki fakultet, Novi Sad, 1980. 5. D. Rade, Ž. Mokrovčak, D. Štrucelj: Priručnik za vježbe iz kemije i tehnologije lipida, Zagreb, 2001.		
Recommended reading	1. D. F. Gunstone: Vegetable Oils in Food Technology: Composition, Properties and Uses, C.H.I.P.S., 2002. 2. Y. H. Hui: Bailey´s industrial oil & fat product, Volume 4, Edible Oil and Fat Product: Processing Technology, Culinary and Hospitality Industry Publications Services (C.H.I.P.S), 2005. 3. E. Dimić, J.Turkulov: Kontrola kvaliteta u tehnologiji jestivih ulja, Univerzitet u Novom Sadu Tehnološki fakultet, 2000. 4. R. J. Hamilton, A. Bhati: Recent Advances in Chemistry and Technology of Fats and Oils, Elsevier Applied Science, London and New York, 1987.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Describe the importance of oils and fats in human diet
2.	List and diferentiate chemical composition and characteristics of plant oils and animal fats (chemical, physical).
3.	Diferentiate type, quality and criteria of plant materials used for oil production
4.	Define and understand the importance of proper storageinng of oil production raw materials (short term and long term).
5.	Explain the preparation of raw materials for oil production (conditins, equipment) and their influence on oil production.
6.	Diferentiate technological process of raw oils and fats production (pressing equimpent, extraction, schemes, equipment)
7.	Describe the processing of animal fat and fish oil production.
8.	Define and apply refining processes on raw plant oils (chemical, physical refining)
9.	Analyse posibilitye s of using oil production by-products (lecitine, etc)
10.	Apply adequate storage conditions for fat and oil stabilisation (antioxidants, sinergysts).
11.	Describe fat and oil deterioration
12.	Apply analytical methods to determine stability of oils and fats
13.	Define and diferentiate production of unrefined and cold pressed plant oils and their quality control.
14.	Define and describe application of edible oils and fats in production of margarines, mayonaise, shortenings etc.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures / consultations	0.5	1-14	Attendance (Lectures/consultations)	Attendance list disscussion	5	10
Laboratory practice	1.5	5-14	Active participation – experiment and reports	Attendance list and report evaluation	10	20
Final exam	5	1-14	Literature studying	Written and oral exam	45	70
TOTAL	**7**				**60**	**100**

Course title	**Wine Technology**		
Course code	43758	**Course status**	Elective
Study programme	Food Engineering		
Semester	II		
Course lecturer	Anita Pichler, PhD, full prof.		
Course associates	Ivana Ivić, PhD		
Course content	Grape vine origin and grape vine types. Wine-growing regions in R. Croatia. Mechanical and chemical grape and wine composition. Grape sorts for wine production. Grape vintage, meaning for maturity and vintage time, transport and grape reception for processing. Technological processes and manufacturing of white and red wines. Deceptinization of must, must sulphuring, must clearing, must controled fermentation, aging and stabilization of wine, decauting, sulphuring, clearing, cold stabilization, filtration, bottle filling. Usage and effects of sulphure dioxide in must and wine, mechanisms and effects on the stability and protection of must and wine. Fermentation of must and pomaces, biochemical processes of alcohol fermentation and metabolisms of wine yeasts, wine yeasts genera. Wine stabilization, natural stabilization, wine decauting, clearing and coloidal phenomenon, clearing and stabilization processes, wine clearing by filtration and centrifugation, wine stabilization by physical and phisically chemical processes. Chemical composition of wine, organic acid, alcohol and volatile compounds, carbohydrates, extractive substances, compounds of nitrogen, compounds of phenols, aroma substances. Categorization of wine by Wine Law and Regulation of wine production. Fruit wines, raw materials for fruit wine productions, fruit wines production, stabilization and fruit wine bottle filling. Methods of chemical analyse of wine.		
General and specific knowledge acquired in course (objective)	The course objectives is to provide students with special knowledge of wine production, chemical composition of must and wine, procedures of fermentation, stabilization, bottle filling and determination of chemical composition and wine quality.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	4		2
(total)	60		30
Examination method	Writing and oral examination of whole subject matter at the end semester or in form of two writing exams during semester and oral at the end of semester		
Credits	7	**Language**	Croatian
Compulsory reading	1.P. Riberean Gayon, D. Dubourdieu, B. Doneche, A. Lonvaud: Handbook of Enology a. Volume II: The Chemistry of Wine Stabilization and Treatments. b. Volume I: The Microbiology of Wine and Vinifications, Wiley, 2000. 2. R. B. Boulton, V. L. Singleton, L. F. Bisson, R. I. Kuukee: Principelsw and Practies of Winemaking, The Chapman-Hall Enology Library, October 1995. 3. B. W. Zoecklein, K. C. Fugelsang, B. H. Gump, F. S. Nury, Wine Analisis and Production, The Chapman-Hall Enology Library, June 1995. 4. S. Muštović: Vinarstvo sa enohemijom i mikrobiologijom, Privredni pregled, Beograd, 1985. 5. R. Licul, D. Premužić: Praktično vinogradarstvo i podrumarstvo, Nakladni zavod Znanje, Zagreb, 1977.		
Recommended reading	1. J. J. Hadiburg: Winning with Quality, The FP2 Story, New York, 1991. 2. K. C. Fugelsang: Wine Microbiology, The Chapman-Hall Enology Library, January 1997. 3. D. R. Storm: Winery Utilities, The Chapman-Hall Enology Library, January 1997. 4. R. P. Vine, B. Bordelon, T. Browning, Winemaking: Frof Grape growing to Marketplace, The Chapman-Hall Enology Library, June 1997.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	List species and types of grapes and define basics of grape production
2.	Analyse chemical composition of grapes and factors influencing grape and wine quality
3.	Differentiate grape production by grape type and explain influence of climatic and environmental conditions on the quality of grapes and wine
4.	Analyse chemical composition of grape must and wine.
5.	Explain enzymatic and nonenzymatic browning of must and wine, and treatment options of must and wine with sulphur dixide.
6.	Describe technological equipment in vinery and technological process of white and red wine production
7.	Apply gained knowledge in problems solving related to wine production
8.	List and diferentiate categries of wine based on their quality and explain each parameter

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures, Labs	1	1-8	Lectures attendance, Active participation in laboratory practice	Attendance list and reports evaluation	10	20
Written exam	2.5	1-8	Literature studying	Written exam	20	30
Final exam	3.5	1-8	Literature studying	Oral exam	30	50
TOTAL	**7**				**60**	**100**

Course title	**Meat And Fish Technology**		
Course code	43759	**Course status**	Elective
Study programme	Food Engineering		
Semester	II		
Course lecturer	Dragan Kovačević, PhD, full prof. Krešimir Mastanjević, PhD, full prof.		
Course associates			
Course content	Lectures: Situation and perspective in the sector of the meat industry and fish processing industry in Republic of Croatia and EU. Meat anatomy and chemical composition. Post-mortem changes and maturation of the meat. Basic raw materials and supplements for meat products production. Market classification of the meat. Meat industry. Slaughter technology and carcasses processing technology. Meat categorization and cutting. Market quality evaluation of meat. Meat spoilage. Meat conservation methods. Meat products systematization. Technological processes and machines for meat products production and conserving. Fish anatomy and chemical composition. Post-mortem changes of the fish. Fish spoilage. Basic raw materials and supplements for fish products production. Fish conservation methods. Fish products systematization. Technological processes and machines for fish products production and conserving. Health-veterinary inspection in meat and fish processing industry (ISO standards and HACCP). Achievements in area of meat and fish packaging. Labs**:** Discussion of meat industry or fish processing industry. Making technological scheme with normative and technological calculation for meat or fish products. Laboratory exercises – determination of the physical, chemical and sensory characteristics of meat and fish.		
General and specific knowledge acquired in course (objective)	Programme provides total insight in the characteristics of meat and fish, post-mortem changes and in the all phases of industrial processing with emphasis on the brand-new discoveries and trends. Higher consumer requests for nutritional and safe food (including labelling in harmony with highest standards for consumer protection) demands application of the brand-new processing, conserving and packaging technologies and application of the brand-new health-veterinary inspection concepts for meat and fish products.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	4		2
(total)	60		30
Examination method	Oral and/or written exam; Continuous examination throughout semester – minimum 2 written exams		
Credits	7	**Language**	Croatian
Compulsory reading	1. Kovačević, D. (2001): Kemija i tehnologija mesa i ribe, PTF - Osijek, Osijek (sveučilišni udžbenik). 2. Kerry, J., Kerry J., Ledward, D. (2002): Meat Processing: Improving Quality, C.H.I.P.S., Weimar, Texas. 3. Pearson, A. M., Dutson, T. R. (2001): HACCP in Meat, Poultry and Fish Processing, C.H.I.P.S., Weimar, Texas. 4. Hall G.M. (1997): Fish Processing technology, 2th ed., C.H.I.P.S., Texas. 5. Varnam, A. H., Sutherland, J. P. (1995): Meat and Meat Products. Technology, chemistry and microbiology, Chapman & Hall, London - Glasgow - Weinheim - New York-Tokyo - Melbourne - Madras.		
Recommended reading	1. Kovačević, D. (2004): Sirovine prehrambene industrije (meso i riba), PTF-Osijek, Osijek (sveučilišni udžbenik). 2. Pearson, A. M., Dutson, T. R. (1997): Production processing of healthy meat, poultry and fish products, Blackie Academic & Professional, London - Glasgow - Weinheim -New York - Tokyo - Melbourne - Madras. 3. Živković, J. (2001): Higijena i tehnologija mesa (I. Dio), (II. dopunjeno izdanje), Veterinarski fakultet Sveučilišta u Zagrebu, Zagreb.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Define meat and fish products and list legislation regarding meat and fish processing and products.
2.	Compare methods used in meat and fish preservation.
3.	Define (in accordance with legislation) systematization of meat and fish products and list the specific products.
4.	Describe technological processes and equipment use din meat and fish processing (n accordance with systematization).
5.	Analyse options of meat industry by-products and waste processing.
6.	Describe role of veterinary-sanitary inspection in meat and fish processing industry.
7.	Describe new developments and trends in meat and fish packaging.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	1.5	1-7	Lecture attendance	Attendance list	15	30
Labs	1.5	1-7	Active participation	Attendance list report evaluation	15	30
Periodic knowledge check	4	1-7	Literature studying	Partial written exam 1 Partial written exam 2	20	40
Final exam*	4*	1-7	Literature studying*	Written exam*	20*	40*
TOTAL	**7**				**50**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Technology of Flour Production and Processing**		
Course code	43754	**Course status**	Elective
Study programme	Food Engineering		
Semester	III		
Course lecturer	Daliborka Koceva Komlenić, PhD, full prof. Marko Jukić, PhD, full prof.		
Course associates			
Course content	Lectures: Process and application value of cereals. Chemical composition of grain and significance of particular components in evaluation of technological quality. Cereal storage and conservation. Wheat milling: methods, machinery and equipment. Mill products. Flour storage, packaging and transportation. Chemical composition of flour. Rheological properties and baking quality of flour dough. Technological procedures of bread and other bakery products production. Machinery and equipment. Bakery products. Quality evaluation, transport, packaging and storage of bakery products. Raw materials, operations and processes of pasta production and biscuit and wafer production technology. Extruding process and products. Labs: Laboratory exercises – Physical and chemical analytical methods for evaluation of flour, flour dough and final products properties. Industrial practice – Visit to plants of flour production and processing (silo, mill, bakery, pasta and biscuit industry) and introduction to technological processes of production.		
General and specific knowledge acquired in course (objective)	It is very important to train experts that will be able to insure quality production of cereal-based products considering exceptional economical importance of this branch of food industry. Knowledge that students acquire during the course will qualify them for autonomy in solving engineering production problems, as well as for production of quality cereal-based products that can be competitive on the EU market.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	4		2
(total)	60		30
Examination method	3 written partial exams during lectures and final oral exam		
Credits	7	**Language**	Croatian
Compulsory reading	1. Ž. Ugarčić-Hardi: *Tehnologija proizvodnje i prerade brašna: Opći dio i skladištenje*. (interna skripta). PTF Osijek, 1999. 2. Ž. Ugarčić-Hardi: *Tehnologija proizvodnje i prerade brašna: Mlinarstvo*. (interna skripta). PTF Osijek, 1999. 3. Ž. Ugarčić-Hardi: *Tehnologija proizvodnje i prerade brašna: Pekarstvo*. (interna skripta). PTF Osijek, 1999. 4. Ž. Ugarčić-Hardi: *Tehnologija proizvodnje i prerade brašna: Proizvodnja tjestenine i keksa*. (interna skripta). PTF Osijek, 2000. 5. Ž. Ugarčić-Hardi, D. Koceva Komlenić, A. Kuleš: *Tehnologija proizvodnje i prerade brašna: Upute za laboratorijske vježbe*. (interna skripta). PTF Osijek, 2002.		
Recommended reading	1. Z. Katić: *Sušenje i sušare u poljoprivredi*. Multigraf d.o.o. Zagreb, 1997. 2. S. Kljusurić: *Uvod u tehnologiju mljevenja pšenice*. Prehrambeno tehnološki fakultet Sveučilišta josipa Jurja Strossmayer-a u Osijeku, 2000. 3. Y. Pomeranz: *Advances in Cereal Science and Technology*. Volumen I i II. American Association of Cereal Chemists, St. Paul, Minnesota, 1978. 4. Y. Pomeranz: *Wheat: Chemistry and Technology*. Volumen I i II. American Association of Cereal Chemists, St. Paul, Minnesota, 1988. 5. E. J. Pyler: *Baking Science and Tehnology*. Volumen I i II. Sosland Publishing Company, Marriam, Kansas, 1988.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	List chemical composition of grain and significance of particular components in evaluation of grain technological quality.
2.	Explain technlogical process of cereal preparation and storage.
3.	Describe technological process of wheat milling and cllasify milling products.
4.	Define baking characteristics and explain rheological properties of flour.
5.	Describe the role of raw cereal products and aditives in bakery products, biscuit and vafel as well as the pasta production.
6.	Describe various technological processes used in flour processing.
7.	Explain biochemical and physico-chemical changes during production of various flour products.
8.	Clasify and describe various bakery products, biscuits, wafels and pasta.
9.	Apply physico-chemical methods to analyse flour, flour dough and final products.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures and labs	2.5	1-9	Attendance; Active participatin; Laboratory work	Attendance list Report evaluation	0	0
Periodic knowledge check	4.5	1-9	Literature studying	Partial written exam 1 Partial written exam 2 Partial written exam 3	60	100
Final exam*	4.5*	1-9	Literature studying*	Oral exam*	60*	100*
TOTAL	**7**				**60**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Technology of Carbohydrates and Confectionery Products**		
Course code	81739	**Course status**	Elective
Study programme	Food Engineering		
Semester	III		
Course lecturer	Drago Šubarić, PhD, full prof. Jurislav Babić, PhD, full prof. Đurđica Ačkar, full prof. Antun Jozinović, assoc. prof.		
Course associates			
Course content	Lectures: Carbohydrates, classification and properties. Sucrose production form sugar beet. Preparation for extraction. Juice extraction and purification. Juice concentration. Crystallisation and centrifugation. Crystals refining and storage. By-products in sugar beet processing. Waste water processing. Sugar production from sugar cane. Physical and chemical properties of starch. Raw materials for starch production. Corn Starch production. By-products. Enzymes in starch technology. Starch hydrolysates production. Crystal glucose production. Fructose syrup and fructose production. Modified starch production. Starch production from potato and wheat. Confectionery products production and consumption. Raw materials for confectionary products production. Cocoa bean, cultivation and processing. Cocoa mass, cocoa powder and coca butter. Cocoa butter and cocoa butter replacements properties. Chocolate production. Rheological properties of chocolate. Bonbons products production. Technology of other confectionery products. Chemistry and technology of coffee. Tea. Snack products technology. Labs: Analytical methods in carbohydrates and confectionary technology. Sugar quality. Thermophysical properties of starch. Rheological properties of starch suspensions. Water holding capacity. Modified starches preparation. Industrial practice.		
General and specific knowledge acquired in course (objective)	The course objective is to provide students with knowledge necessary for managing industrial processes of sugar, starch, starch derivates and confectionary products, as well as research in the mentioned fields. Lecture topics include all aspects of the mentioned product production, starting from quality of raw material, process conditions, quality control, hygiene condition and all other elements important to produce quality and safe products. Students will work in groups during laboratory practice and will elaborate individual production in the form of seminar.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	4	1	1
(total)	60	15	15
Examination method	Oral examination is at the end of semester or in form of three oral exams after every lecture topic.		
Credits	7	**Language**	Croatian
Compulsory reading	1. P. W. Van der Poel, H. Schiweck, T. Schwartz: Sugar Technology. Verlag Dr. Albert Bartens KG-Berlin, 1998. 2. R. L. Whistler, J. N. BeMiller, E. F. Paschall (1984): Starch, Chemistry and technology. 3. S. T. Beckett: Industrial chocolate manufacture and use. Blackwell Science, 1999. 4. S.T. Beckett: The science of chocolate, Royal Society of chemistry, York, 2000.		
Recommended reading	1. S. Šušić: Priručnik industrije šećera. Knjiga I, Beograd, 1980. 2. S. Šušić: Priručnik industrije šećera. Knjiga II, Beograd, 1980. 3. R.J. Clarke, R. Macrae: Coffee-Technology. Elsevier Applied Science, London, New York, 1987. 4. F. W. Schenck, R. E. Hebeda: Starch hydrolysis products.VCH, New York, Weinheim, 1992.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Describe sucrose production form sugar beet.
2.	Describe process of chocolate production
3.	Describe process of candies production
4.	Describe modified starch and starch hydrolystaes production.
5.	Define parameters of raw-materials and final products quality – forr all uper mentioned processes.
6.	Define extrusion process.
7.	Describe production process of extruded products and semiproducts.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures and Labs	3	1-6	Attendance; Active participation;	Attendance list and active participation	5	10
Seminars	1	1-6	Individual (guded) work on a selected topic	Public presentation	15	25
Periodic knowledge check	3	1-6	Literature studying	Partial written exam 1 Partial written exam 2	35	65
Final exam*	3*	1-6	Literature studying*	Written exam*	35*	65*
TOTAL	**7**				**55**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Technology Of Milk And Dairy Products**		
Course code	43760	**Course status**	Elective
Study programme	Food Engineering		
Semester	III		
Course lecturer	Mirela Lučan, PhD, assoc. prof.		
Course associates			
Course content	Lectures: Production and primary treatment of milk. Biochemistry and composition of milk. Importance of milk processing. Microbiology of milk and dairy products. Sanitation in dairy industry. Technology of pasteurised and sterilised milk. Technology of fermented dairy product. Technology of cream and butter. Technology of production of ice cream, milk desserts and specific milk products. Cheesemaking. Technology of concentrated milk and milk powder. Modified dairy products. Autochthonous dairy products. Whey processing. Production of by-products in dairy industry. Package and packaging of dairy products. Storage of dairy industry. Regulations and standards for milk and milk products. Latest developments in dairy industry. Labs: Presentation of equipments and operations in dairy industry. Physical-chemical methods of analysis of milk and dairy products. Sensory evaluation of milk and dairy products.		
General and specific knowledge acquired in course (objective)	The aim of this course is to provide knowledge about processing of raw milk to different dairy products (liquid and cultured milk, concentrated milk, milk powder, cream, butter, cheeses etc.). During the course student will get detailed information about basic operation in dairy industry. Student will get knowledge about modern technologies in dairy industry, as well as the role of principal biochemical and microbiological changes that occur during handling, storage and processing of milk and dairy products. They will also understand meaning of hygiene and quality control in dairy industry.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	4		2
(total)	60		30
Examination method	Accepted exercises, reports Oral exam or preliminary exams during semester		
Credits	7	**Language**	Croatian, Hungarian
Compulsory reading	1. Lj. Tratnik: *Mlijeko – tehnologija, biokemija i mikrobiologija*. Hrvatska mljekarska udruga, Zagreb, 1998. 2. S. Miletić: *Mlijeko i mliječni proizvodi*. Hrvatsko mljekarsko društvo, Zagreb, 1994. 3. Lj. Kršev: *Mikrobiološke kulture u proizvodnji mliječnih proizvoda*. Udruženje mljekarskih radnika Hrvatske, Zagreb, 1989. 4. S. Duraković: *Prehrambena mikrobiologija*. Medicinska naklada, Zagreb, 1991. 5. D. Sabadoš: *Kontrola i ocjenjivanje kakvoće mlijeka i mliječnih proizvoda*. Hrvatsko mljekarsko društvo, Zagreb, 1996.		
Recommended reading	1. I. F. Vujičić: *Mlekarstvo – I. dio*. Naučna knjiga, Beograd, 1985. 2. R. K. Robinson: *Modern Dairy Technology – Advances in Milk Processing*, vol. 1. Elsevier Applied Science, London – New York, 1986. 3. R. K. Robinson: *Modern Dairy Technology – Advances in Milk Products*, vol. 2. Elsevier Applied Science, London – New York, 1993. 4. A. Y. Tamime, B. A. Law: *Mechanisation and Automation in Dairy Technology*. CRS Press, Sheffield, England, 2001. 5. E. Spreer: *Technologie der Milchverarbeitung*. VEB Fachbuchverlag, Leipzig, 1978.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Analyse critical points in milk manipulation form farm to milk industry.
2.	Define chemical composition of milk and the influence of various milk cmpounds on in its processing inf various products.
3.	Define basic technological operations for milk processing in dairy industry.
4.	List and define processes of heat treatment.
5.	List technological processes in liquid milk products production (pasteurised and sterilised).
6.	Define the role of starter cultures and fermentation in dairy industry.
7.	Describe production of fermented milk products.
8.	Describe butter production.
9.	Describe milk powder production.
10.	Define and diferentiate various cheese types production.
11.	Argument the importance of autochtonous cheese production and name „protection“.
12.	Analyse and explain whey processing.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	1.75	1-12	Attendance, Disscussion	Attendance list	10	20
Experimental work	1.75	1-12	Practical laboratory work	Evaluation of the laboratory reports	10	20
Seminar	1	1-12	Literature studying, seminar writing	Seminar evaluation	10	20
Final exam	2.5	1-12	Literature studying, disscussion	Oral exam	20	40
TOTAL	**7**				**50**	**100**

Course title	**Technology of Strong Alcoholic Beverages**			
Course code	88267	**Course status**	Elective	
Study programme	Food Engineering			
Semester	III			
Course lecturer	Ante Lončarić, PhD, assoc. prof.			
Course associates				
Course content	Lectures: Course definition. Economical importance of strong alcoholic beverages production on a global scale, in EU and in Croatia; legislation. Raw materials use din strong beverages production, basic physico-chemical properties and basic biochemical processes in raw materials. Alcoholic fermentation, chemisms, dinamics, alcoholic fermentation products, microrganisms and technological processes, basic processes of colloid and microbiological stabilisation, separation and clean-up, ecological by-product and waste management. Distillation – basic rinciples, dynamics, chemical changes, distillation equipment. Strong alcoholic beverages standardisation. Maturation and storage of strong alcoholic beverages. Special processes of production (grape spirit, c*ognac, brandy*). Fruit spirits (plum, pear), special techniques (whisky, rum, tequila, vodka). Liquors production. Basics of chemical, physical and sensory analyses of strong alcoholic beverahes. Labs: Phasico-chemical anayses of strong alcohlic beverages; sensory evaluation of strong alcoholic beverages by DLG method; Industrial exercises.			
General and specific knowledge acquired in course (objective)	The aim of this course is for students to gain knowlwdge necesarry to plann, prepare and manage bio-processes of alcoholic beverages production. Lectures encompass all aspects of production including raw-materials quality, legislation, hygiene, environment protection and consumer health protection.			
Teaching method	**Lectures**	**Seminars**	**Labs**	
(hrs/week)	4		2	
(total)	60		30	
Examination method	Oral exam at the end of the semester or two written partial exams through the semester.			
Credits	7	**Language**	Croatian, English	
Compulsory reading	1. V. Marić*:* Biotehnologija i sirovine*,* Stručna i poslovna knjiga d.o.o., Zagreb, 2000. 2. B. Miličević: Voćne rakije i destilati – iskre tehnologije BMMZ consulting, Požega, 2004. 3. J.H. Bryce, G.G. Steward: Distilled Spirits: Tradition and innovation, Nottingham University Press, UK, 2004.			
Recommended reading	1. AOAC: Official Methods of analysis. Association of Official Chemists, Arlington, VA, USA, 2000. 2. A.H.P. Varnam, J.P. Sutherland: Beverages, technology, chemistry and microbiology, Chapman and Hall, London, 1994. 3. L.M. Rose: Distillation design in practice*,* Elsevier Applied Science, Amsterdam, 1985. 4. L. Nykanen, H. Suomalainen: Aroma of beer, wine and distilled alcoholic beverages, Akademie Verlag, Berlin, 1983.			

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Know legal requirements regarding strong alcoholic beverages production and sale.
2.	Describe raw materials used for strong alcoholic beverages production.
3.	Analyse basic physico-chemical characteristics and basic bichemical processes in raw materials.
4.	Describe technological processes of primary processing in strong alcoholic beverages production.
5.	Explain alcoholic fermentation, chemiskm, dinamic and products of alcoholic fermentation.
6.	Explain distillation – basic principles, dinamic, chemical changes, distillatin equipment and systems.
7.	Explain standardisation of strong alcoholic beverages.
8.	Explain maturation of strong alcoholic beverages, physico-chemical processes in maturation and final processing of strong alcoholic beverages.
9.	Describe technological processes of strong alcoholic beverages production.
10.	Define basic chemical, physical and sensory evaluation methds for strong alcoholic beverages quality control.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures and labs	1	1-10	Attendance; Active participation	Attendance list and active participation	5	10
Periodic knowledge check	2	10	Literature studying	Oral exam	15	25
Periodic knowledge check	4	1-6	Literature studying	Oral exam	35	65
TOTAL	**7**				**55**	**100**

Course title	**Food Quality and Safety Management**		
Course code	88268	**Course status**	Elective
Study programme	Food science and nutrition		
Semester	III		
Course lecturer	Ivana Flanjak, PhD, full prof.		
Course associates			
Course content	General concept of quality, historical background. Quality management principles and standards. Food quality legislation. Statistical quality control: statistical process control, control charts, process capability, sampling procedures. Food safety and legal requirements. Risk analysis. Traceability in food safety management. Food safety management standards. Principles and implementation of HACCP system. GMP and GHP principles and implementation. Accreditation, scope, standards.		
General and specific knowledge acquired in course (objective)	The course introduces student with legislative bases, principles and methodology of food quality and safety management. Participants are provided wih the skills needed to assess existing food safety and quality management systems and introduce improvements.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		
(total)	30		
Examination method	Oral and written exam with two written exams over the course of semester.		
Credits	3	**Language**	Croatian
Compulsory reading	1. Zakoni, Pravilnici, Norme (ISO 9000, ISO 22000) 2. P.A. Luning, W.J. Marcelis, W.M.F. Jongen: Food quality management a techno-managerial approach. Wageningen Pers, Wageningen 2002. 3. P.A. Luning, F. Devlieghere, R. Verhe (ed): Safety in the agri food chain. Wageningen Academic Publichers Pers, The Netherlands 2006.		
Recommended reading	1. J.M. Juran, Frank M Gryna: Quality planning and analysis/ Planiranje i analiza kvalitete/. Mate, Zagreb, 1999.		

LEARNING OUTCOMES

No	LEARNING OUTCOMES
1.	To present roles and obligations of a subject in a food provision chain
2.	Discuss principles and tools used in food legislation
3.	Select and explain methods of product authenticity control
4.	Apply sampling planns and control maps
5.	Describe characteristics of specific phases in food quality development
6.	Explain principles of quality management with special focus on the production process
7.	To present the ISO 9001 with special focus on documents
8.	To compare various quality assurance systems

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	1	1-8	Attendance and active participatin	Attendance list and active participation	4	10
Individual work	0.5	1-8	Individual work on a topic by students couice	Evaluation of the presentation an written report	8	20
Continuous knowledge check	0.7	1-4	Literature studying	Written and oral exam	14	35
Continuous knowledge check	0.8	5-8	Literature studying	Written and oral exam	14	35
TOTAL	**3**				**40**	**100**

Course title	**Food Process Equipment Design**		
Course code	66933	**Course status**	Elective
Study programme	Food Engineering		
Semester	III, IV		
Course lecturer	Darko Velić, PhD, full prof. Stela Jokić, PhD, full prof. Krunoslav Aladić, PhD, assist. prof.		
Course associates			
Course content	Lectures: Transport and storage equipment design: Pumping of fluids, Pipelines, Pneumatic, Hydraulic & Mechanical Conveyer, Tanks. Mechanical processing equipment design: Peeling, Cating, Slicing, Size Reduction, Sorting, Grading, Mixing, Emulsification, Agglomeration, Extrusion, Forming. Mechanical separation equipment design: Screening, Cleaning, Washing, Filtration, Centrifugation. Heat transfer equipment design: Heating, Blanching, Cooking, Frying, Pasteurisation, Sterilisation, Evaporation, Refrigeration, Freezing. Mass transfer equipment design: Drying, Extraction, Distillation, Crystallisation. Membrane separation equipment design: Ultrafiltration, Reverse Osmosis. Non-thermal preservation equipment design: Irradiation, High Pressure, Pulsed Electric Fields. Packing equipment design: Filling, Closing, Aseptic Packaging. Equipment for cleaning and disinfections: CIP systems design. Measurement and regulation equipment. Food equipment optimisation: Energy analysis and recuperation. Case studies. Labs: Example of food process equipment design. Determination of critical equations, coefficients and exponents from experimental data. Research and development in equipment design. Computer aided drawing (CAD): equipment, flowsheets, P&I diagrams, 2D & 3D diagrams, plant layout. Video projections and animations. Simulation software. Food industry visit.		
General and specific knowledge acquired in course (objective)	Obtaining advanced engineering knowledge in Food Equipment Design. Detailed Design. Computer-Aided Equipment Design. Good manufacturing practices. Obtaining education for planning, preparation and control of food production.		

Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		2
(total)	30		30

Examination method	Written exam, seminar work, final oral exam 2 written examinations during the semester and final oral examination.		
Credits	5	**Language**	Croatian, English
Compulsory reading	1. Z. B. Maroulis, G. D. Saravacos: Food Process Design, Marcel Dekker, 2003. 2. R. P. Singh, D. R. Heldman: Introduction to Food Engineering, 3. ed., Marcel Dekker, 2001. 3. E. Beer: Priručnik za dimenzioniranje uređaja u kemijskoj industriji, Kemija u industriji, Zagreb, 1985. 4. Mate Bilić, Darko Velić: Projektiranje uređaja, interna skripta, Prehrambeno tehnološki fakultet Osijek, 2003. 5. R. H. Perry, D. W. Green: Perry's Chemical Engineer's Handbook. 7. ed., McGraw Hill, New York, 1997.		
Recommended reading	1. P. J. Fellows: Food processing technology; Principles and practice, Second Edition, Woodhead Publishing Limited, 2000. 2. G. D. Saravacos, A. E. Kostaropoulos: Handbook Of Food Processing Equipment, Marcel Dekker, 2003. 3. W. D. Seider, J. D. Seader, D. R. Lewin: Proces Design Principles Synthesis, Analysis and Evaluation of Process Flowsheets, J. Wiley & Sons, 2000.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Define and diferentiate basic principles of food processing equipment design.
2.	Define and understand food processing engineer role in process equipment design.
3.	Apply gained knowledge in design of food processing equipment used in fluid transport an mechanical transport.
4.	Apply gained knowledge in design of process equipment used in mechanical, physical and separation processes.
5.	Apply gained knowledge in design of process equipment used in heat and mass transport.
6.	Apply gained knowledge in design of CIP systems and in measurement and regulation.
7.	Compare and analyse softwares used in process equipment design
8.	Analyse, diferentiate and properly interprete legislation regarding food processing equipment design.
9.	List and analyse examples of good engineering practice.
10.	Compare and analyse practical examples of food processing equipment design.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures, seminars and labs	2	1-10	Attendance list; Active participation	Attendance list and active participation	0	5
Periodic knowledge check	2	1-10	Literature studying; partial exam writing	Partial written exam 1 Partial written exam 2	35	65
Written exam*	2*	1-10	Literature studying, exam writing*	Written exam*	35*	65*
Final exam	1	1-10	Literature studying, disscussion	Oral exam	15	30
TOTAL	**5**				**50**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Food Process Preparation**		
Course code	62317	**Course status**	Elective
Study programme	Food Engineering		
Semester	IV		
Course lecturer	Nela Nedić Tiban, PhD, full prof.		
Course associates			
Course content	Raw (of plant and animal origin) material preparation for different types of food service. Treatment for hotels, public institutions (schools, hospitals, nursurinh houses for children, older people, etc.), avio- and other transportation companies, restaurants, and others. Practical laboratory work on food preparation.		
General and specific knowledge acquired in course (objective)	Students are getting theoretical and practical knowledge in principal food preparation processes.		

Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		2
(total)	30		30

Examination method	Oral exam		
Credits	5	**Language**	Croatian, English
Compulsory reading	1. J. M. Connor and W. A. Schiek, Food Processing, Sec. Ed. 1997, John Wiley & Sons, Inc., New York, U.S.A		
Recommended reading	Available literature from the food processing.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Describe key factors of quality for raw materials intended for processing.
2.	Differentiate processing of plant and animal foodstufs intended for varius consumer groups.
3.	Describe various methods of preparation and packaging of foods intended for hotels, public institutions (schools, hospitals, nursing homes), restaurants, etc.
4.	Describe changes in food during prcessing, storage and distribution.
5.	Apply gained knowledge in food preparation.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	0.5	1-6	Lecture attendance	Attendance list	6	10
Laboratory exercises	1	1-6	Active participation	Attendance list lab reports	12	20
Final exam	3.5	1-6	Literature studying	Oral exam	42	70
TOTAL	**5**				**60**	**100**

Course title	**Malting and Brewing Technology**		
Course code	62318	**Course status**	Elective
Study programme	Food Engineering		
Semester	IV		
Course lecturer	Kristina Mastanjević, PhD, assoc. prof.		
Course associates			
Course content	Outline of malting. History, present and trends of development in malting industry. Biology of barley sorts and types. Physiology, biochemistry and composition. Theory and practice of barley transport, manufacturing and storage. Malting stages and types. Theory and practice of steeping. Chemical and biochemical changes during steeping. Induction, synthesis and activity of enzymes during barley germination. Traditional and modern germination technologies. Different malting germination constructions. Theory and processes during green malt drying and kilning. Chemistry of kilning – formation of colour and flavour substances of malt, enzyme denaturation. Kiln types. Energy consumption. Economy of malting and process losses. Material and energy balance. Continuous and high capacity malting systems. Hygiene and sanitation in malting. Types and chemical composition of malts. Quality assurance in malting process. Malting by-products, wastes and its treatment. Ecology aspects of malting. History, present stage and trends in world and Croatian brewing industry. Survey of biochemical, chemical, physical processes and engineering problems in brewing. Chemistry, biochemistry and technology of mashing. Classical and modern brewing. Chemistry and technology of wort boiling, hop extraction and wort cooling. Biology and metabolism of different brewing yeasts. Theory of brewing fermentation. Brewing fermentation - top, bottom, and accelerated and continuous systems. Fermentation tanks. Young beer. Beer lagering –clarification, fining, conditioning and formation of flavour substances. Beer treatment –pasteurisation, stabilization, carbonation and filtration. Beer filling – bottling, canning, casking, kegging and transport. Microbial contamination, hygiene and sanitation in brewing process. Chemical and physical properties of beers –composition, nutrients and contaminants. Types of beers and their characteristics. Beer quality – flavour, foam, colloidal and microbial shelf life. Legislation. Brewing by-products and waste treatment. Energy requirements in brewing industry.		
General and specific knowledge acquired in course (objective)	Obtaining education for planning, preparation and control of malt and beer production processes. Application of analytical methods for malt and beer quality control.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		2
(total)	30		30
Examination method	Essay (evaluation of work and presentation), 2 written examinations during the semester and final oral examination.		
Credits	5	**Language**	Croatian
Compulsory reading	1. Marić V.: Tehnologija piva (2009.) Veleučilište u Karlovcu 2. Marić V.: Biotehnologija i sirovine, (2000.) Stručna i poslovna knjiga, Zagreb 3. Kunze W.: Technology Brewing and Malting, 2nd revised ed. (1999.). VLB Berlin		
Recommended reading	1. Narziss L.: Die Technologie Der Malzbereitung, 7 ed. (1999) F. Enke, Stuttgart 2. Schuster K., Weinfurtner, F. i Narziss L.: Die Technologie der Würzebereitung, (1985) Tehnologija proizvodnje sladovine, prijevod S.Gaćeša, Posl. zajed. ind. piva i slada Jug. 1988. 3. Schuster K., Weinfurtner, F. i Narziss L.: Die Technologie der Malzberbereitung. (1988) Tehnologija proizvodnje slada. (S. Gaćeša, Posl. zajed. ind. piva i slada Jug. 1990. 4. Marić V., Nadvornik Z.: Pivo tekuća hrana, (1995) ZSB, Zagreb		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Define barley, malt, hop, beer marketing and diferentiate types of beer, barley species and malt types.
2.	Operate and monitor malt production. Calculate efficacy of the process and degree of malt quallity.
3.	Evaluate beer production raw materials (water, hop, malt, enzymes) and beer yeasts.
4.	Operate malting.
5.	Conduct brewing fermentation, lagering (clarification, fining, conditioninng and formation of flavour substances), filling and transport.
6.	Solely oversee raw-materials, malt and beer quality.
7.	By-products and waste management.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	0.5	1-7	Attendance; Active participation	Attendance list and active participation	5	10
Labs	0.5	1-7	Active participation	Attendance list and lab reports evaluation	5	10
Periodic knowledge check	2	1-7	Literature studying	Partial written exam 1 Partial written exam 2	30	50
Written exam*	2*	1-7	Literature studying*	Written exam*	30*	50*
Final exam	2	1-7	Literature studying	Oral exam	15	30
TOTAL	**5**				**55**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Carbohydrate Technology**		
Course code	62319	**Course status**	Elective
Study programme	Food Engineering		
Semester	III		
Course lecturer	Drago Šubarić, PhD, full prof. Jurislav Babić, PhD, full prof. Đurđica Ačkar, PhD, full prof. Antun Jozinović, PhD, assoc. prof.		
Course associates			
Course content	Lectures: Carbohydrates in human diet and industrial application. Polysaccharides, classification and properties. Chemicall and physicall properties of starch. Trends in starch, starch hydrolysates and modified starches production and consumption. Raw material in starch production (corn, wheat, potato and rice). Cornstarch production. Enzymes in starch technology. Starch syrups production. Crystalline glucose production. Fructose syrups and fructose. Modified starches, production and application in food and other industries. Potato starch production. Wheat starch production. By-products in starch industry. Sucrose production form sugar beet and sugar cane. Preparation for extraction. Juice extraction and purification. Juice concentration. Crystallisation and centrifugation. Crystals refining and storage. By-products in sugar beet processing. Waste water processing. Sugar production from sugar cane. Labs: Analytical methods in carbohydrates technology. Sugar quality. Thermophysical properties of starch. Rheological properties of starch suspensions. Water holding capacity. Modified starches preparation.		
General and specific knowledge acquired in course (objective)	Upgrade of specific knowledge on previously gained knowledge from natural science and engineering to provide students with an understanding of starch production technology from different raw materials and starch hydrolysates and modified starches, as well as sucrose production from sugar beet and sugar cane. Besides, students gain wide knowledge about starch structure and starch properties and products on starch basis as well as possibilities of application mentioned products in production different products in food industry and other industries.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		2
(total)	30		30
Examination method	Oral or written examination of the whole subject matter at the end of semester or in the form of two oral exams during semester.		
Credits	5	**Language**	Croatian
Compulsory reading	1. M. W. Kearsley,S. Z. Dziedzic: Handbook of starch hydrolysis products and their derivates., Blackie Academic & and Professional, 1995. 2. G. M. A. Van Beynum, J. A. Roel: Starch conversion technology, Marcel Dekker INC, New York and Basel, 1985. 3. M.F. Chaplin and J.F. Kennedy, Carbohydrates analysis, IRL Press, Oxford Washington, 1986.		
Recommended reading	1. F. W. Schenck, R. E. Hebeda: Starch hydrolysis products.VCH, New York, Weinheim, 1992. 2. P. W. Van der Poel, H. Schiweck, T. Schwartz: Sugar Technology. Verlag Dr. Albert Bartens KG-Berlin, 1998.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Define starch properties and describe process f starch production from corn, potato and wheat.
2.	Define properties of raw material and sucrose and describe sucrose production.
3.	Define properties and potential of use for starch and sucrose by products.
4.	Describe crystal glucose, fructose, starches and poyols production.
5.	Define enzyme application in starch technology.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures labs	2	1-5	Attendance; Active participation	Attendance list and active participation	5	10
Periodic knowledge check	3	1-5	Literature studying	Partial written exam 1 Partial written exam 2	50	90
Written exam*	3*	1-5	Literature studying *	Written exam*	50*	90*
TOTAL	**5**				**55**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Technology of Confectionery and Related Products**		
Course code	81740	**Course status**	Elective
Study programme	Food Engineering		
Semester	IV		
Course lecturer	Drago Šubarić, PhD, full prof. Jurislav Babić, PhD, full prof. Đurđica Ačkar, PhD, full prof. Antun Jozinović, PhD, assoc. prof.		
Course associates			
Course content	Lectures: Confectionery products through the history. Trends in confectionery products production and consumption. Confectionery products and health. Raw materials in confectionery product (fats, sugar, milk, colours, emulsifiers...). Types of cocoa products. Cocoa bean, fermentation, drying and storage. Cocoa mass, cocoa powder, cocoa butter and chocolate mass production. Cocoa butter and cocoa butter replacement properties. Chocolate production. Rheological properties of chocolate. Bonbon products production. Production of other confectionery products. Chemistry and technology of coffee. Tea. Snack products. Packing materials and packaging. Product storage. Equipment in confectionery products production. Law regulations. Labs: Quality of cocoa bean determination. Determination of thermophysical properties of chocolate, cocoa butter and cocoa butter replacement. Rheological properties of chocolate. Sensorial evaluation of confectionery products. Industrial practice.		
General and specific knowledge acquired in course (objective)	The course is intended to provide students with knowledge and understanding of confectionery and related products production, starting from raw material demands, all phases of a production, packing materials and packaging, final products storage to product quality control.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2	1	1
(total)	30	15	15
Examination method	Oral or written exam of the whole subject matter at the end of semester or in the form of two oral exams during semester.		
Credits	5	**Language**	Croatian
Compulsory reading	1. S. T. Beckett (1999): Industrial chocolate manufacture and use. Blackwell Science. 2. S.T. Beckett: The science of chocolate, Royal Society of chemistry, York, 2000.		
Recommended reading	1. R.J. Clarke, R. Macrae: Coffee-Technology. Elsevier Applied Science, London, New York, 1987. 2. R.J. Clarke, R. Macrae: Coffee-Chemistry. Elsevier Applied Science, London, New York, 1985		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Describe process of cocoa grain processing and chocolate production
2.	Describe process of candies production
3.	Describe proceses of snack pruducts production
4.	Define quality parameters of foodstufs and products for above mentioned products
5.	Describe production process of tee, coffe and similar products
6.	Define rheolgical properties of chocolate and list parameters influencing them

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures, labs	2	1-6	Attendance; Active participation	Attendance list and active participation	5	10
Seminars	1	1-6	Individual preparation of presenatation on a selected topic	Evaluation of public presentation	15	25
Periodic knowledge check	2	1-6	Literature studying	Partial written exam 1 Partial written exam 2	35	65
Written exam*	2*	1-6	Literature studying *	Written exam*	35*	65*
TOTAL	**5**				**55**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Cereal Storage and Flour Production**		
Course code	62321	**Course status**	Elective
Study programme	Food Engineering		
Semester	III, IV		
Course lecturer	Daliborka Koceva Komlenić, PhD, full prof. Marko Jukić, PhD, full prof.		
Course associates			
Course content	Lectures: Technological procedure of wheat preparation and storage. Biochemical and microbiological processes during storage. Drying and active ventilation. Wheat storage facilities. Cooling storage of grain. Storage in the inert atmosphere. Wheat milling, procedures and equipment. Mill products. Flour storage, packaging and transportation. Chemical composition of flour. Rheological properties and baking quality of flour dough. Milling of durum wheat, rye and corn. Labs: - Physical and chemical analytical methods for grain and flour evaluation. - Industrial practice exercises in plants of silo and mill.		
General and specific knowledge acquired in course (objective)	Detailed description of methods for cereal storage and flour production, as well as influence of particular processing stages on flour quality, is presented in this course. Additionally, the course is designed to develop students' abilities to solve production problems and to improve product quality.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		2
(total)	30		30
Examination method	2 oral exams during semester or final oral exam		
Credits	5	**Language**	Croatian
Compulsory reading	1. Ž. Ugarčić-Hardi: *Tehnologija proizvodnje i prerade brašna: Opći dio i skladištenje*. (interna skripta). Prehrambeno tehnološki fakultet Sveučilišta Josipa Jurja Strossmayer-a u Osijeku, 1999. 2. Ž. Ugarčić-Hardi: *Tehnologija proizvodnje i prerade brašna: Mlinarstvo*. (interna skripta). Prehrambeno tehnološki fakultet Sveučilišta Josipa Jurja Strossmayer-a u Osijeku, 1999. 3. S. Kljusurić: *Uvod u tehnologiju mljevenja pšenice*. Prehrambeno tehnološki fakultet Sveučilišta josipa Jurja Strossmayer-a u Osijeku, 2000.		
Recommended reading	1. Z. Katić: *Sušenje i sušare u poljoprivredi*. Multigraf d.o.o. Zagreb, 1997. 2. E.S. Posner, A.N. Hibbs: *Wheat Flour Milling.* American Association of Cereal Chemists, Inc. St. Paul, Minnesota, U.S.D. 1997.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	List chemical composition of grain and significance of particular components in evaluation of grain technological quality.
2.	Explain technlogical process of cereal preparation and storage.
3.	Explain biochemical and microbiological changes during storage.
4.	Describe technological process of wheat milling and cllasify milling products.
5.	Describe termo of flour storage, packageing and transport.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures i labs	1.5	1-5	Attendance, Active participation in disscussions Experimental work	Attendance list and lab report evaluation	0	0
Seminars	1	1-5	Seminar preparation	Evaluation of the presented seminar	10	20
Periodic knowledge check	2,5	1-5	Literature studying	Partial written exam 1 Partial written exam 2	50	80
Final exam*	2,5*	1-5	Literature studying *	Oral exam*	50*	80*
TOTAL	**5**				**60**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Baking Technology**		
Course code	62322	**Course status**	Elective
Study programme	Food Engineering		
Semester	III, IV		
Course lecturer	Daliborka Koceva Komlenić, PhD, full prof. Marko Jukić, PhD, full prof.		
Course associates			
Course content	Lectures: Primary and secondary raw materials and additives in bakery production. Rheological properties and baking quality of flour dough. Different methods of dough preparation. Technological procedures of bread and other bakery products production. Production of sourdough bakery products. Biochemical processes in dough during fermentation. Physical and chemical changes in dough during baking. Machinery and equipment. Bakery products. Wheat breads and other kinds of bread. Frozen bakery products. Quality evaluation, transport, packaging and storage of bakery products. Labs: Laboratory exercises – Determination of physical, chemical and sensory characteristics of flour, flour dough and final bakery products. Industrial practice – Visit to industrial bakery and introduction to technological processes of bakery products production.		
General and specific knowledge acquired in course (objective)	After completing this course students acquire knowledge about physical and chemical properties of raw materials and technological procedures of bread and other bakery products production. Students will be able to use correct methods and technology to solve possible problems in baking technology process.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		2
(total)	30		30
Examination method	2 oral exams during semester or final oral exam		
Credits	5	**Language**	Croatian
Compulsory reading	1. Ž. Ugarčić-Hardi: *Tehnologija proizvodnje i prerade brašna: Pekarstvo*. (interna skripta). Prehrambeno tehnološki fakultet Sveučilišta Josipa Jurja Strossmayer-a u Osijeku, 1999. 2. Ž. Ugarčić-Hardi, D. Koceva Komlenić, A. Kuleš: *Tehnologija proizvodnje i prerade brašna: Upute za laboratorijske vježbe*. (interna skripta). Prehrambeno tehnološki fakultet Sveučilišta Josipa Jurja Strossmayer-a u Osijeku, 2002. 3. E. J. Pyler: *Baking Science and Tehnology*. Volumen I i II. Sosland Publishing Company, Marriam, Kansas, 1988.		
Recommended reading	1. S. A. Matz: *Bakery Technology: Packaging, Nutrition, Product Development, Quality Assurance*. Elsevier Science Publishers, Essex, U.K., 1989. 2. Hirsekorn, W. Nehrkorn, K. Miekley: *Grundprozesse der Backwarenherstellung und Feinbackwaren*. VEB Fachbuchverlag Leipzig, 1986 3. K. Kulp, K. Lorenz, and J. Brümmer (Ed.): *Frozen and Refrigerated Doughs and Batters*, American Association of Cereal Chemists, St. Paul, Minnesota, 1995.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	List chemical composition of grain and significance of particular components in evaluation of grain technological quality.
2.	Define flour baking properties and role of various raw materials and aditives.
3.	Describe bread and bakery products.
4.	Explain biochemical and physico-chemical changes during production of various bakery products.
5.	Clasify and describe various bakery products

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures and labs	1.5	1-5	Attendance; Active participation; Experimental work	Attendance list Lab report evaluation	0	0
Seminar	1	1-5	Seminar preparation	Evaluation of presented seminar	10	20
Periodic knowledge check	2.5	1-5	Literature studying	Partial written exam 1 Partial written exam 2	50	80
Final exam*	2.5*	1-5	Literature studying*	Oral exam*	50*	80*
TOTAL	**5**				**60**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Technology of Pasta and Biscuit Production**		
Course code	62323	**Course status**	Elective
Study programme	Food Engineering		
Semester	III, IV		
Course lecturer	Daliborka Koceva Komlenić, PhD, full prof. Marko Jukić, PhD, full prof.		
Course associates			
Course content	Lectures: Quality requirements of raw materials. Durum wheat. Operations and processes in technology of pasta production (mixing, extrusion and drying). Machinery and equipment. Different types of pasta. Filled pasta. Proper choice of raw materials and additives for biscuit production. Classification of biscuits. Technological procedures of biscuit and wafer production. Machinery and equipment. Dough preparation and processing. Baking and cooling of biscuits. Packaging, transport and storage of raw materials and final products. Snack products, breakfast cereals and extrusion process. Labs: Laboratory exercises – Determination of physical, chemical and sensory characteristics of raw materials and final products. Laboratory pasta production. Industrial practice – Visit to plants of pasta and biscuit industry and introduction to technological processes of production.		
General and specific knowledge acquired in course (objective)	After completing this course students acquire knowledge about physical and chemical properties of raw materials and products, as well as about technological procedures of pasta and biscuits production. Students will be qualified for autonomous production process control and for quality assurance of products.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		2
(total)	30		30
Examination method	2 oral exams during semester or final oral exam		
Credits	5	**Language**	Croatian
Compulsory reading	1. Ž. Ugarčić-Hardi: *Tehnologija proizvodnje i prerade brašna: Proizvodnja tjestenine i keksa*. (interna skripta). Prehrambeno tehnološki fakultet Sveučilišta Josipa Jurja Strossmayer-a u Osijeku, 2000. 2. Ž. Ugarčić-Hardi, D. Koceva Komlenić, A. Kuleš: *Tehnologija proizvodnje i prerade brašna: Upute za laboratorijske vježbe*. (interna skripta). Prehrambeno tehnološki fakultet Sveučilišta Josipa Jurja Strossmayer-a u Osijeku, 2002. 3. G. Fabriani, C. Lintas: *Durum Wheat: Chemistry and Technology*. American Association of Cereal Chemists, St. Paul, Minnesota, 1988.		
Recommended reading	1. J. E. Kruger, R. B. Matsuo, J. W. Dick: *Pasta and Noodle Technology*. American Association of Cereal Chemists, St. Paul, Minnesota, 1996. 2. Ch. Mercier, C. Cantarelli: *Pasta and extrusion cooked foods.* Elsevier Applied Science Publishers, London, New York, 1986. 3. P. R. Whiteley: *Biscuit Manufacture*. Elsevier Publishing Company LTD, London, Amsterdam, 1971.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Explain quality demands for proper choice of raw-materials and aditive sin biscuits and pasta production.
2.	Describe proceses of biscuits and pasta production.
3.	Explain biochemical and physico-chemical changes during production
4.	Clasify and describe various biscuits and pasta.
5.	Describe operations and conditions for packageing, transport and storage of final products.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures and labs	1.5	1-5	Attendance; Active participation; Experimental work	Attendance list lab report evaluation	0	0
Seminar	1	1-5	Individual seminarpreparation	Evaluation of seminar presentation	10	20
Periodic knowldege check	2.5	1-5	Literature studying	Partial written exam 1 Partial written exam 2	50	80
Final exam*	2.5*	1-5	Literature studying*	Oral exam*	50*	80*
TOTAL	**5**				**60**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Minimally Processed Food**		
Course code	62312	**Course status**	Elective
Study programme	Food Engineering		
Semester	III, IV		
Course lecturer	Nela Nedić Tiban, PhD, full prof.		
Course associates			
Course content	Quality factors of raw material for minimally food processing. Changes in minimally processed food. Undesirable changes and its prevention. Preparation, processing, packaging, handling and distribution of minimally processed food. Preservation of minimally processed food.		
General and specific knowledge acquired in course (objective)	Studens get the knowledge in the field of processing, preservation, packaging and distribution of the food products produced by non-conventional, non-traditional processes with fresh-like properties.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		2
(total)	30		30
Examination method	Oral examination at the end of lectures (courses).		
Credits	5	**Language**	Croatian
Compulsory reading			
Recommended reading	Scientific and professional articles		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Define quality factors of raw material for minimally food processing.
2.	Explain storage conditions, unwanted changes and their prevention.
3.	Describe changes in minimally processed food during processing, storage and distribution.
4.	Explain basics of preservation of minimally processed food.
5.	Explain basics of packageing, and distribution of minimally processed food.
6.	Apply gained knowledge in production of minimally processed food.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	0.5	1-6	Lecture attendance	Attendance list	6	10
Labs	1	1-6	Active participation and report writting	Attendance list and evaluation of lab reports	12	20
Final exam	3.5	1-6	Literature studying	Oral exam	42	70
TOTAL	**5**				**60**	**100**

Course title	**Primary Processing of Milk and Fermented Dairy Beverages**		
Course code	62313	**Course status**	Elective
Study programme	Food Engineering		
Semester	III, IV		
Course lecturer	Mirela Lučan, PhD, assoc. prof.		
Course associates			
Course content	Fundamentals of mechanical milk treatment (deaeration / deodorisation, separation of milk fat, milk fat standardisation, clarification, bactofugation, homogenisation). Heat treatment of milk (pasteurisation, uperisation, sterilisation, thermalisation). Changes of milk composition caused with thermal processing and transfer of heat. Membrane processes in treatment of milk (membranes and module, technological procedures). Technology of pasteurised and sterilised (long-life) milk. Development trends of new minimum processed dairy products. Fermented dairy beverages. Microbiological cultures for production of fermented dairy beverages (mesophilic, thermophilic and therapeutic cultures of lactic acid bacteria, mixed starters, use of yeast and moulds together with lactic acid bacteria). Technology of fermented dairy beverages. Development of aromatic compounds during fermentation. Achievements in fermented dairy industry. Use of probiotic, prebiotic and symbiotic in dairy industry.		
General and specific knowledge acquired in course (objective)	The aim of this course is to enhance student's knowledge about modern fermented dairy production. Students will get knowledge about managing and control of processes in primary treatment of milk, as well as in production of fermented milks. The role of microbial cultures in fermented production of dairy products will be also explained. The role of probiotic starters in dairy industry, as well as in human health will be commented. After the finishing of the course, the students should be able to understand methods and equipment of production of consume milk and fermented dairy products.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		
(total)	30		
Examination method	Oral exam		
Credits	4	**Language**	Croatian
Compulsory reading	1. A. Petričić: *Konzumno i fermentirano mlijeko*. Udruženje mljekarskih radnika SRH, Zagreb, 1984. 2. Lj. Tratnik: *Mlijeko – tehnologija, biokemija i mikrobiologija. Hrvatska mljekarska udruga*. Zagreb, 1998. 3. S. Miletić: *Mlijeko i mliječni proizvodi*. Hrvatsko mljekarsko društvo, Zagreb, 1994. 4. Lj. Kršev: *Mikrobiološke kulture u proizvodnji mliječnih proizvoda*. Udruženje mljekarskih radnika Hrvatske, Zagreb, 1989. 5. I. F. Vujičić: *Mlekarstvo – I. dio*. Naučna knjiga, Beograd, 1985.		
Recommended reading	1. S. Duraković: *Prehrambena mikrobiologija*. Medicinska naklada, Zagreb, 1991. 2. R. K. Robinson: *Modern Dairy Technology – Advances in Milk Processing*, vol. 1. Elsevier Applied Science, London – New York, 1986. 3. R. K. Robinson: *Modern Dairy Technology – Advances in Milk Products*, vol. 2. Elsevier Applied Science, London – New York, 1993. 4. B. A. Law: *Microbiology and Biochemistry of Cheese and Fermented milk*. Chapmann & Hall, London, 1997. 5. A. Y. Tamime, R. K. Robinson: *Yoghurt – Science and Technology*. CRS Press, Boca Raton, Boston, New York, Washington, 2000.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Analyse presence and types of fermented milk on a global scale. Compare specifics of its use in various cultures and argument on its importance in human diet.
2.	Describe and define the importance of primary treatment of milk in fermented milk production.
3.	Analyse the role of microbiological quality of raw milk as the raw-material used in fermented milk production.
4.	Describe and analyse dry matter, milk fat and protein standardisation.
5.	Describe and analyse milk homgenisation.
6.	Describe and analyse heat processing of milk: types, parameters and role in fermented milk quality.
7.	Compare various types of milk heat processing and argument their use.
8.	Describe general characteristics of fermented milk production.
9.	Diferentiate specifics of fermented milks of various consistency, composition and characteristics.
10.	Describe principles of various additions (fruit, vegetables, cereals, hydrocolloids, prebiotics) to fermented milk products.
11.	Define specifics of probiotic fermented milk production.

Course title	**Autochthonous Dairy Products**			
Course code	62314	**Course status**	Elective	
Study programme	Food Engineering			
Semester	III, IV			
Course lecturer	Mirela Lučan, PhD, assoc. prof.			
Course associates				
Course content	Short historical overview of manufacture of specific dairy products. Definition of autochthonous products. Properties of certain autochthonous products. Most important dairy products in Croatia, as well as on world market. Technology of production of certain autochthonous dairy products. Manufacture, farms, family economy, traditional farmers production. Transfer of autochthonous technological operation to industrial processing. Protection of authenticity of autochthonous products (geographic origin, composition, standardization of production, labels for quality recognition). Most important Croatian autochthonous dairy products. Croatian Creation. Croatian Quality.			
General and specific knowledge acquired in course (objective)	The aim of the course is to introduce the students with early beginnings of manufacturing dairy products. How the idea of autochthonous products has risen. During the course students will gain information concerned main world, European and Croatian autochthonous dairy products, their production technology and characteristics. Implementation of autochthonous products to industry norm will be also included. Emphasis is on Croatian autochthonous dairy products and quality labels: Croatian Creation and Croatian Quality.			
Teaching method	**Lectures**	**Seminars**	**Labs**	
(hrs/week)	2			
(total)	30			
Examination method	Oral exam			
Credits	4	**Language**	Croatian	
Compulsory reading	1. J. Harbutt: *Svjetska enciklopedija sira*. Naklada Fran, Zagreb, 2000. 2. T. Slanovec: *Sirarstvo*. ČZP Kmečki, Ljubljana, 1982. 3. Lj. Tratnik: *Mlijeko – tehnologija, biokemija i mikrobiologija. Hrvatska mljekarska udruga*. Zagreb, 1998. 4. S. Miletić: *Mlijeko i mliječni proizvodi*. Hrvatsko mljekarsko društvo, Zagreb, 1994. 5. A. T. Meyer: *Processed Cheese Manufacture*. Food Trade Press LTD, London, 1973.			
Recommended reading	1. R. Scott: *Cheesemaking practice*. Applied science publishers LTD, London, 1981. 2. B. A. Law: *Microbiology and Biochemistry of Cheese and Fermented milk*. Chapmann & Hall, London, 1997. 3. W. Scholz: *Käse aus Schaf- und Ziegenmilch*. Ulmer, Stuttgart, 1995. 4. V. Maier: *Käse in Österreich*. Falter Verlag, Wien, 1993. 5. K. Masui, T. Yamada: *Französischer Käse*. Wilhelm Heyne Verlag, München, 1997.			

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Describe trends in production and protection of autochtonous milk products in Croatia and EU.
2.	List and describe most important Croatian autochthonous dairy products.
3.	Explain specifics of production of certain dairy products.
4.	Explain transfer of autochthonous technological operation to industrial processing.
5.	PExplain protection of authenticity of autochthonous products (geographic origin, composition, standardization of production, labels for quality recognition).

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	1.5	1-5	Lecture attendance	Attendance list	15	30
Labs	1.5	1-5	Active participation	Attendance list lab reports	15	30
Periodic knowledge check	2	1-5	Literature studying	Partial written exam 1 Partial written exam 2	20	40
Written exam*	2*	1-5	Literature studying*	Written exam*	20*	40*
TOTAL	**5**				**50**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Microbiological and Biochemical Processes in Dairy Industry**		
Course code	62315	**Course status**	Elective
Study programme	Food Engineering		
Semester	III, IV		
Course lecturer	Mirela Lučan, PhD, assoc. prof.		
Course associates			
Course content	Composition of milk. Influence of processing to milk ingredients (water, milk fat, lactose, proteins, enzymes, minerals, vitamins, microorganisms, primary and secondary microflora). Microorganisms in dairy industry: wanted and unwanted microbes, starter cultures, growing condition of different starters in milk, prevention against unwanted and pathogenic microbes. Dairy starter cultures. Metabolism of lactose, glucose, galactose, citrate and proteins in milk. Lactic acid fermentation. Development of slime compounds during fermentation. Development of flavour and aroma compounds. Control of fermentation process. Mesophilic, thermophilic and therapeutic starters for production of fermented dairy products. Curdling of milk (by the use of acid, enzyme, heat). Acidic and enzymic coagulation of milk proteins (acid and sweet curd). Thermal coagulation of whey proteins. Starters in cheesemaking. Use of moulds for production of some special types of cheese. Biochemical processes during chesses ripening. Development of flavour and aroma compounds during cheese ripening. Development of unwanted aroma compounds during the cheese ripening. Some faults which occur during production of cheese (physical-chemical and microbiological faults).		
General and specific knowledge acquired in course (objective)	This course is designed to enhance student's knowledge about biochemical and microbiological changes of milk ingredients in dairy industry. Mechanisms of lactose and other milk ingredients degradation will be described. Furthermore, development of lactic acid and aroma substances during fermentation and coagulation of milk will be explained. The role of starter cultures in these processes will be also observed. After the finished course, the students should be able to understand mechanisms of the processes in milk and dairy products during different technological operations.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2	1	
(total)	30	15	
Examination method	Seminar paper Oral exam		
Credits	5	**Language**	Croatian
Compulsory reading	1. B. A. Law: *Microbiology and Biochemistry of Cheese and Fermented milk*. Chapmann & Hall, London, 1997. 2. S. Duraković i sur.: *Moderna mikrobiologija namirnica* (Knjiga prva). Kugler, Zagreb, 2002. 3. S. Duraković i sur.: *Moderna mikrobiologija namirnica* (Knjiga druga). Kugler, Zagreb, 2002. 4. S. Miletić: *Mlijeko i mliječni proizvodi*. Hrvatsko mljekarsko društvo, Zagreb, 1994. 5. A. T. Andrews, J. Varley: *Biochemistry of Milk Products*. The Royal Society of Chemistry, Cambridge, 1994.		
Recommended reading	1. Lj. Kršev: *Mikrobiološke kulture u proizvodnji mliječnih proizvoda*. Udruženje mljekarskih radnika Hrvatske, Zagreb, 1989. 2. S. Duraković, L. Duraković: *Mikrobiologija namirnica – osnove i dostignuća* (Knjige I, II, III). Kugler, Zagreb, 2001. 3. S. Duraković, L. Duraković: *Specijalna mikrobiologija*. Kugler, Zagreb, 2000. 4. S. Duraković: *Prehrambena mikrobiologija*. Medicinska naklada, Zagreb, 1991. 5. B. A. Law: *Microbiology and Biochemistry*. Elsevier Applied Science, London, New York, 1989.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Analyse composition of milk and biological significance of selecte milk constituents.
2.	Define starter culture, their types and application.
3.	Describe homofermentative and heterofermentative milk fermentation.
4.	Define biochemical processes in fermentations with the presence of (yeasts).
5.	Analyse acidic, enzymatic and heat curdling of milk.
6.	Define probiotic fermented milks and explain their biological activity.
7.	Describe microbilogical and biochemical prcess during cheese maturation.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	1	1-7	Attendance, active participation in disscussions	Attendance list	10	20
Literature studying	0.75	1-7	Literature studying	Disscussion	10	20
Individual work and consultations	1.25	1-7	Seminar writting	Seminar evaluation	10	20
Literature studying	2	1-7	Disscussion	Oral exam	20	40
TOTAL	**5**				**50**	**100**

Course title	**Autochthonous Meat Products**		
Course code	62316	**Course status**	Elective
Study programme	Food Engineering		
Semester	III, IV		
Course lecturer	Dragan Kovačević, PhD, full prof. Krešimir Mastanjević, PhD, full prof.		
Course associates			
Course content	Lectures: Autochthonous meat products in Croatia. Cultural, gastronomic and market importance of production of the autochthonous meat products. Specific chemical composition, nutritional and sensory characteristics of autochthonous meat products. Basic raw materials, supplements and spices for production of autochthonous meat products. Traditional technologies and application of new technological achievements in production of autochthonous meat products (Dalmatian "pršut", Slavonian "kulen", Dalmatian "panceta", Istrian "pršut", Slavonian homemade "kobasica"). Problems in area of production and trade legalization, health-veterinary inspection, standardization and protection of autochthonous products. Protected designation of origin, protected geographical indication and traditional specialty guaranteed. Marketing and export possibilities for the autochthonous products. Labs: Sensory evaluation of autochthonous meat products. Farms discussion– producers of autochthonous meat products. Making a scheme for mini – manufacturing facility for the production of autochthonous meat products.		
General and specific knowledge acquired in course (objective)	Improvement in area of technology, marketing, veterinary-sanitary inspection, standardization and protection of autochthonous meat products in harmony with consumers trends of European Union, and beginning a common agricultural policy of EU (CAP) and system of subsidies for agricultural production where farms and agricultural production are the foundation of agricultural policy. Better education about nutritional and protective characteristics of food and increased consumer purchasing power in the EU effects on demand of traditional and organic food products indicating that autochthonous meat products could become an important export brand, especially offered through tourism.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		2
(total)	30		30
Examination method	Oral and/or written exam; Continuous examination throughout semester – minimum 2 written exams		
Credits	5	**Language**	Croatian
Compulsory reading	1. Kovačević, D. (2001): Kemija i tehnologija mesa i ribe, PTF - Osijek, Osijek (sveučilišni udžbenik). 2. Dainty, R., Bloom, H. (1995): Flavour chemistry of fermented sausages. In Fermented Meats, G. Campbell-Platt and P.E. Cook (eds.), pp. 176-193. Blackie Academic & Professional, London. 3. Flores, M., Spanier, A.M., Toldra, F. (1998): Flavour analysis of dry-cured ham. In Flavor of Meat, Meat Products and Seafoods, pp. 320-341. F. Shahidi (ed.), Blackie Academic & Professional, London. 4. Toldra, F. (2007): Handbook of Fermented Meat and Polutry. Ames, Iowa: Blackwell Pub.		
Recommended reading	1. Kovačević, D. (2004): Sirovine prehrambene industrije (meso i riba), PTF-Osijek, Osijek (sveučilišni udžbenik). 2. Varnam, A. H., Sutherland, J. P. (1995): Meat and Meat Products. Technology, chemistry and microbiology, Chapman & Hall, London - Glasgow - Weinheim - New York-Tokyo - Melbourne - Madras. 3. Benčević, K., Petričević, A. (1999): Slavonski domaći kulen i kobasice. Mala škola povijesti i proizvodnje., Hrvatski farmer d.d., Zagreb.		

LEARNING OUTCOMES

No.	LEARNING OUTCOMES
1.	Describe trends in autochtonous meat production in Croatia and EU.
2.	List and describe problems in production and distribution of autochtonous meat products: technological, marketing and veterinary-helath issues.
3.	Define legislative and ways of protection of autochtonous meat products with various originality marks.
4.	Define microbiological, physico-chemical and sensory properties of autochtonous meat products.
5.	Define and describe production of various autochtonous products.
6.	Analyse aditives and preservatin methods used in autochtonous meat processing.

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	1.5	1-6	Lecture attendance	Attendance list	15	30
Labs	1.5	1-6	Active participation, experimental work, report preparation	Attendance list and report evaluation	15	30
Periodic knowledge check	2	1-6	Literature studying	Partial written exam 1 Partial written exam 2	20	40
Final exam*	2*	1-6	Literature studying*	Written exam*	20*	40*
TOTAL	**5**				**50**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Functional Foods and Supplements**		
Course code	88269	**Course status**	Elective
Study programme	Food Engineering		
Semester	II		
Course lecturer	Daniela Čačić Kenjerić, PhD, full prof.		
Course associates	Ines Banjari, PhD, full prof. Milica Cvijetić Stokanović, MSc		
Course content	Lectures and seminars: Defining functional foods, functional foods legislation (EU, US, Japan etc.), labelling Functional foods and health: functional health claims, markers; colonic functional foods, functional foods and coronary heart disease, functional foods anti-tumour properties, functional foods and acute infections Developing functional food products: maximising the functional benefits of plant foods (macronutrient and micronutrient enhancing), developing functional ingredients, functional fats and spreads, functional confectionery, probiotic and prebiotic functional foods, dietary fibre functional products The role and position of supplements in human health. To disseminate course content, the students according the favour, elect particular content, independently elaborate, present and discuss. Labs: The students have to practice preparation of scientific project proposal; Gain experience with using computers for literature searching; Determination of buffering capacity of functional foods. Determination of inhibitory effect of fermented functional foods by probiotic.		
General and specific knowledge acquired in course (objective)	The course is focusing on human well-being, the influence of functional components on metabolism, the cardiovascular system and intestinal physiology. In view of these facts, it is necessary to assess and evaluate the developments in food production in terms of their effect on the individual consumer and the society at large.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2	1	1
(total)	30	15	15
Examination method	During the semester the students will be included in course through discussion and making seminars (the result of this work will influence in the final mark), and the exam will be oral		
Credits	5	**Language**	Croatian, English
Compulsory reading	1. G.R. Gibson, M.W.Williams: *Functional foods*. CRC Press, Woodhead Publishing Limited, Boca Raton, Boston, New York, Washington, DC, 2000. 2. Lectures - written material will be prepared		
Recommended reading	1. R. Chadwick, S.Henson, B.Moseley, G.Koenen, M.Liakopoulos, C.Midden, A.Palou, G.Rechkemmer, D.Schröder, A.von Wright: *Functional Foods*. Springer, Berlin, 2003.		

LEARNING OUTCOMES

No	LEARNING OUTCOMES
1.	Describe role and application of dietary supplements
2.	List and explain selected dietary supplement and reasons for their use
3.	Define principles of development and marketing of functional foods
4.	Present the scientific evidence for use of functional fod in health promotion
5.	Present the posibilities of attenauting the functional properties of selected foods
6.	Follow the legislation regarding the functional foods and dietary supplements with special focus on dietary and health claims
7.	Apply gained knowledge in evalating the potential of food/food compound from the aspect of functionality

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	1	1-6	Attendance	Attendance list and active participation	6	10
Seminars	2	7	Individuald work on a selected topics	Attendance list, Evaluation of seminars	12	20
Laboratory practice	0.5	7	Laboratory practice – individual work	Results of the analysis	6	10
Continuous knowledge check	1	1-3	Literature studying	Partial written exam 1	9	15
Continuous knowledge check	1	4-6	Literature studying	Partial written exam 2	9	15
Written exam*	2*	1-6	Literature studying*	Written exam*	18*	30*
Final exam	0.5	7	Literature studying	Oral exam	18	30
TOTAL	**6**				**60**	**100**

*Activity performed only in case if minimum is not achieved throughout the semester on continuous knowledge check.

Course title	**Sensory Analysis**		
Course code	85361	**Course status**	Elective
Study programme	Food Engineering		
Semester	II		
Course lecturer	Ivana Flanjak, PhD, full prof. Antonija Perl Pirički, PhD, full prof.		
Course associates	Blanka Bilić Rajs, PhD, assist. prof.		
Course content	Lectures: Introduction to sensory analysis (definition, historical background and applications); Physiological and psychological factors of sensory analysis; Sensory attributes (taste, odor/aroma, appearance, texture and noise); The trigeminal senses and sensory interactions; Organization and operation of a sensory evaluation program (selection and training of panel member, performance monitoring and motivation, test room for sensory evaluation); Sensory evaluation in quality control; Test methods (analytical and testing of consumers); Difference tests; Descriptive analysis techniques; Sensory evaluation by scoring; Affective tests (the subjects-sampling and source of test subjects, choice of test location, qualitative and quantitative affective tests, preference tests, acceptance tests). Labs: Tests for selection and training of panel members. Application of selected discriminative and descriptive tests to food products. Scoring of selected food products. Statistical analysis and interpretation of results of sensory examinations.		
General and specific knowledge acquired in course (objective)	Over the course of lectures and lab work, students are introduced to physiological bases, sensory attributes and methodologies of sensory evaluation.		
Teaching method	**Lectures**	**Seminars**	**Labs**
(hrs/week)	2		3
(total)	30		45
Examination method	Oral. Prerequisites: completed laboratory classes and taken written colloquium. Written examination twice in semester.		
Credits	5	**Language**	Croatian
Compulsory reading	1. M.L. Mandić, Lj. Primorac, T. Klapec, A. Perl, D. Kenjerić: Senzorske analize. *Interna skripta*, Prehrambeno tehnološki fakultet u Osijeku, 2002.		
Recommended reading	1. M. Meilgaard, G.V. Civille, B.T. Carr: *Sensory Evaluation Techniques*. CRC Press, London, 1991. 2. H. Stone, J.L. Sidel: *Sensory Evaluation Practices*. Academic Press, London, 1993. 3. R.L. McBride, H.J. MacFie: *Psychological Basis of Sensory Evaluation*. Elsevier, London, 1990. 4. H.T. Lawless, H. Heymann: *Sensory Evaluation of Food, Principles and Practices*. Chapman & Hall, New York, 1998. 5. D.H. Lyon Ed.: *Guidelines for Sensory Analysis in Food Product Development and Quality Control*. Chapman & Hall, New York, 1992.		

LEARNING OUTCOMES

No	LEARNING OUTCOMES
1.	Explain physiology behind organoleptic perception
2.	Discuss parameters which influence sensory evaluation
3.	Describe tests for the selection and training od sensory panell members
4.	Explain principles and application of sensoric methods in various types of consumer testing
5.	Statisticaly analyse obtained results and interprete them
6.	To select and conduct apropriate sensory evaluation

CONSTRUCTIVE ALIGNMENT OF LEARNING OUTCOMES, TEACHING AND ASSESMENT METHODS

TEACHING METHOD	ECTS	LEARNING OUTCOME	STUDENT ACTIVITY	ASSESMENT METHOD	CREDITS	
					min	max
Lectures	1	1-6	Attendance and actice participation in disscussions	Attendance list and active participation	4	10
Labratory practice	1.5	3,5,6	Laboratory practice; reports	Attendance list and results of assignments	6	15
Continuous knowledge check	1	1-3	Literature studying	Witten exam	10	25
Continuous knowledge check	0.5	4-6	Literature studying	Writen evaluation - calculus	8	20
Exam	1	1-6	Literature studying	Oral exam	12	30
TOTAL	**5**				**40**	**100**