UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
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Nr._____din _____ **Formular USAMV 0702030110**

COURSE DESCRIPTION

1. General data

1.1. Higher Education Institution	University of Agricultural Sciences and Veterinary Medicine
1.2. Faculty	Faculty of Food Science and Technology
1.3. Department	Food Engineering
1.4. Study field	Food Engineering
1.5. Study level[1)]	Bachelor
1.6. Specialization/ Study Program	Food Control and Expertise
1.7. Teaching Form	FT

2. Course Characteristics

2.1. Name of the course	**Special biotechnologies 2**							
2.2. Course leader				Prof. PhD, Dan Cristian VODNAR				
2.3. Coordinator of the laboratory/seminar activity				Assistant Professor PhD, Lavinia Muresan				
2.4. Year of study	III	2.5. Semester	**6**	2.6. Type of Evaluation	Continously	2.7. Course regime	Content[2]	DS
							Level of compulsory[3]	DI

3. Total estimated time (hours/semester for the teaching activities)

3.1. Number of hours/week– frequency form	4	of which care: 3.2. course	2	3.3. seminar/ laboratory/ project	2
3.4.Total hours in the curricula	56	Of which: 3.5.course	28	3.6.seminar/laboratory	28
Distribution of time					h
3.4.1.Study based on handbook, notes, bibliography					10
3.4.2. Extra documentation in the library, on specific electronic platforms and on field					2
3.4.3. Prepare the seminars / laboratories / projects, theme, essays, reports, portofolio					3
3.4.4.Tutorial					2
3.4.5.Examination					2
3.4.6. Other activities					10
3.7. Total hours of individual study	19				
3.8. Total hours per semester	75				
3.9. Number of ECTS [4]	3				

4. Pre-conditions (where is the case)

4.1. of curriculum	Knowledge of general biotechnology, food chemistry, food biochemistry, general / special microbiology.
4.2. of competences	The student must have knowledge about the chemical reactions involved in fermentation processes, specific conditions for the cultivation of microorganisms.

5. Conditions (where is the case)

5.1. of course development	The course is interactive, students can ask questions about the content of the presentation. The university discipline requires the observance of the start and end time of the course. No other activities are tolerated during the lecture; mobile phones must be switched off.
5.2. of seminar/laboratory/project development	At the practical works it is mandatory to consult the practical guide, each student will carry out an individual activity with the laboratory materials provided and described in the Practical works guide. Academic discipline is required throughout the work.

6. Specific acquired competences

Proffesional competences	C1. Identify, describe and use appropriately the specific notions of food science and food safety. C2. Management of general engineering processes, operation of food industry facilities and equipment. C3. Supervision, management, analysis and design of food technologies from raw materials to the finished product. C4. Planning, organizing and coordinating agro-food marketing activities. C5. Design of new food products, implementation and project management. C6. Carrying out management and marketing activities on the agri-food chain.
Transversal competences	CT1. Applying strategies of perseverance, rigor, efficiency and responsibility at work, punctuality and taking responsibility for the results of personal activity, creativity, common sense, analytical and critical thinking, problem solving, etc., based on the principles, norms and values of the code of professional ethics in the food field. CT2. Applying interrelationship techniques within a team; amplifying and refining the empathic capacities of interpersonal communication and assuming specific attributions in carrying out the group activity in order to treat / resolve individual / group conflicts, as well as the optimal time management. CT3. Efficient use of various ways and techniques of learning - training for the acquisition of information from bibliographic and electronic databases, both in Romanian and in a language of international circulation, as well as assessing the need and usefulness of extrinsic and intrinsic motivations of continuing education .

7. Subject Objectives (as a result of the specific acquired competences)

7.1. Subject general objectives	To acquire particular knowledge about the current field of food biotechnologies applied to food.
7.2. Specific objectives	To understand the enzymatic processes. To be able to make bioactive packaging and smart labels with antimicrobial activity. To know the modern biotechnological systems so that they can make innovative products on the Romanian market

8. Content

8.1.COURSE **Number of hours – 28**	Methods of teaching	Observations
Biotechnologies for the production of polysaccharides used in food Introduction, Microbial polysaccharides used as food additives, Exopolysaccharides as sources of flavor components.	Lecture	1 lecture
Development of fermentation processes on solid substrate for food applications Importance of SSF, SSF for the production of enzymes, SSF for the production of amino acids, SSF for the production of edible mushrooms, SSF for the production of flavor compounds, vitamins, pigments.	Lecture	1 lecture
Carotenoid production by genetic recombination Carotenoids: Properties, Commercial aspects, E. coli as a carotenoid production system, Principles of carotenoid biosynthesis, Carotenoid production by E. coli.	Lecture	1 lecture
Production of pectinases and their uses in the food industry, Pectinase production (SSF, SF, SI), Pectinases produced by Aspergillus, Pectinase applications in the food industry	Lecture	2 lectures
Biotechnology of citric acid production, Microorganisms used for the production of citric acid, Biosynthesis of citric acid, Factors affecting the production of citric acid, Production of citric acid by free and immobilized microorganisms, Substrates used for the production of citric acid.	Lecture	1 lecture
Phenolic plant antimicrobials for the control of bacterial pathogens Antimicrobial phenolic compounds in plants, Lamiaceae potential as an antimicrobial phenolic source, Soy for H. Pylori control, Recent advances and other strategies for the production of phenolic compounds.	Lecture	1 lecture
Biosensors in food quality assessment General aspects of biosensors, Biosensors for the analysis of food compounds, Biosensors for the analysis of food contaminants, Commercial biosensors available for the analysis of food.	Lecture	1 lecture
Biotransformations with applicability in the food industry General notions, Fructose syrups obtained by biotechnological processes, Oligosaccharides, Food flavors.	Lecture	1 lecture
Anaerobic processes for the treatment of food industry residues. Treatment evaluation, Process monitoring and control, Process technologies (UASB process, Anaerobic fermentation processes), Applications (fermentation and industrialization of beverages, Dairy industry).	Lecture	1 lecture
Fermentative biotechnologies for traditional products Introduction, Fermented alcoholic products, Fermented foods and spices, Analogy traditional process vs. modern process.	Lecture	1 lecture
Modern biotechnologies used to improve the nutritional quality and viability of vegetables and fruits Introduction, Potatoes (sugar accumulation, starch metabolism in tubers, glycolysis, free radicals and		

antioxidant enzymes), Tomatoes (the role of the membrane for storage, lipoxygenase), Cell membrane metabolism and fruit perishability. **Biotechnologies for the production of amino acids and vitamins** Amino acids and protein foods, Protein hydrolysates used as flavorings and flavor enhancers, Vitamins obtained by fermentation. **Safety of biotechnologies for the food industry** Evaluation of food quality and safety, Biosafety, Ethics in biotechnologies.	Lecture Lecture	1 lecture 1 lecture

8.2. PRACTICAL WORK **Number of hours – 14**		
Immobilization of enzymes by microencapsulation.	Study of microcapsules	2 laboratory works
Determination of glucose, lactic acid, using biosensors.	Quantification of metabolites	2 laboratory works
Use of antimicrobial labels in reducing the microbial load of fruits.		2 laboratory works
Determination of the inhibitory activity of plant biomolecules in cell proliferation.	Making bio-packaging	1 laboratory paper
Bio-technological food production (jelly with probiotic microcapsules).	Study of antimicrobial activity	2 laboratory works
Fortification of foods with active substances obtained from biotechnological processes (juices).	Study of food formulation Study of fortified food formulation	2 laboratory works
The use of probiotic bacteria in the formulation of functional foods (development of probiotic drinks).	Study of the formulation of functional drinks	1 laboratory paper
Making molecular cocktails with the help of bio-polymers	Smart food design	2 laboratory works

Compulsory bibliography
1. Vodnar Dan Cristian. Notiuni de Biotehnologii Alimentare. AcademicPress, ClujNapoca, 2013.
2.Vodnar Dan Cristian. In vitro survivability of probiotic bacteria during exposure to gastrointestinal tract conditions. Academic Pres, ClujNapoca, Romania, 2014.
3.Vodnar Dan Cristian. Biotehnologii alimentare – Lucrări practice. AcademicPress, ClujNapoca, 2013.
4. Banu,C. (coordonator) – Biotehnologii în industria alimentară, Editura Tehnică, Bucureşti, 2000.
5. Banu, C. (coordonator) – Biotehnologii în industria alimentară, Editura Tehnică, Bucureşti, 2004.
6. Jurcoane, Ştefana (coordonator) – Tratat de biotehnologie, volumul I, Editura Tehnică, Bucureşti, 2004.
7.Jurcoane, Ştefana (coordonator) – Tratat de biotehnologie, volumul II, Editura Tehnică, Bucureşti, 2006.

Optional bibliography:
1. Mencinicopschi,Gh.,Kathrein,I.Teodoru,V. – Biotehnologii în prelucrarea produselor agroalimentare, Editura Ceres, Bucureşti, 1987.

9. Correlations between the subject against the expectations of the epistemic communitiy representatives, of the professional associations and employers' representatives in the domain

In order to identify ways to modernize and continuously improve the teaching and content of the courses, with the most current topics and practical problems, teachers consult the international literature.

10. Evaluation

Type of activity	10.1. Evaluation criteria	10.2. Evaluation methods	10.3. Percent of the final grade
10.4. Course	Knowledge of fermentation processes on solid substrate. Characterization of biotechnologies	Continously	70%

	for polysaccharide production. Aspects of carotenoid production by genetic recombination. Characterization of phenolic antimicrobials. Knowledge of biosensors. Aspect related to the anaerobic processes involved in the treatment of residues.		
10.5. Seminar/Laboratory	I know immobilization techniques. Formulates bioactive labels and packaging. Makes biotech food Determination of antimicrobial activity. Project.	Colloquim	20%
		Project	10%
10.6.Minimal standard of performance Mastery of scientific information transmitted through lectures and practical work at an acceptable level. Obtaining the pass mark for the ongoing checks is a condition of passability.			

[1] level of study – to be chosen one of the following – Bachelor /Post graduate/Doctoral
[2] Course regime (content)- for bachelor level it will be chosen one of the following - **DF** (fundamental subject), **DD** (subject in teh domain), **DS** (specific subject), **DC** (complementary subject).
[3] Course regime (compulsory level)- to be chosen one of the following – **DI** (compulsory subject) **DO** (Optional subject) **DFac** (Facultative subject).
[4] One ECTS is equivalent with 25-30 de hours of study (didactical and individual study).

Date of completition
09.09.2021

Course coordinator
Prof. PhD, Dan VODNAR

Leader of the laboratory/seminar
Assistant Professor PhD, Lavinia Muresan

Date of Department`s aproval
22.09.2021

Department manager
Assoc.Prof. Ramona SUHAROSCHI

Dean
Professor dr. Elena Mudura

Approved by the Faculty Council on
28.09.2021