Sveučilište u Zagrebu Agronomski fakultet
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Non-invasive methods of agricultural products processing (188843)

Nositelj kolegija

izv. prof. dr. sc. Jana Šic Žlabur

Opis kolegija

Module Non-invasive methods of agricultural products processing would be based on introducing students with the methods of processing by applying thermal and non-thermal treatments which do not damage the raw material. The focus of lectures is placed on the application of microwaves and infrared radiation in the processing of agricultural products, the application of coherent light (laser), the application of ultrasound techniques and active and intelligent (smart) packaging application. The objective of the course is to deepen knowledge on non-invasive methods of processing the agricultural products, with an emphasis on the preserving the nutritional quality of mentioned products with maintaining the durability of the final product.

ECTS: **4.00**

E-učenje: **R1**

Sati nastave: 60
Predavanja: 44
Seminar: 16

Izvođač predavanja

- izv. prof. dr. sc. Jana Šic Žlabur

Izvođač vježbi

- izv. prof. dr. sc. Ante Galić

Ocjenjivanje

Dovoljan (2): 60 %
Dobar (3): 70 %
Vrlo dobar (4): 80 %
Izvrstan (5): 90 %

Vrsta kolegija

- Undergraduate studies / BS Courses taught in English (Izborni kolegij, 2. semestar, 1. godina)

Opće kompetencije

The course qualifies for controling the processes of agricultural products processing using non-invasive methods. Students gain the necessary theoretical and practical knowledge about non-invasive methods of agricultural products processing as a basis for understanding and application in the processing of products on family farms.

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Oblici nastave

- Lectures
- Seminars
  Seminar work- skills acquiring - group of 2 students independently prepare and present a lecture related to the certain non-invasive method and their principle of processing and preservation of agricultural products.

Ishodi učenja i način provjere

Ishod učenja	Način provjere
To describe and explain the main characteristics of non-invasive methods in the processing of the agricultural products	Participating in the discussions, assignments during class - seminar assay, written exam, oral exam
To evaluate the importance of the application of non-invasive methods for the purpose of preserving the nutritional quality of the final product	Participating in the discussions, assignments during class - seminar assay, written exam, oral exam
List a main characteristics of the agricultural products treated with non-invasive methods	Participating in the discussions, assignments during class - seminar assay, written exam, oral exam
To identify the possibilities of choosing the optimal non-invasive methods for specific agricultural product	Participating in the discussions, assignments during class - seminar assay, written exam, oral exam
To compare and map the conventional technologies of the processing the agricultural products with the non-invasive methods	Participating in the discussions - seminar assay
Individually present acquired knowledge through seminar	Seminar assay

Način rada

Obveze nastavnika

All teaching materials are organized according to weekly class schedule and available on the „Merlin“ system; schedule of the important events for the lectures; notifications related to the course; lectures and evaluation of student colloquium, written exams, conducting oral exams. Lecturer teaches the knowledge defined by curriculum, checks lessons learned and evaluate the acquired knowledge and skills acquired through seminars, laboratory exercises, written and oral exam.

Obveze studenta

Attending lectures, laboratory exercises and seminars are required. Students must participate in learning in the course through the system for e-learning. Students during the first two weeks of classes should log into the system of e-learning „Merlin“ within which can use the presentation of lectures, announcements and other materials. Conditions for exam participation are regularly attending of lectures and laboratory exercises, seminar work. The student is required to attend to all forms of teaching: lectures, laboratory exercises, seminar assay according to the Regulation of the Faculty of Agriculture. Conditions for the the exam participation ate regularly attending of lectures and laboratory exercises, seminars, and regularly solve all tasks from the lectures and laboratory exercises.

Polaganje ispita

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Elementi praćenja	Maksimalno bodova ili udio u ocjeni	Bodovna skala ocjena	Ocjena	Broj sati izravne nastave	Ukupni broj sati rada prosječnog studenta	ECTS bodovi
Active participation in class	10%				20	1
Seminar (S) Preparation+ presentation	10%			16	40	1
Partial exam 1 (PE1)	35%	60-70 % 71-80 % 81-90 % 91-100 %	Dovoljan (2) Dobar (3) Vrlo dobar (4) Izvrstan (5)		30	1
Partial exam 2 (PE2)	35%	60-70 % 71-80 % 81-90 % 91-100 %	Dovoljan (2) Dobar (3) Vrlo dobar (4) Izvrstan (5)		30	1
Oral exam (OE)	10%	60-70 % 71-80 % 81-90 % 91-100 %	Dovoljan (2) Dobar (3) Vrlo dobar (4) Izvrstan (5)		20	1
Attendance of lectures + laboratory exercises				44	44	1

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Elementi praćenja	Opis	Rok	Nadoknada
Active participation in class	Active participation in teaching correct to higher grade		
Seminar (S) Preparation+ presentation	The structure and content of the written work 50 % Quality of presentation 50 %		
Active participation in class	Students are encouraged to participate in discussions, presentation of ideas and problem solutions, argument opinions and attitudes. Follow the theoretical and factual knowledge, presentation and communication skills, critical opinion, teamwork and social responsibility. Follow the capability of performing laboratory exercises. The observed activity of students in class is recorded in the student records (+), which enables the correction of the final grade upward (++) or benefit on the oral exam (+++).	Continuous during class	Possible through independent assignment (1 ECTS)
Seminar work (S) (preparation+presentation)	Seminar is conceived as the teamwork, group consists of 2-3 students. The written work is submitted for review at least a week before presentation. The corrected work must be submitted at the presentation. Presentations of seminar works beginning in the 9th week of the semester according to the agreed schedule. All the members of the working group present seminars and evaluated are the ability of teamwork, presentation skills, analytical skills and the concluding ability (synthesis).	1st week 9th week 10th week 11th week 12th week	Possible through independent assignment (1 ECTS)
Partial exam 1 (PE1)	Includes the first part of the module program: the theory of non-invasive methods in the processing of agricultural products, non-invasive methods in the processing of agricultural products by applying the thermal processes, the application of non-thermal processes, the use of microwaves and infrared radiation in the processing of agricultural products, the application of coherent light (laser) as a non-invasive method for processing of agricultural products (Voća, Dobričević, Pliestić). Questions from the theoretical part are open and examine the knowledge and understanding of the facts. Transcription is prohibited.	7th week	

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Elementi praćenja	Opis	Rok	Nadoknada
Partial exam 2 (PE2)	Includes the second part of the module program: the theory of application of the ultrasound techniques as a non-invasive method of agricultural products processing, active and intelligent (smart) packaging. Natural preservatives, non-invasive methods in practice, non-thermal pasteurization of fruit and vegetable juices by applying a pulsed electric field (Voća and Dobričević). Questions from the theoretical part are open and examine the knowledge and understanding of the facts. Transcription is prohibited.	15th week	
Compensation in the module (independent task)	If the student does not achieve the required 3 ECTS credits as a precondition for going to the oral exam, one point can be compensated by an additional independent task, such as: translation of professional texts, and presentation the scientific article or book chapter, project idea etc.	During the exam period, before the oral examination	
Oral exam (OE)	The oral exam consists of three, possibly two questions (+++), depending on the student's previous activities. Testing the acquisition of theory and facts, analytical skills, critical thinking, creativity and social responsibility.	Examination periods. The logs are in the system ISVU	

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Tjedni plan nastave

1. In the introductory lecture, students will learn about non-invasive methods of processing the agricultural products by applying thermal and non-thermal treatments.
2. Defining the methods and basic principles of the thermal processes during the use of non-invasive methods of the processing the agricultural products. Classification, basic characteristics and specificities of the thermal non-invasive methods.
3. Defining the methods and basic principles of the non-thermal processes during the use of non-invasive methods of the processing the agricultural products. Classification, basic characteristics and specificities of the non-thermal non-invasive methods.
4. The students will be acquainted with the technologies of microvawe and infrared radiation application in the processing of agricultural products through defining the basic terms and methods description
5. Students will be acquainted with technology of application the coherent light in the processing of agricultural products by defining the basic terms and characteristics of the mentioned method.
6. Students will be acquainted with the ultrasonic technology in the processing of the agricultural products by defining the basic terms and characteristics of the mentioned method.
7. Defining the basic terms, principles and possible application to on the particular agricultural products.
8. The types of natural preservatives, the mechanism of action and application in agricultural products.
9. The changes of nutritional characteristics of agricultural products processed by non-invasive methods. The basic technological operations in the preparation of agricultural products for processing.
10. Defining the characteristics of technique, application and specifics of mentioned method. Possibilities of application the pulsed electric field (PEP) in the production of fruit and vegetable juices.
11. -
12. -
13. -
14. -
15. -

Obvezna literatura

1. Ohlsson, T., Bengtsson, N. (2002): Minimal Processing Technologies in the Food Industry. Woodhead Published Limited, CRC Press, UK.
2. Hui, Y.H., Barta, J., Pilar Cano, M., Gusek, T., Sidhu, S.T., Sinha, N. (2006): Handbook of fruits and fruit products. Blackwell Publishing, Iowa, USA.
3. Jeličić , I. Božanić, R., Tratnik, Lj., Lisak, K. (2010): Mogućnosti primjene netradicionalnih postupaka procesiranja u mljekarskoj industriji. Mljekarstvo, 60 (2): 113-126.
4. Brnčić, M.,Tripalo, B., Penava, A., Karlović, D., Ježek, D., Vikić Topić, D., Karlović, S.,BosiljKov, T. (2009). Applications of Power Ultrasound for Foodstuffs Processing. Croatian Journal of Food Technology, Biotechnology and Nutrition 1-2, 32-37.
5. Belkin, M., Schwarz, M., (1989): New biological phenomena associated with laser radiation. Health Physics 56: 687-690.
6. Lugomer, S., Stipančić, M. (1997): Laser-fizikalne osnove, konstrukcija i primjene, IGKRO Svjetlost, Sarajevo.

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Preporučena literatura

1. Liu, J., Li, J. Tang, J. (2010): Ultrasonically assisted extraction of total carbohydrates from Stevia rebaudiana Bertoni and identification of extracts. Food and Bioproducts Processing, 88: 215-221.
2. Jović, F., Pliestić, S., Kolak, I., Jagnjić, Ž., Blažević, D. (2004). Estimation of the laser beam scattering in food grain preprocessing. In: Proceedings of M4PL17, Igls/Innsbruck.
3. Nenadić, K., Jović, F., Pliestić, S. (2008). An Investigation of Automatic Treatment of Seeds With Low Power Laser Beam. Automatics, vol 49 (3-4), pp. 127-134.

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