UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
Calea Mănăştur 3-5, 400372, Cluj-Napoca
Tel: 0264-596.384, Fax: 0264-593.792
www.usamvcluj.ro

No._____of _____ **USAMV form 0703010103**

SUBJECT OUTLINE

1. Information on the programme

1.1. Higher education institution	University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca
1.2. Faculty	Food Science and Technology
1.3. Department	Food Science
1.4. Field of study	Food Engineering
1.5.Education level	Bachelor
1.6.Specialization/ Study programme	Food Engineering
1.7. Form of education	Full time

2. Information on the discipline

2.1. Name of the discipline	Physics							
2.2. Course coordinator				Assoc. Prof. Coman Cristina				
2.3. Seminar/ laboratory/ project coordinator				Assoc. Prof. Coman Cristina				
2.4. Year of study	I	2.5. Semester	**I**	2.6. Type of evaluation	continuous	2.7. Discipline status	Content[2]	FD
							Compulsoriness [3]	CD

3. Total estimated time (teaching hours per semester)

3.1. Hours per week – full time programme	4	out of which: 3.2. lecture	2	3.3. seminar/ laboratory/ project	2
3.4.Total number of hours in the curriculum	56	Out of which: 3.5.lecture	28	3.6.seminar/laboratory	28
Distribution of the time allotted					hours
3.4.1. Study based on book, textbook, bibliography and notes					25
3.4.2. Additional documentation in the library, specialized electronic platforms and field					15
3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays					15
3.4.4.Tutorials					4
3.4.5.Examinations					10
3.4.6. Other activities					
3.7. Total hours of individual study	69				
3.8. Total hours per semester	125				
3.9. Number of credits[4]	5				

4. Prerequisites (is applicable)

4.1. curriculum-related	General knowledge of physics, chemistry-physics, algebra, according to high school curricula
4.2. skills-related	The student must have basic knowledge of physics, algebra, chemistry-physics in high school

5. Conditions (if applicable)

5.1. for the lecture	Academic discipline requires compliance with the start and end of the course. We do not allow any other activities during the lecture, mobile phones will be turned off. The course is interactive, students can ask questions regarding the content of lecture Classroom equipped with blackboard, video projector, computer, projection screen In the case of online teaching activities, the teaching methods will be adapted
5.2. for the seminar/ laboratory/ project	Academic discipline is imposed throughout the course of practical works. Compliance with the start and end time of the laboratory During practical works, each student will develop an individual activity with laboratory materials (made available in the book that describes the laboratory work) Wearing protective equipment Laboratory equipped with blackboard, reagents and glassware, equipment and apparatus specific to the topic In the case of online teaching activities, the teaching methods will be adapted

6. Specific competences acquired

Professional competences	C1.1. Description and use of basic concepts, theories and methods in food science (defined in multidisciplinary terms), related to the structure, properties and transformations of food components and contaminants during the agri-food chain. C1.2. Explanation and interpretation of concepts, processes, models and methods in food science, using basic knowledge of the composition, structure, properties and transformations of food components and their interaction with other systems throughout the agri-food chain. C1.3. Application of basic principles and methods in food science to solve engineering and technological problems, including those related to food safety. C1.4. Evaluation of qualitative and quantitative characteristics, performance and limits of processes specific to the agri-food chain C2.1. Description and use of basic concepts, theories and methods in the field of processes and operation of agri-food chain installations
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 ethics professional in the food field.

7. Course objectives (based on the list of competences acquired)

7.1. Overall course objective	Acquisition of knowledge about physical quantities and physical properties with an impact on food engineering.
7.2. Specific objectives	Knowledge and understanding of the relationship between physical properties and quality parameters (texture, structure, appearance) and stability (water activity) of food and food products. Acquisition and quantitative knowledge of some physical notions of interest for food engineering (conductivity, pressure, viscosity, density, heat, energy, etc.).

8. Content

8.1.LECTURE **Number of hours – 28**	Teaching methods	Notes
1. Introduction. The importance of physics in the food industry. Highlight the connections between the characteristics that define the quality (eg texture, structure and appearance) and stability (eg water activity) of foods and their physical properties.		1 lecture (2 ore)

2. The international system of units of measurement. Physical properties essential for the food industry, for the prediction of the behavior of raw materials and food products in processing, distribution and storage (shape, size, mass, volume, density, viscosity, pressure, etc.). Dependence of physical properties on different parameters.	Lecture Brainstorming, conversation Calculation applications	3 lectures (6 hours)
3. Water activity and its importance in food.		1 lecture (2 hours)
4. Optical properties of foods and applications.		2 lectures (4 hours)
5. Thermal properties of food and applications.		2 lectures (4 hours)
6. Electrical properties of food and applications.		2 lectures (4 hours)
7. Mechanical properties of food and applications.		1 lecture (2 hours)
8. Diffusion and permeability. Applications in the food industry.		1 lecture (2 hours)
9. Osmotic pressure and applications in the food industry.		1 lecture (2 hours)

8.2. PRACTICAL WORK **Number of hours – 28**		
1. Labor protection. Calculation applications of different physical quantities relevant to the food industry (mass, density, energy, water content, etc.)	Seminar	1 lab work (2 hours)
2. Measurements for estimating force, mechanical work, power.	Practical work Teamwork Conversation / Explanation	1 lab work (2 hours)
3. Determination of liquid density.	Practical work Demonstration / Explanation	1 lab work (2 hours)
4. Determination of the energy content of peanuts.	Practical work Teamwork Conversation / Explanation	1 lab work (2 hours)
5. Viscosity of liquids. Changes in viscosity with temperature and molecular structure of liquids.	Practical work Teamwork Conversation / Explanation	1 lab work (2 hours)
6. Optical properties. Measurement of the refractive index. Applications in the food industry.	Practical work Demonstration	1 lab work (2 hours)
7. Optical properties of food. Example by using UV-Vis spectroscopy.	Practical work Demonstration / Explanation	1 lab work (2 hours)
8. Thermal energy transfer. Study of the transfer of thermal energy from containers made of different types of materials.	Practical work Teamwork Conversation / Explanation	1 lab work (2 hours)
9. Conductivity measurement. Applications in the food industry and factors influencing conductivity	Practical work Demonstration	1 lab work (2 hours)
10. Irradiation of food.	Practical work Demonstration	1 lab work (2 hours)
11. Food processing. Activity on the principles of microwave heating.	Practical work Demonstration Explanation/Conversation	1 lab work (2 hours)
12. Exemplifying diffusion and permeability by creating intelligent packaging.	Practical work Explanation/Demonstration	1 lab work (2 hours)
13. Calculation applications for expressing a physical quantity in different units (e.g. calculating the sugar content of fruit juices)	Practical work Demonstration	1 lab work (2 hours)
14. Coloquium.	Knowledge verification	1 lab work (2 hours)
Compulsory bibliography: *Andronie Luiza, Biofizică:manual didactic, Ed. Academic Pres, Cluj-Napoca, 2020.*		

Ludger O. Figura, Arthur O. Teixeira, Food Physics – Physical Properties – Measurement and Applications, Springer, Berlin, 2007.
Optional bibliography: *Michael L. Tunick, Charles O. Onwulata, Physical Methods in Food Analysis, Oxford University Press, Washington, 2013.*

9. Corroborating the course content with the expectations of the epistemic community representatives, of the professional associations and of the relevant stakeholders in the corresponding field

The content of the discipline is in accordance with the requirements of specific national professional associations. In order to identify ways to modernize and continuously improve the teaching and content of courses with the latest topics and practical issues, teachers participate in various conferences / seminars / courses / summer schools / workshops / round tables, where they meet with specialists from the private food industry and with teachers from other higher education institutions in the country. The meetings aim to identify the needs and expectations of employers in the field and coordinate with other similar programs within other higher education institutions.

10. Assessment

Type of activity	10.1. Assessment criteria	10.2. Assessment methods	10.3. Percentage of the final grade
10.4. Lecture	Level of mastering and understanding the issues addressed. Consistency and correctness of answers. Solving calculus applications and establishing connections between different physical quantities.	Written exam	75%
10.5. Seminar/Laboratory	Theoretical and practical knowledge of the physical parameters and methods of analysis used during laboratory activities.	Continuous evaluation and colloquium at the end of the semester	25%
10.6. Minimum performance standards			
Attendance of practical activities. Passing grade at the laboratory colloquium. Knowledge of the fundamental physical properties for food engineering at an acceptable level. Based on given relationships, establishing the dependence between different physical parameters.			

[1] Education levels- choose of the three options: Bachelor/ * Master/Ph.D.

[2] Discipline status (content)- for the undergraduate level, choose one of the options:- **FD** (fundamental discipline), **BD** (basic discipline), **CS** (specific disciplines-clinical sciences), **AP** (specific disciplines-animal production), **FH** (specific disciplines-food hygiene), **UO** (disciplines based on the university's options).

[3/] Discipline status (compulsoriness)- choose one of the options – **CD** (compulsory discipline) **OD** (optional discipline) **ED** (elective discipline).

[4] One credit is equivalent to 25-30 hours of study (teaching activities and individual study).

[5 / *] Disciplines: AK- Advanced knowledge, CT- Complementary Training, S- Synthesis

Filled in on
08.09.2021

Course coordinator

Laboratory work/seminar coordinator

Subject coordinator

Approved by the
Department on
22.09.2021

Head of the Department
Prof. Dr. Ramona SUHAROSCHI, PhD

Approved by the Faculty
Council on
28.09.2021

Dean
Prof. Dr. Elena Mudura, PhD