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 –CN-0701020113**

SUBJECTIVE OUTLINE

1. Information on the programme

1.1 Higher education institution	University of Agricultural Sciences and Veterinary Medicine 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	Technology of agricultural products processing
1.7. Form of education	Full time

2. Discipline data

2.1. Name of the discipline	REFRIGERATION AND AIR CONDITIONING INSTALLATIONS							
2.2. **Course coordonator**				Lect. PhD. eng. Adriana – Paula DAVID				
2.3. **Seminar/laboratory/project leader**				Lect. PhD. eng. Adriana – Paula DAVID				
2.4. Year of study	**II**	**2.5. Semester**	**IV**	**2.6. Evoluation type**	**continuos**	**2.7. Discipline status**	**Content[2]**	DD
							Compulsoriness	DI

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 books, textbooks, bibliography and notes					9
3.4.2. Additional documentation in the library, electronic platforms and field experiences					5
3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays					8
3.4.4. Tutorials					4
3.4.5. Examinations					8
3.4.6. Other activities					
3.7. Total hours of individual study	34				
3.8. Total hours per semester	90				
3.9. Number of credits[4]	3				

4. Preconditions (where applicable)

4.1. curriculum-related	Knowledge of Mathematics, Biophysics, Microbiology and Chemistry
4.2. skills-related	Understanding physical phenomena and reading diagrams

5. Conditions (if applicable)

5.1. **for the course**	Classroom equipped with projection system; internet connection The course is interactive, being supported with the help of the video projector through ppt and video presentations. 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 to be turned off.

5.2. **for the seminar/ laboratory/ project**	Laboratory equipment: refrigeration room and freezing room, models At the practical works it is obligatory to consult the guide of practical works / documentation sheets, each student will carry out an individual activity with the laboratory materials made available and will write his project taking into account the specificity of the discipline. Academic discipline is required for the entire duration of the works of refrigeration installations, sectioned compressors, pressure switches, thermometers, thermohygrometers

In the case of online teaching, the teaching methods are adapted to the conditions and online platforms used

6. Cumulated specific competences

Professional competences	C1.1. Describe and use basic concepts, theories and methods from the use of cold in the food industry C1.2. Apply the basic principles and methods of refrigeration technology, refrigeration and air conditioning to solve engineering and technological problems, including those related to food traceability and safety C1.3. To apply the principles and methods of conservation with the help of the cold for solving the technological problems that appear in the agri-food chain
Transversal competences	CT2 Applying interrelationship techniques within a team; amplifying and refining the empathic capacities of interpersonal communication and of assuming specific attributions in carrying out the group activity in order to treat / resolve individual / group conflicts, as well as the optimal time management.

7. Discipline objectives (based on the cumulated specific competences)

7.1. **General objective**	To acquire knowledge regarding the technical systems and methods of thermal heat treatment of food products.
7.2. **Specific objectives**	Knowledge of the general notions regarding the principles underlying the production of artificial cold, basic principles in the operation of refrigeration installations, cold preservation methods and influences of the use of cold in technology and food storage. Study of the effects of cold use on food quality and biochemical and microbiological activity.

8. Content

8.1. LECTURE	**Teaching method**	**Observation**
Elements of thermodynamics	lecture;	1 lecture
General considerations regarding refrigeration installations	explication;	
Refrigeration work agencies		1 lecture
Processes in refrigeration installations		
A. Theoretical bases of the use of cold in the food industry	problem solving;	1 lecture
Food refrigeration		1 lecture
Freezing food		1 lecture
Lyophilization of food	case study;	
Air conditioning and weight loss when stored in the cold		1 lecture
B. Use of cold in the meat and meat products industry		
Use of cold in the poultry industry	conversation	1 lecture
Use of cold in the case of fish and fish products		
Use of cold in the dairy and dairy industry		1 lecture
Use of cold in the case of eggs		
Use of cold in the case of fruits and vegetables		1 lecture
Use of cold in the case of cereals		
Use of cold in the case of bakery and pastry products		1 lecture
Use of cold in the fermentation beverage industry		
Use of cold in other foods		1 lecture
Refrigerator chain		1 lecture

8.2. PRACTICAL WORK **Namber of hours – 14** Technical norms of work safety and PSI International System of Units (SI) Constructive-functional study of refrigeration installations Constructive-functional study of freezing installations Study of the impact of heat treatment on the quality of some products - case study	Study constructive functional Case Study	1 laboratory work 2 laboratory work 2 laboratory work 2 laboratory work
8.3. Project **No. of hours 14** Establishing project themes and project structure. Study the specific bibliography of the project theme and establish the way of packaging and preliminary processing of the product from the project theme. Identifying the influence of ambient temperature on storage time and chosen storage method. Cold storage parameters calculation Calculation of the power required for the cold instalation Project presentation	Case Study Exemplificare Problematizare	1 lucrare 2 lucrari 1 lucrare 1 lucrare 1 lucrare 1 lucrare

Compulsory bibliography:

1. NAGHIU, AL. (2016) *Tehnica frigului şi climatizare în industria alimentară*, Editura Risoprint, Cluj-Napoca
2. NAGHIU, AL., APOSTU, S. (2011) *Tehnica frigului şi climatizare în industria alimentară*, Editura Risoprint, Cluj-Napoca
3. APOSTU S., BÂRZOI, D. (2002) *Microbiologia produselor alimentare*, Editura Risoprint, Cluj-Napoca
4. ENESCU, G. (1985) *Fizica pentru tehnicieni*, Vol II, Editura tehnică, Bucureşti

Optional bibliography:

1. APOSTU, S., NAGHIU, AL. (2008) *Analiza senzorială*, Editura Risoprint, Cluj-Napoca
2. BANU, C. şi colab. (1992) *Progrese tehnice, tehnologice şi ştiinţifice în industria alimentară*, Editura Tehnică, Bucureşti
3. BARRET, M. (1989) *La modélisation thermodynamique des fluides frigorigènes*, Revue Générale du Froid 12, pg. 690-695
4. BĂLAN, M., Pleșa Angela (2010) *Instalaţii frigorifice. Construcţie, funcţionare şi calcul*, Cluj-Napoca
5. FEIDT, M. (1987) *Thermodinamique et optimisation énergétique des systèmes et procédés*, Technique et Documentation Lavoisier, Paris
6. FENNEMA, O., KAREL, M., LUND, D. (1975) *Principles of Food Science, part 2: Physical Principles of Food Preservation*, Marcel Dekker Inc., New York, Basel
7. DESROSIER N, TRESSLER D. (1977) *Fundamentals of Food Freezing*, Avý Publishing Co. Inc, Westport, Connecticut
8. GEESON, J.D. (1989) *Cooling and Storage of Fruits and Vegetables*, Institute of Refrigeration, pg. 65-73.
9. HELDMAN, D.B., LUND, D.B. (1992) *Handbook of Food Engineering*, Marcel Decker
10. * * * (1998) *Refrigeration*, ASHRAE Handbook, Atlanta
11. APOSTU, S. (2004) *Managementul calităţii*, Editura Risoprint, Cluj-Napoca

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

• Knowledge by students of all important aspects presented in the practical works, project and course;
• Mastering good craftsmanship and fully understanding the importance of knowing this discipline,
• Achieving the teaching objective with interdisciplinary implications, ie understanding and placing the Refrigeration and Air Conditioning Installations and other related disciplines in the practical aspects of the chosen profession,
• Involvement of students in the activity and discussions as numerous as possible on the theoretical and pre-practical aspects presented

10. Evaluation

Type of activity	**10.1.** Assessment criteria	**10.2.** Assessment methods	10.3. Percentage of the final grade
10.4. Lecture	Logical, correct and coherent application	Written exam (Evaluation of the answers given to the subjects on	

	of the acquired notions	the exam ticket)	70%
10.5. Seminar/Laboratory	Ability to perform analyzes and interpret the results obtained.	Final oral colloquium/ project (Test of practical evaluation of the acquired professional competences or projects)	30%
10.6. Minimum performance standard			
•Description of a specific process, including the argumentation of the methods, techniques, procedures and apparatus or equipment and installations used. • Elaboration of a team solution for the elimination of risk factors in a microbiological process			

[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 the 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), cu modificarile corespunzatoare si in text (abrevieri)

Course coordinator
Lect. PhD. eng. Adriana-Paula DAVID

Laboratory work/seminar coordinator
Lect. PhD. eng. Adriana-Paula DAVID

Filled in on
08.09.2020

Subject coordinator

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Approved by the
Department on
22.09.2020

Head of the Department
Prof. PhD. Ramona SUHAROSCHI

Approved by the Faculty
Council on
28.092020

Dean
Prof. PhD. Elena MUDURA