UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
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No._____of _____ **USAMV form 0702030114**

SUBJECT 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 Engineering**
1.4. Field of study	**Food Engineering**
1.5.Cycle of study[1]	**Bachelor**
1.6.Specialization/ Study programme	**Control and expertise of food products**
1.7. Form of education	**Full time**

2. Information on the discipline

2.1. Name of the discipline	**General technologies of plant products 3**							
2.2. Course coordinator	**Vlad Mureșan, PhD, habil., Associate Professor**							
2.3. Seminar/ laboratory/ project coordinator	**Georgiana Smaranda Marțiș, PhD, Assistant Professor**							
2.4. Year of study	**III**	2.5. Semester	**VI**	2.6. Type of evaluation	summative	2.7. Discipline status	Content[2]	DD
							Compulsoriness[3]	DI

3. Total estimated time (teaching hours per semester)

3.1. Hours per week – full time programme	2	out of which: 3.2. lecture	1	3.3. seminar/ laboratory/ project	1
3.4.Total number of hours in the curriculum	28	Out of which: 3.5.lecture	14	3.6.seminar/laboratory	14
Distribution of the time allotted					hours
3.4.1. Study based on book, textbook, bibliography and notes					8
3.4.2. Additional documentation in the library, specialized electronic platforms and field					4
3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays					5
3.4.4.Tutorials					2
3.4.5.Examinations					3
3.4.6. Other activities					
3.7. Total hours of individual study	22				
3.8. Total hours per semester	50				
3.9. Number of credits[4]	2				

4. Prerequisites (if applicable)

4.1. curriculum-related	Food chemistry; Food biochemistry; Transfer Phenomena; Biophysics
4.2. skills-related	The student must know the physical and chemical properties of carbohydrates. It should also be able to identify, describe and use specific science concepts adequate for food.

5. Conditions (if applicable)

5.1. for the lecture	Room with projector and internet connection. The course is interactive; students can ask questions regarding the content of the statement. Academic discipline requires compliance of starting time and end of the course. There are not allowed any other activities during the lecture, mobile phones to be closed.

5.2. for the seminar/ laboratory/ project	For practical works each student will carry out an application / technological computation / chemical analysis specific to Sugar technology. Academic discipline is imposed for the duration of works. Specially designed laboratory (equipped with specific glassware, oven, balance, refractometer, polarimeter); Confectionery Pilot Plant.

6. Specific competences acquired

Professional competences	C3.2. Explaining and interpreting the principles and methods used in technological processes in the food chain. C2.3. Application of basic engineering principles and methods for solving technological problems in the agri-food chain
Transversal competences	CT1 Apply strategies perseverance, accuracy, efficiency and accountability in work, punctuality and personal accountability for its performance, creativity, good sense, analytical and critical thinking, problem solving, etc., based on principles, norms and values code of ethics training in food;

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

7.1. Overall course objective	To acquire the knowledge concerning the raw materials, production technologies, equipment and facilities involved in sugar and starch production
7.2. Specific objectives	Knowledge of quality indicators of raw materials and finished products (sugar); Interpretation of analytical results of raw materials, intermediate and finished products from the sugar industry, starch and confectionery.

8. Content

8.1.LECTURE **Number of hours – 14**	Teaching methods	
Ch. I Chemical composition and properties of sucrose. The general scheme of sugar production. 1.1. Generalities. 1.2. Properties of sucrose. 1.3. The general scheme of operations. **Ch. II Raw materials used on sugar manufacturing.** 2.1. Sugarcane. 2.2. Sugar beet. Chemical composition. Harvesting, transport and storage.	Lecture, explanation, conversation, debate	1 Lectures 1 Lectures
Ch. III Preparing the sugar beet for processing. 3.1. Beet discharging. Manual, mechanical, hydraulically. Beet temporary storage. Beet channels. Dosing and washing. Stones and trash removal. 3.2. Beet washing. Aim. Washing machines. Beet chlorination. 3.3. Transport and washing waters. Water recirculation. Decanters. 3.4. Lifting the beet to the cutting machines. Beet elevator. Beet scales.	Lecture, explanation, conversation, debate	1 Lectures

Ch. IV Obtaining the cossettes. 4.1. Aim. Beet slicing. 4.2. Cossettes quality. **Ch. V Extracting sugar from beet - diffusion** 5.1. Diffusion. Generalities. Theoretical consideration. 5.2. Diffusion Equipment. Diffusion batteries. Continuous diffusion equipment. 5.3 Products and control of the diffusion operation. Diffusion juice. Pulp. Wash waters. Dry matter content, sugar content, diffusion juice acidity, pulp, diffusion water.	Lecture, explanation, conversation, debate	1 Lectures
Ch. VI Diffusion juice purification. 6.1. Juice composition and the need of purification. Methods for purification. Preliming. Mainliming. First carbonation and second carbonation. Ion-exchange softening. Thin juice sulphitation. Juice Filtering. Purification schemes. **Ch. VII Thin juice evaporation.** 7.1. Generalities. The aim of the evaporation. Evaporation apparatus. 7.2. Multiple effect evaporation. Principles. Circumstances for heat transmission. Calculation of evaporation station. 7.3. Transformations occurring in juice during evaporation.	Lecture, explanation, conversation, debate	2 Lectures
Ch. VIII Boiling and crystallization. 8.1. The purpose of boiling and crystallization. 8.2. Sucrose crystallization. The formation and growth rate of sugar crystals. Influence factors. Crystallization scheme. 8.3. Boiling devices and their fittings. Vertical and horizontal continuous boiling devices. Fittings. 8.4. Centrifugation of thick mass. White crystal sugar obtaining. 8.5. Drying, sieving, weighing and storage of sugar. 8.6. Boiling and crystallization of the final product. Sugar purification. Work Schemes..	Lecture, explanation, conversation, debate	1 Lectures
Ch. IX Obtaining milk of lime , CO_2 and SO_2 10.1. Obtaining milk of lime and CO_2. 10.2. Obtaining SO_2. **Ch. X By - Products and their preparation** 11.1. Pulp. Use, pressing, drying. 11.2. Molasses. Chemical composition. Loss of sugar in molasses. Theory of molasses formation and use of molasses.	Lecture, explanation, conversation, debate	1 Lectures

8.2. PRACTICAL WORK **Number of hours – 14**		
Practical work. 1 1.1 Process, flux, operations and technological schemes - Definitions 1.2 General flow for production of sugar beet 1.3 Scope of technological operations of sugar industry 1.4 Technologic manufacturing flow diagram for sugar industry	Debate, questioning, explanation	2 Practical works

Practical work. 2 2.1 Quality control scheme used in the sugar industry		
Practical work. 3 3.1 Sampling beet 3.2 Determination of impurities 3.2.1 Determination of mineral impurities 3.2.2 Determination of plant impurities 3.3 Appearance Indicators of beet Indicator 3.4 The chemical composition of sugar beet 3.5 Determination of the amount of beet pulp	Debate, questioning, explanation	1 Practical work
Practical work. 4 4.1 Introduction 4.2 Polarimetric Method 4.3 Determination of sucrose from sugar beets (polarization or digestion) 4.4 Determination of cossets quality 4.4.1 Silin number 4.4.2 Swedish number	Experiment, conversation, explanation	1 Practical work
Practical work. 5 5.1 Introduction 5.2 Determination of dry matter content (Brix degrees, dry matter Refractometric) 5.3 Determination of sugar 5.4 Determination of the purity of diffusion juice 5.5 Determination of acidity 5.6 Determination of pH 5.7 Determination of microorganisms activity	Experiment, conversation, explanation	1 Practical work
Practical work. 6 6.1 Introduction 6.2 Determination of thin juice alkalinity 6.3 Determination of colloid content of thin juice 6.4 Introduction 6.5 Determination of thick juice color	Experiment, conversation, explanation	1 Practical work
Practical work. 7 7.1 Qualitative characteristics of sugar 7.2 Determination of sugar moisture 7.3 Determination of mineral substances (ash Conductivity) 7.4 Determination of sucrose - granulated sugar / raw sugar	Experiment, conversation, explanation	1 Practical work
Knowledge assessing	Debate, questioning, explanation	1 Practical work

Compulsory bibliography:

1. Muresan Vlad, Tehnologii extractive – Caiet de lucrari practice, Editura Mega 2016
2. Racolța E., *Tehnologia Zahărului*, Editura AcademicPres, Cluj-Napoca, 2013.
3. Adriana -Paula David, Emil Racolta, "Utilajul si tehnologia de obtinere a zaharului", Ed. Risoprint, Cluj-Napoca 2010;
4. Racolța Emil, *"Tehnologii generale în industria alimentară*", Ed.Risoprint, 2007;
5. Racolța Emil, "*Tehnologii generale în industria alimentară – Aplicaţii şi calcule în industria alimentară",* Ed. Risoprint, 2006;
6. *Banu C., Progrese tehnice, tehnologice şi ştiinţifice în industria alimentară, Ed. Tehnică, Bucureşti, 1993.*

7. *Dominica Culache, Vasile Platon, Tehnologia zahărului, Ed. Tehnică, Bucureşti, 1987;*
8. *Luca Gh., Probleme de operaţii şi utilaje în industria alimentară, Ed. Tehnică, Bucureşti, 1978;*
9. *Bocioagă V., Îndrumător pentru controlul tehnic şi de calitate în industria zahărului;*

Optional bibliography:
1. Asadi M., *Beet-Sugar Handbook*, John Wiley & Sons, Inc., Hoboken, New Jersey, 2007.

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

Course content is consistent with the demands of specific national professional associations; the teaching staff regularly attend international fairs and undertake field visits on food industry specific establishments.

10. Assessment

Type of activity	10.1. Assessment criteria	10.2. Assessment methods	10.3. Percentage of the final grade
10.4. Lecture	Knowledge acquired; level of understanding; Solving specific problems related to sugar technology.	Exam	75%
10.5. Seminar/Laboratory	Description of an analytical application specific to sugar industry;	Continuous assessment of skills for analytical methods specific to sugar technology.	25%
10.6. Minimum performance standards			
Elaboration of a process or equipment project specific to the food industry, using basic concepts, theories and methods in the field. Obtaining the passing grade at the laboratory and exam 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 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).

Filled in on
07.09.2021

Course coordinator
Vlad Mureșan, PhD, habil., Associate Professor

Laboratory work/seminar coordinator
Georgiana Smaranda Marțiș, PhD, Assistant Professor

Subject coordinator
Vlad Mureșan, PhD, habil., Associate Professor

Approved by the Department on
22.09.2021

Head of the Department
Sevastița Muste, PhD, habil., Professor

Approved by the Faculty Council on
28.09.2021

Dean
Elena Mudura, PhD, habil., Professor