No._____of _____ **USAMV form 0701030104**

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	**Technology of Agricultural Products Processing (TPPA)**
1.7. Form of education	**Full time**

2. Information on the discipline

2.1. Name of the discipline	**Extractive products technology - sugar**							
2.2. Course coordinator				**Vlad Mureşan, PhD, habil., Professor**				
2.3. Seminar/ laboratory/ project coordinator				**Georgiana Smaranda Marţiş, PhD, Assistant Professor**				
2.4. Year of study	**III**	2.5. Semester	**V**	2.6. Type of evaluation	summative	2.7. Discipline status	Content[2]	DS
							Compulsoriness[3]	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 book, textbook, bibliography and notes					17
3.4.2. Additional documentation in the library, specialized electronic platforms and field					7
3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays					12
3.4.4.Tutorials					3
3.4.5.Examinations					5
3.4.6. Other activities					

3.7. Total hours of individual study	44
3.8. Total hours per semester	100
3.9. Number of credits[4]	4

4. Prerequisites (if applicable)

4.1. curriculum-related	Operations and equipment in the food industry; Transfer phenomena; Raw vegetable materials; Food chemistry; Mathematics; Food biochemistry; Food microbiology.
4.2. skills-related	The student should have knowledge of Food Industry unit operations and machines, as well as knowing the physical and chemical properties of sugars.

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 for perseverance, rigor , efficiency and responsibility in work , punctuality and personal accountability for its performance , creativity, common sense, analytical and critical thinking , problem solving, etc., based on principles, norms and values code of professional ethics from food industry;

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 production (beet derived).
7.2. Specific objectives	Knowledge of quality parameters of sugar beet and sugar finished product; Knowledge of operations and operating principles of the equipment from sugar factory; Using and understanding the methods, analysis techniques, applications and technological computations from extraction technology (sugar) field; Interpretation of results obtained by analysing the raw materials, intermediate and finished products from sugar industry.

8. Content

8.1.LECTURE **Number of hours – 28**	Teaching methods	Notes
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.	Lecture, explanation, conversation, debate	1 Lecture
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 Lecture
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	2 Lectures
Ch. IV Obtaining the cossettes. 4.1. Aim. Beet slicing. 4.2. Cossettes quality.	Lecture, explanation, conversation, debate	1 Lecture
Ch. V Extracting sugar from beet - diffusion 5.1. Diffusion. Generalities. Theoretical consideration. 5.2. Diffusion Equipment. Diffusion batteries. Continuous diffusion equipment. 5.30 Products and control of the diffusion operation. Diffusion juice. Pulp. Wash waters. Dry matter content,	Lecture, explanation, conversation, debate	2 Lectures

sugar content, diffusion juice acidity, pulp, diffusion water. **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. **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. **Ch. IX Obtaining sugar cubes** 9.1. Obtaining sugar cubes by pressing. Press machine. Units with continuous operation. **Ch. X Obtaining milk of lime , CO_2 and SO_2** 10.1. Obtaining milk of lime and CO_2. 10.2. Obtaining SO_2. **Ch. XI 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 Lecture, explanation, conversation, debate Lecture, explanation, conversation, debate Lecture, explanation, conversation, debate Lecture, explanation, conversation, debate Lecture, explanation, conversation, debate	1 Lecture 1 Lecture 2 Lectures 1 Lecture 1 Lecture 1 Lecture

8.2. PRACTICAL WORK **Number of hours – 28**		
Case Study: Technology for obtaining sugar at SC Tereos Ludus Technological scheme for obtaining sugar from beet Technologic manufacturing flow chart for sugar industry	Debate, questioning, explanation	2 Practical works
Quality control scheme used in the sugar industry The aim of technological operations of sugar industry	Debate, questioning, explanation	1 Practical work
Sampling beet; Determination of impurities; Determination of mineral impurities; Determination of vegetal impurities; Appearance Indicators of sugar beet; Form Indicator; Diameter indicator	Experiment, conversation, explanation	1 Practical work
Determining the sucrose content of the beet. Hot digestion method.	Experiment, conversation, explanation	1 Practical work
Determination of the dry matter content of the diffusion juice. Sugar content of diffusion juice. Purity diffusion juice	Experiment, conversation, explanation	1 Practical work

Determination of sugar moisture. Determines the sugar polarization. Purity determination. Non sugar content.	Experiment, conversation, explanation	1 Practical work
Technological applications for raw sugar - computations.	Debate, questioning, explanation	4 Practical works
Technological Applications for refined sugar - computations.	Debate, questioning, explanation	2 Practical works
Knowledge assessment	Debate, questioning, explanation	1 Practical work

Compulsory bibliography:

1. Racolța E., *Tehnologia Zahărului*, Editura AcademicPres, Cluj-Napoca, 2013.
2. Adriana -Paula David, Emil Racolta, "Utilajul si tehnologia de obtinere a zaharului", Ed. Risoprint, Cluj-Napoca 2010;
3. Racolța Emil, Marta Hodrea, Teodora Şchiop, "*Îndrumător de lucrări practice pentru produse zaharoase"*, Ed.Risoprint, 2008;
4. Racolța Emil, *"Tehnologii generale în industria alimentară*", " *Aplicatii si calcule tehnologi*ce" Ed.Risoprint, 2007;
5. Racolța Emil, *"Tehnologii generale în industria alimentară*", Ed.Risoprint, 2007;
6. Dominica Culache, Vasile Platon, "*Tehnologia zahărului*", Ed. Tehnică, Bucureşti, 1987;
7. Luca Gh., "*Probleme de operaţii şi utilaje în industria alimentară*", Ed. Tehnică,Bucureşti, 1978;
8. Bocioagă V., *Îndrumător pentru controlul tehnic şi de calitate în industria zahărului;*

Optional bibliography:

1. Banu C., "*Manualul inginerului de industria alimentara*", Ed. Tehnica Bucuresti, 2002;
2. Banu C., "*Progrese tehnice, tehnologice şi ştiinţifice în industria alimentară*", Ed. Tehnică,Bucureşti, 1993;
3. 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 (sugar, glucose, sugar products, starches)

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.Assessment of theoretical knowledge.	60%
10.5. Seminar/Laboratory	Making an application specific to sugar industry; Technological computation specific to sugar industry operations by applying full or partial material balance equations; Description of analytical methods specific to sugar industry.	Continuous assessment of skills for making applications / technological computation and analytical methods specific to sugar technology.	40%
10.6. Minimum performance standards			
Knowledge of quality indices of raw material and finished product.			

Knowledge of technological general scheme for obtaining sugar from sugar beets.

[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., Professor

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

Subject coordinator
Vlad Mureșan, PhD, habil., 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