UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
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No._____of _____ **USAMV–CN-0701030115**

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	Faculty of Food Science and Technology
1.3. Department	Food Engineering
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. Information on the discipline

2.1. Name of the discipline	Fermentative technologies 2							
2.2. Course coordinator				Prof. PhD. Elena Mudura				
2.3. Seminar/ laboratory/ project coordinator				Lecturer PhD. Teodora Emilia Coldea				
2.4. Year of study	III	2.5. Semester	VI	2.6. Type of evaluation	continuous	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	1/1
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					20
3.4.2. Additional documentation in the library, specialized electronic platforms and field					5
3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays					10
3.4.4.Tutorials					5
3.4.5.Examinations					4
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 (is applicable)

4.1. curriculum-related	Food biochemistry. Food microbiology. Food chemistry. Food industry equipments
4.2. skills-related	The student must gain knowledge referring to malt and brewing technologies.

5. Conditions (if applicable)

5.1. for the lecture	The course is interactive; students can ask questions regarding the content of 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. In the case of the didactic activity carried out online, the teaching methods will be adapted.

5.2. for the seminar/ laboratory/ project	During practical works, each student will develop an individual activity with laboratory materials (made available in the book that describes the laboratory work). Academic discipline is imposed throughout the course of practical works. In the case of the didactic activity carried out online, the teaching methods will be adapted.

6. Specific competences acquired

Professional competences	Knowledge: C3.1 Description and use of basic concepts, theories and methods on agro-food technologies Abilities: C1.3. Application of basic principles and methods in food science to solve engineering and technological problems, including those related to food safety C3.3. Monitoring and control of technological processes in the food industry, identifying abnormal situations and proposing solutions C2.4. Critical analysis, evaluation of the characteristics, performances and limits of some technological processes and equipment in the field of the agro-food industry C3.5. Elaboration of projects related to technologies and products specific to the agro-food industry
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 professional ethics in the food field.

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

7.1. Overall course objective	To acquire knowledge referred to the utilization and application of obtaining technologies, process control, design in the brewing technology fields
7.2. Specific objectives	To understand the flow operations distribution in malt and brewing technologies To be able to interpret the physico-chemical parameters of malt and brewing technologies To know the factors influencing the malt and beer quality To identify solutions to technical issues in malt and brewing technologies

8. Content

8.1. LECTURE **Number of hours – 28**	Teaching methods Lecture	Notes 1 lecture = 2 hours
Raw materials used in malt and brewing industries 1.1 Barley 1.2 Hops 1.3 Water for malt and brewing industries 1.4 Brewing yeast 1.5 Process adjuvants	Lecture	1 lecture
Malt technology 2.1 Process description. Process objectives. 2.2 Technology flow diagram and quality control.	Lecture	1 lecture
Conditioning of barley for the malting process 3.1 Qualitative and quantitative reception 3.2 Cleaning, sorting and barley transfer 3.3 Conditioning and storage of barley	Lecture	1 lecture
Barley soaking 4.1 Description of barley soaking process	Lecture	1 lecture

4.2 Machinery and equipments for barley soaking		
Barley germination 5.1 Biological and biochemical transformations during germination 5.2 Barley germination methods 5.3 Machinery and equipments for barley germination	Lecture	1 lecture
Malt drying 6.1 Physical, chemical and biochemical transformations during malt drying 6.2 Machinery and equipments for malt drying 6.3 Drying process management for different malt assortments	Lecture	1 lecture
Dried malt conditioning 7.1 Malt cooling 7.2 Malt cleaning 7.3 Malt storage. Malt analysing.	Lecture	1 lecture
Brewing technology 2.2 Process flow chart and quality control.	Lecture	1 lecture
Malt milling 9.1 Malt cleaning 9.2 Dry milling of malt 9.3 Wet milling of malt 9.4 Malt conditioning	Lecture	1 lecture
Saccharification 10.1Teoretical aspects for saccharification. 10.2 Equipments used for saccharification. 10.3 Technological procedures for saccharification. 10.4 Saccharification control	Lecture	1 lecture
Filtration and boiling of wort 11.1 Wort filtration. Process description. 11.2 Wort boiling. Objectives. 11.3 Hot trub separation 11.4 Machines and equipments used for filtration, boiling and hot trub separation.	Lecture	1 lecture
Wort fermentation 12.1 Wort fermentation. Process description. Biochemical mechanisms 12.2 Wort cooling, aeration and wort inoculation. 12.3 Wort primary fermentation 12.4 Beer secondary fermentation 12.5 Machines and equipments used for beer fermentation	Lecture	1 lecture
Beer conditioning 13.1 Beer filtration. Equipments. Filtration adjuvants. 13.2 Chemical and microbiological stabilization of beer 13.3 Beer blending	Lecture	1 lecture
Beer bottling 14.1 Types of packaging materials for beer bottling 14.2 Packages conditioning 14.3 Filling, sealing and labelling 14.3 Finished product storage	Lecture	1 lecture

8.2. PRACTICAL WORK **Number of hours – 28**	Theoretical presentation of practical works	1 lab work (2 hours / work)

Technological project: Obtaining technology of a beer assortment – Identification of literature sources needed for chosen beer assortment. – Determination of the raw materials for the specific beer assortment. – Calculation of the process parameters of the saccharification. – Calculation of the process parameters for the boilling operation. – Calculation of the process parameters for the primary and secondary fermentation of beer. – Calculation of the process parameters for the beer filtration. – Calculation of the process parameters for the beer bottling.	Case study	7 lab works
Saccharification operation quality control.	Case study	1 lab work
Wort boilling. Quality control of the operation: determination of wort concentration, wort colour, and bitterness.	Case study	2 lab works
Microbial analysis of yeast for beer inocullum.	Case study	1 lab work
Beer fermentation. Quality control of beer fermentation – determining of final fermentation grade and apparent extract.	Case study	1 lab work
Microbial and sensory assessment of beer	Case study	1 lab work
Colloquium	Evaluation	1 lab work

Compulsory bibliography:

1. Mudura, Elena, 2004. Tehnologii fermentative. Tehnologia berii. Indrumator de lucrări practice. Editura Risoprint, Cluj-Napoca
2. Elena Mudura, 2013.Tehnologia malţului şi berii. Editura Mega, Cluj Napoca.
3. Elena Mudura, 2014. Calitatea şi inocuitatea berii. Editura Mega, Cluj Napoca
4. Banu,C.(coordonator), 2000(2001). Tratat de ştiinţa şi tehnologia malţului şi berii,vol I şi II ,Editura Tehnică, Bucureşti,
5. Modoran, D., Modoran Constanţa, 2007. Tehnologii de analiză a malţului şi a berii, Editura Academicpres, Cluj-Napoca

Optional bibliography:

1. Kunze,W., 1999. Technology brewing and malting,VLB, Berlin,
2. Banu, C. (coordonator). 1999.Manualul inginerului de industrie alimentară, vol.II, Editura Tehnică, Bucureşti
3. Anca Sipos, Vasile Mircea Cristea, Elena Mudura, Arpad Imre-Lucaci, Dorina Braftalean. 2014. Modelarea, simularea şi conducerea avansată a bioproceselor fermentative. Editura Universităţii "Lucian Blaga" din Sibiu.
4. Modoran, D.,2002. Tehnologii fermentative, Editura ICPIAF, Cluj-Napoca

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 qualification of highly prepared specialist based on advanced and actual knowledge in the field malt and brewing technologies.

10. Assessment

Type of activity	10.1. Assessment criteria	10.2. Assessment methods	10.3. Percentage of the final grade

10.4. Lecture	Use of basic knowledge to explain and interpret various types of concepts, situations, processes, projects associated with malt and brewing technologies.	Exam oral (E)	50 %
10.5. Seminar/Laboratory	Knowledge, use and application of methods and techniques for the manufacture of malt and beer. Use of standard methods for determining the control parameters of malt and beer. Solving technological calculation for beer industry.	Colloquium (C)	20 %
	Elaborarea proiectului tehnologic conform cunostintelor dobandite si a instructiunilor primite. Elaboration of technological project according to the gained knowledge and received instructions.	Project (P)	30%
10.6. Minimum performance standards			
Course: Knowledge of the technological scheme for obtaining malt and beer technologies. Characterization of the raw material and the finished product. Description of technological operations, process parameters and equipment for the manufacture of malt and beer. Minimum grade (E): 5. Lab work: Identification and analysis of quality parameters monitored on the technological flow of obtaining malt and beer. Minimum grade (C): 5. Minimum grade (P): 5 Final grade = 50% E + 20% C + 30% P			

[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
08.09.2021

Course coordinator
Prof. PhD. Elena Mudura

Laboratory work/seminar coordinator
Lecturer PhD. Teodora Emilia Coldea

Subject coordinator
Prof. PhD. Elena Mudura

Approved by the
Department on
22.09.2021

Head of the Department
Prof. PhD. Sevastița Muste

Approved by the Faculty
Council on
28.09.2021

Dean
Prof. PhD. Elena Mudura