UNIVERSITATEA DE ŞTIINŢE AGRICOLE ŞI MEDICINĂ VETERINARĂ CLUJ-NAPOCA
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No._____of _____ **USAMV–CN-0703030107**

SUBJECT OUTLINE

1. Information on the programme

1.1. Higher education institution	University of Agricultural Sciences and Veterinary Medicine of Cluj-N
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	Food Engineering
1.7. Form of education	Full time

2. Information on the discipline

2.1. Name of the discipline	Malt and brewing technologies							
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	**V**	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	2	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 biotechnology. Food chemistry. Food industry equipment.
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.
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.

6. Specific competences acquired

Professional competences	Theoretical knowledge – knowledge and understanding: To know the procedures for the malt and brewing quality assurance To know the specific terminology for the malt and brewing technologies To know how to implement and manage the projects in the sector of malt and brewing technologies Thoroughly master the technologies of brewing and those for obtaining malt Acquired skills – explanation and interpretation: Utilization of methods and advanced laboratory techniques in order to correctly interpret the microbiological and physico-chemical parameters. Exploitation of the installations and equipment in malt and brewing industries.
Transversal competences	To demonstrate the integration capacity, communication and team working To be able to conduct research activities referred to the operations optimization in brewing technology, identification of advanced and sustainable techniques in malt and brewing technology To demonstrate the focus on professional perfectioning by critical thinking skills To be involved in research activities in brewing technology

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	Notes
Barley for beer 1.1 Barley for beer 1.2 Choosing the barley for beer 1.3 Other malted raw materials	Lecture, heuristic conversation, explanation	1 lecture
1.2 Malt technology. 1.2.1 General description of the process. 1.2.2 Technological and quality control flow diagram	Lecture, heuristic conversation, explanation	1 lecture
Malt technology 2.1 Process description, technological objectives 2.2 Flow diagram and quality control	Lecture, heuristic conversation, explanation	1 lecture
Malting barley conditioning 3.1 Qualitative and quantitative reception 3.2 Cleaning, sorting and transfer of barley 3.3 Conditioning and storage of barley	Lecture, heuristic conversation, explanation	1 lecture
Soaking barley 4.1 Description of soaking process 4.2 Machinery and equipment for soaking barley	Lecture, heuristic conversation, explanation	1 lecture
Barley germination 5.1 Biological and biochemical transformations during	Lecture, heuristic conversation, explanation	1 lecture

germination 5.2 Methods for barley germinating 5.3 Machinery and equipment for the barley germination		
Malt drying 6.1 Physical, chemical and biochemical changes during the malt drying 6.2 Machinery and equipment for malt drying 6.3 Management of the drying process to obtain various types of malt	Lecture, heuristic conversation, explanation	1 lecture
Dried malt conditioning 7.1 Malt cooling 7.2 Malt cleaning 7.3 Malt storage. Malt evaluation	Lecture, heuristic conversation, explanation	1 lecture
Brewing technology 8.1 Description of the technological process 8.2 Hops for beer 8.3 Water in malt and beer industry 8.4 Yeast 8.5 Flow diagram and quality control	Lecture, heuristic conversation, explanation	1 lecture
Malt milling 9.1 Malt cleaning 9.2 Dry malt grinding 9.3 Wet malt milling 9.4 Malt conditioning	Lecture, heuristic conversation, explanation	1 lecture
Wort technology 10.1 Mash saccharification 10.2 Mash filtering 10.3 Wort boiling with hops 10.4 Mash cooling and aeration	Lecture, heuristic conversation, explanation	1 lecture
Wort fermentation technology 11.1 Wort sowing 11.2 Wort primary fermentation 11.3 Beer secondary fermentation	Lecture, heuristic conversation, explanation	1 lecture
Filtration, conditioning and beer bottling technology 12.1 Beer filtering 12.2 Filtered beer conditioning 12.3 Packaging for beer conditioning 12.4 Beer bottling	Lecture, heuristic conversation, explanation	1 lecture
Brown beer technology 13.1 Porter beer technology 13.2 The most popular and top brown beer technology	Lecture, heuristic conversation, explanation	1 lecture
Special beers technology 14.1 Low alcohol and alcohol-free beer technology 14.2 Dietary beer technology 14.3 Functional beer technology	Lecture, heuristic conversation, explanation	1 lecture

8.2. PRACTICAL WORK **Number of hours – 28**	Teaching methods	Notes
Technological project in brewing technology	Establish the project theme, direction and supervision of the project	7 project lectures
The flow process control of the mash saccharification: temperature, pH, mash saccharification	Heuristic conversation, case study	1 lecture
Wort concentration determining, wash water saccharification control	Heuristic conversation, case study	1 lecture
Wort boiling. Operation quality control. Boiling control: wort concentration, color, bitterness	Heuristic conversation, case study	1 lecture

Yeast analysis from the sowing wort. Consistency and sustainability determination	Heuristic conversation, case study	1 lecture
Beer fermentation. Final fermentation and apparent extract determination	Heuristic conversation, case study	2 lectures
Physico-chemical, microbiological and sensory analysis of the beer	Heuristic conversation, case study	1 lecture

Compulsory bibliography:

1. Mudura, Elena, 2004. Tehnologii fermentative. Tehnologia berii. Indrumator de lucrări practice. Editura Risoprint, Cluj-Napoca
2. Banu,C.(coordonator), 2000(2001). Tratat de ştiinţa şi tehnologia malţului şi berii,vol I şi II ,Editura Tehnică, Bucureşti,
3. 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. 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	Using basic knowledge for explanation and interpretation of various types of concepts, situations, processes, technology related projects to the malting and brewing	Continuous assessment (VP1, VP2)	50%
10.5. Project/Laboratory	Developing the technological project according to the knowledge acquired and instructions received	Project	30%
	The knowledge of the methods and techniques applied for the manufacture of beer Using standard methods for malt and beer controlling parameters	Colloquium	20%

10.6. Minimum performance standards

Lecture (C): The knowledge of the malting flow diagram. Technological operations, process parameters and equipment description for the malting technology. (Minimum Standard VP1: minimum 5). The knowledge of the brewing flow diagram. Technological operations, process parameters and equipment description for the brewing technology. (Minimum Standard VP2: 5).
Project (P): Design and present the project. Minimum standard: 5.
Colloquium (C): Identification and analysis of quality parameters on the malting and brewing technological processes. (Minimum standard: 5).
Final mark = 50% (VP1 + VP2) + 30% P 20% C

[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
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