



COURSE SYLLABUS

General information

Course title:	BREWING TECHNOLOGY 1
ISVU course code:	266814
Course instructor:	
Course assistant:	
Study programme and specialization in which the course is taught:	Food processing technology
ECTS credits:	6.0
Semester of the course execution:	IV
Exam prerequisites:	Biochemistry
Course objectives:	The aim of the course is to acquaint students with the raw materials needed for beer production, the preparation of recipes and the selection of necessary and suitable raw materials for a certain type of beer, the technological procedures of grinding malt, mashing, extracting wort from saccharified mash and processing wort. In addition, they will learn which chemical, biochemical and physical changes occur during these technological operations and why they are important.

Course structure

Teaching mode	Number of contact hours per semester:	Student's requirements per teaching mode
Lectures:	30	80%
Exercises (auditory, linguistics):	30	100%
Exercises (laboratory, practical):	5	100%
Field work:	10	100%
Other:		
TOTAL:	75	

Monitoring of students' work and knowledge evaluation during the course

OUTCOMES		Colloquium 1	Colloquium 2	Oral exam	Total	Pass	Time frame for the recognition of the outcome
Outcome 1	Describe the brewery and basic stages in the proces of wort production	10%			10%	5%	By the end of the academic year
Outcome 2	Describe the principal raw materials used for wort production and the proces of their preparation for mashing	10%			10%	5%	By the end of the academic year



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Outcome 3	Explain the procedure and changes occurring during mashing, and methods of separation of coarse break from wort	10%			10%	5%	By the end of the academic year
Outcome 4	Explain the procedure of cooking and dosage of hop, as well as to explain what kind of changes occur during this process		10%		10%	5%	By the end of the academic year
Outcome 5	Describe the procedures of wort treatment and preparations for fermentation		10%		10%	5%	By the end of the academic year
Outcome 6	Calculate the necessary quantities of raw materials for the production of a certain amount of beer		10%		10%	5%	By the end of the academic year
Outcome 7	Design and describe specific fermentation procedures for different styles of beer			40%	40%	20%	By the end of the academic year
Total % grade points		30	30	40	100	50	
Share in ECTS		1,8	1,8	2,4	6,0		

Knowledge evaluation on exams

Exam prerequisites					
OUTCOMES		Written exam	Oral exam	Total	Pass
Outcome 1	Describe the brewery and basic stages in the process of wort production	10%		10%	5%
Outcome 2	Describe the principal raw materials used for wort production and the process of their preparation for mashing	10%		10%	5%



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Outcome 3	Explain the procedure and changes occurring during mashing, and methods of separation of coarse break from wort	10%		10%	5%
Outcome 4	Explain the procedure of cooking and dosage of hop, as well as to explain what kind of changes occur during this process	10%		10%	5%
Outcome 5	Describe the procedures of wort treatment and preparations for fermentation	10%		10%	5%
Outcome 6	Calculate the necessary quantities of raw materials for the production of a certain amount of beer	10%		10%	5%
Outcome 7	Design and describe specific fermentation procedures for different styles of beer		40%	40%	20%
Total % of grade points		60	40	100	50
Share in ECTS		3,6	2,4	6,0	

Review of units per week with associated learning outcomes

Week	Lecture course content and learning outcomes:	Outcome	Exercises course content and learning outcomes:	Outcome
1.	Production of wort, Brewhouse equipment, Brewhouse types	I1, I7	Getting to know the brewhouse. Name all parts, machines and apparatus in the brewhouse. - field teaching, process practicum	I1, I7
2.	Milling of malt, Devices for dry grinding, Devices for wet grinding	I1	Milling of malt. Choose and describe a suitable process for milling of malt or unmalted grain - laboratory exercises, process practicum	I1
3.	Composition of malt grist, Evaluation of the quality of malt grist	I1	Determination of the physico-chemical parameters of the quality of the malt grist. Describe and apply the methods of determining the quality of the malt grist - laboratory exercises	I1
4.	Mashing temperature, Mashing duration, Mash concentration	I2, I7	Mashing and production of wort - field teaching, process practicum	I2, I7
5.	Enzyme activity, Decomposition of starch, Factors on which the composition of fermentable sugars depends	I2	Mashing and production of wort - laboratory exercises	I2
6.	Degradation of β -glucan, proteins and other ingredients	I2	Mashing and production of wort - laboratory exercises	I2
7.	Extract composition, Acidification of mash, Combined acidification of mash and wort	I2	Getting to know and using methods for quality control of the obtained wort - laboratory exercises, process practicum	I2
8.	Vessels for mashing, Mash, Grain bill, Main infusion	I3	Using methods to control the quality of the obtained wort - field teaching, process practicum	I3
9.	Mixing of water and solids, Infusion process of mashing, Decoction process of mashing	I3, I4, I7	Getting to know different methods of mashing - process practicum	I3, I4, I7



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10.	Decoction, Mashing diagrams, Oxidation of mash	14, 17	Creation and drawing of the mashing diagram - laboratory exercises	14, 17
11.	Malting with skipping the pause for β -amylase action, Malting with malt and unmalted raw materials	14, 15, 17	Creation and drawing of the mashing diagram – process practicum	14, 15, 17
12.	Mash lautering, Rinsing of spent grains, Equipment for lautering	15, 17	Mash lautering. Getting to know different procedures for extracting wort from mash. - field teaching, process practicum	15, 17
13.	Boiling of wort, Dosing, dissolving and conversion of hop ingredients, Construction and heating of the wort kettle	15, 16, 17	Adding hops and wort boiling - process practical	15, 16, 17
14.	Other wort boiling procedures, Energy consumption and saving for wort boiling, Diary and control of wort boiling	16, 17	Creating and filling in a mashing logbook - laboratory exercises	16, 17
15.	Extraction of coarse break in whirlpool, Cooling and clarification of wort, Cooling equipment, Aeration of wort	15, 16, 17	Separation of cold and warm coarse break and preparation of wort for fermentation - field teaching, process practicum	15, 16, 17

References (compulsory / additional)

Compulsory

1. Marić, V., Tehnologija piva, Karlovac University of Applied Sciences, 2009.
2. Kunze, W. Technology Brewing and Malting, VLB Berlin, 6. izd., 2016.

Additional

1. Briggs, D. E. et al., Brewing - Science and practice, Woodhead Publishing Ltd and CRC Press, 2004.
2. Bamforth, C. W., Brewing - New technologies, Woodhead Publishing Ltd and CRC Press, 2006.