

COURSE SYLLABUS

General information

Course title:	BREWING TECHNOLOGY 2
ISVU course code:	266819
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:	V
Exam prerequisites:	Brewing technology 1, Malt production, Raw materials and by- products of the brewing industry
Course objectives:	Aim of the course is to familiarize the students with physical, chemical and biochemical changes which occur during fermentation of wort and aging of green beer. They will also learn how to use the necessary machines and equipment used for fermentation, maturation, stabilization and filling of finished beer in different types of packaging. They will be introduced to physico- chemical and sensory methods for quality control of finished beer.

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):	6	100%
Field work:	9	100%
Other:		
TOTAL:	75	

Monitoring of students' work and knowledge evaluation during the course

OUTCOMES		Colloquium 1	Colloquium 2	Seminar work	Total	Pass	Time frame for the recognition of the outcome
Outcome 1	Describe the procedure and explain biochemical changes that occur during primary fermentation of wort.	10%			10%	5%	By the and of academic year
Outcome 2	Explain the changes that occur during maturation of green beer.	10%			10%	5%	By the and of academic year
Outcome 3	Explain the procedures of beer processing before filling.	10%			10%	5%	By the and of academic year
Outcome 4	Recognize different types of packaging and filling procedures.		10%		10%	5%	By the and of academic year



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Outcome 5	Describe the sanitizing procedure in brewery and the methods of quality control.		10%		10%	5%	By the and of academic year
Outcome 6	Describe and define specifics of production of special beer types.		10%		10%	5%	By the and of academic year
Outcome 7	Choose a specific technology and create own style and brand of beer			40%	40%	20%	By the and of academic year
Total % gr	ade points	30%	30%	40%	100%	50%	
Share in E	CTS	1,8	1,8	2,4	6,0	3,0	

Knowledge evaluation on exams

Exam pre	requisites					
OUTCOMES		Written exam	Oral exam	Total	Pass	
Outcome 1	Describe the procedure and explain biochemical changes that occur during primary fermentation of wort.	10%	10% 10%			
Outcome 2	Explain the changes that occur during maturation of green beer.	10%		10%	5%	
Outcome 3	Explain the procedures of beer processing before filling.	10%		10%	5%	
Outcome 4	Recognize different types of packaging and filling procedures.	10%		10%	5%	
Outcome 5	Describe the sanitizing procedure in brewery and the methods of quality control.	10%		10%	5%	
Outcome 6	Describe and define specifics of production of special beer types.	10%		10%	5%	
Outcome 7	Choose a specific technology and create own style and brand of beer		40%	40%	20%	
Total % of	grade points	60	40	100	50	
Share in E	CTS	3,6	2,4	6,0		

Review of units per week with associated learning outcomes

Week	Lecture course content and learning outcomes:	Outco me	Exercises course content and learning outcomes:	Outco me
1.	Procedures for conducting the main fermentation of wort, Biochemical reactions during the main fermentation, Green beer	I1, I6, I7	Getting to know fermenters, storage tanks and other equipment - process practicum	I1, I6, I7
2.	Sugar breakdown and energy production in yeasts, Dosing and yeast characteristics affecting fermentation	I1	Microscopy of yeasts - recognition of cell structure and differentiation of bottom and top fermentation yeasts - laboratory exercises	I1
3.	Alcoholic fermentation, Fermentation by-products, Other changes that occur during fermentation of wort	I1	Yeast reproduction and propagation - process drive	I1



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I1. I2 Transfer of wort to fermentation I1. I2 Yeast propagation in the laboratory and 4. in the plant, Other ways of yeast tanks and start of fermentation propagation process practicum I1, I2, Fermentation monitoring through I1, I2, Classic procedure of main boiling, 5. I6, I7 certain physical-chemical analyzes - t I6, I7 Degree of fermentation laboratory exercises 12, 16, Fermentation monitoring through I2, I6, Separation of yeast, Maintenance and 17 certain physico-chemical analyzes -I7 6. storage of yeast process practicum Separation of yeasts from green beer 12, 16, I2, I6, Subsequent fermentation, Saturation of 7. Ι7 and beer maturation - process Ι7 beer with CO₂. Clarification of beer practicum 12,13 Monitoring quality parameters of 12,13 Maturation tanks, Management of 8. green beer during maturation maturation laboratory exercises Fermentation and maturation in I2. I3 Preparation and sanitation of I2, I3 9. cylindrical-conical fermenters, CO₂, equipment for filling beer and Cooling of CCF, Monitoring equipment packaging - process practicum 15, 16, 15, 16, Familiarization with materials and Quality indicators of matured beer, Beer I7 equipment for beer filtration, Beer I7 10. filtration, Filtration media, Filter types filtration and filling - process practicum I4 Getting to know the CIP system and I4 Filling beer into bottles, Preparation of 11. washing and disinfection of the plant bottles, Closing and control of bottles - process practicum Filling beer into cans, Filling beer into I4, I6, Quality control of produced beer -I4, I6, 12. kegs, Losses in beer production I7 laboratory exercises I7 Washing and disinfection, Materials for 15 Sensory evaluation of different beer 15 13. vessel and pipeline production, CIP styles - laboratory exercises - sensory washing and disinfection laboratory Beer quality control, Beer and nutrition 15, 16, Field teaching - visit to a craft I1-7 14. physiology, Sensory evaluation of beer Ι7 brewery High-gravity brewing, top-fermented I6, I7 I1-7 Field teaching – visit to an industrial 15. beers, beers with reduced alcohol brewerv content, light and diet beers

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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.
- 3. Bamforth, C. W., Brewing New technologies, Woodhead Publishing Ltd and CRC Press, 2006.