



SYLLABUS PREDMETA

General information

Course title:	Brewing technology 2
ISVU ¹ course code:	38353
Studies in which the course is taught:	Food processing technology
Course Instructor:	Goran Šarić, PhD, senior lecturer
Course Assistant:	Mladen Hendija, Uglješa Stegnjaić
ECTS credits:	6,0
Semester of the course execution:	V
Academic year:	
Exam prerequisites:	Brewing technology 1, Malt production, Brewing industry raw materials
Lectures are given in a foreign language:	English
Aims:	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 examination of finished beer.

Course

Course structure	Number of contact hours per week:	Number of contact hours per semester:	Student's requirements by type of teaching:
Lectures:	2	30	attendance 80%
Tutorials:			
Practical (lab) sessions:	3	45	attendance 80%
Seminars:			
Field work:			
Other:			
TOTAL:	5	75	

Monitoring of students' work, knowledge evaluation and learning outcomes

Formation of the grade during the implementation of teaching: (Define from minimum 5 to maximum 10 learning outcomes)	LEARNING OUTCOMES (upon completion of the course the student should be able to:)	FACTORS AFFECTING THE GRADE (e.g. term paper, practical work, presentation, ...)	MAXIMUM NUMBER OF POINTS PER FACTOR
	I1: Describe the procedure and explain biochemical changes that occur during primary fermentation of wort.	Term paper 1	Term paper 1 - 25 points Term paper 2 - 25 points Attendance - 10 points Oral exam - 40 points
	I2: Explain the changes that occur during maturation of green beer.	Term paper 1	
	I3: Explain the procedures of beer processing before filling.	Term paper 1	
	I4: Recognize different types of packaging and filling procedures.	Term paper 2	
	I5: Describe the sanitizing procedure in brewery and	Term paper 2	

¹ ISVU – Information System of Higher Education Institutions in Croatia



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	the methods of quality control.		
	I6: Describe and define specifics of production of special beer types.	Term paper 2	
Alternative formation of the grade (I 1 - I 10)	or alternative formation of the grade: I 1 - I 6		TOTAL: 100 points
Students' competencies	Students will gain practical and theoretical knowledge about the process of wort fermentation, maturation of green beer, filling methods with packaging types and physico-chemical and sensory methods for quality assessment of the finished product. In theory and practice they will be familiarized with all the necessary equipment needed for quality management of fermentation, maturation and filling processes. Besides that they will gain theoretical knowledge on all the physical, chemical and biochemical processes that occur during the entire process. By using physico-chemical and sensory methods, they will be able to evaluate the quality of the finished product and compare it with other similar products on the market.		

Prerequisites for course approval (lecturer's signature):	Student attendance on lectures and practical work - minimum 80%
Prerequisites for taking exams:	Signature and seminar.
Grading scale:	(According to the Regulations on student assessment of Karlovac University of Applied Sciences, Article 9, Paragraph 5) 90-100 - excellent (5) (A) 80 to 89.9 - very good (4) (B) 65 to 79.9 - good (3) (C) 60 to 64.9 - sufficient (2) (D) 50 to 59.9 - sufficient (2) (E) 0 to 49.9 - fail (1) (F) Students are graded during class, what forms 70% of final exam. Students who achieve 50% (35 points) and more are allowed to take the final exam. The score on final exam makes 30% of the final grade.

ECTS structure

ECTS credits allocated to the course reflect the total burden to the student during adoption of the course content. Total contact hours, relative gravity of the content, effort required for exam preparation, as well as, every other possible burden are taken in account:

Attendance (active participation)	Term paper	Composition	Presentation	Continuous assessment and evaluation	Practical work
0,5					
Independent work	Project	Written exam	Oral exam	Other	
		3	2,5		

Review of topics/units per week associated with learning outcomes

Week	Lectures topics/units and learning outcomes:	Tutorials topics/units and learning outcomes:
1.	Procedures of main fermentation of wort; Biochemical reactions during main fermentation; Green beer.	Introduction to fermentors, lagering tanks and other equipment.



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2.	Sugar degradation and energy production in yeast; Dosing and characteristics of yeast which affect fermentation.	Yeast under a microscope - recognition of cell structure and differentiation of top and bottom fermenting yeasts.
3.	Alcohol fermentation; Fermentation by-products; Other changes that occur during fermentation.	Yeast under a microscope - recognition of cell structure and differentiation of top and bottom fermenting yeasts.
4.	Yeast propagation in laboratory and in production plant; Other means of yeast propagation.	Propagation of yeast.
5.	Conventional fermentation and maturation; Degree of attenuation.	Transfer of wort into fermentors and the start of fermentation.
6.	Yeast cropping and separation; Yeast storage.	Monitoring of fermentation with physico-chemical analyses.
7.	Beer maturation; Carbonisation of beer; Beer clarification.	Monitoring of fermentation with physico-chemical analyses.
8.	Maturation tanks; Management of beer maturation.	Yeast cropping and transfer of beer to maturation tanks.
9.	Fermentation and maturation in cylindroconical tanks (CCVs); CO ₂ , Cooling of CCVs; Control and operating elements and safety fittings.	Monitoring of quality parameters of green beer during maturation.
10.	Quality parameters of finished beer; Beer filtration; Filters and filter aids.	Monitoring of quality parameters of green beer during maturation.
11.	Filling the beer in bottles; Bottle preparation before filling; Closing the bottles.	Preparation and sanitation of beer filling equipment and packaging.
12.	Filling the beer in cans and kegs; Beer losses during filling.	Introduction to materials and equipment for beer filtration; Beer filtration and filling into bottles.
13.	Sanitation; Materials for tanks and pipes; CIP cleaning	Introduction to CIP cleaning: Washing and disinfection of the brewery.
14.	Beer quality control; Sensory evaluation of beer.	Quality control of the finished product.
15.	High-gravity brewing; Ale beers; Beers with reduced alcohol content; Light and diet beers.	Sensory evaluation of manufactured beer and comparison with other beer types from different manufacturers.

References

REFERENCES (compulsory/additional):	
Basic:	Kunze, W. Technology Brewing and Malting, VLB Berlin, 5th edition., 2014.
2004.	Briggs, D. E. et al., Brewing - Science and practice, Woodhead Publishing Ltd and CRC Press, 2004.
	Bamforth, C. W., Brewing - New technologies, Woodhead Publishing Ltd and CRC Press, 2006.

Exams for the academic year: 2022/2023

Exam dates:	According to the schedule of exams for current academic year
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Contact information

1. Course Instructor/Lecturer:	Goran Šarić, PhD
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