
	UNIVERSITY OF EAST SARAJEVO Faculty of Technology Zvornik					
	Study programme: <i>Chemical Engineering and Technology</i>					
	Study module: <i>Food Technology</i>					
	Cycle I	Year IV				
Course title	Malt and Beer Technology					
Department	Department for Food Technology – Faculty of Technology Zvornik					
Course code	Course status	Semester	ECTS			
04-2-121-8	Elective	VIII	5			
Teacher	Milan Vukic, PhD, Assistant Professor.					
Teaching assistant	Milan Vukic, PhD, Assistant Professor.					
Number of classes/ teaching workload (per week)			Individual student workload (in hours per semester)		Student workload coefficient S₀	
Lectures	Auditory exercises	Laboratory exercises	Lectures	Auditory exercises	Laboratory exercises	S₀
3	0	2	45	0	30	1.00
$3*15+0*15+2*15=75$ hours			$(3*15*1.00+0*15*1.00+2*15*1.00)=75$ hours			
Total course workload 75 + 75 = 150 hours per semester						
Learning outcomes	After finishing the course, students will be able to: <ol style="list-style-type: none"> 1. Define concepts: brewing barley, malt, hops, wort, beer, and marketing in brewing. 2. Differentiate beer types, barley varieties, and malt types. Explore barley grain biology, physiology, and biochemistry during malting. 3. Explore by-products of malting, environmental aspects of malting, waste materials, and their disposal. 4. Familiarize with other raw materials for beer production (water, hops, adjuncts, enzyme preparations), and brewing yeast. 5. Learn fermentation theory, types of fermentation, chemistry, biochemistry, and technologies for mashing malt and non-malted materials, boiling, hop extraction, and wort cooling. 6. Understand the process of fermentation management, including calculations, fermenter construction, and operation. 7. Manage maturation, aging, and finishing of beer. 8. Acquire the ability to independently oversee wort and beer quality, and understand relevant legislation. 9. Explore by-products and wastewater treatment in breweries, as well as the economic aspects of production. 10. Define control and critical control points in production and explain their impact on product safety. 					
Prerequisites	None					
Teaching methods	Lectures, auditory and laboratory exercises, mid-term tests (colloquia).					
Syllabus outline per week	<ol style="list-style-type: none"> 1. Biology, physiology, and biochemistry of barley grains. Barley varieties and types. 2. Theory and practice of barley transport, acceptance, and storage. 3. Malting phases and processes. Theory and practice of barley steeping. Chemical and biochemical changes during steeping. 4. Traditional and modern germination methods. 5. Theory and procedures for drying and stabilizing green malt. Chemistry of drying - formation of colored and aromatic compounds in malt, enzyme inactivation. Types of dryers. 6. Types of maltings. Continuous maltings. 7. Economics of malting and process losses. Capacity calculation for malting. 8. Types of barley malt and the chemical composition of malt. Specialty and roasted malts. 9. From sweet wort production to pitching wort 10. Fermentation of wort 11. Chemistry, biochemistry, and technologies of mashing. Chemistry and technology of boiling, hop extraction, and wort cooling. Biology and metabolism of brewing yeast. 12. Fermentation theory. Types of fermentation. Fermentation tanks. Young beer. Maturation and aging of beer. 					

	13. Beer finishing - colloidal stabilization, carbonation, beer filtration, and pasteurization. 14. Packaging, transportation, and storage of beer. Chemical and physical properties of beer - composition and nutritional properties. Types of beer and their characteristics. 15. Quality control of wort and beer. Legislation. Sensory properties of beer, colloidal stability, and microbiological safety. Mid-term tests are taken after the 8th week and the 15th week. Semester verification is required after the 15 th week.		
Obligatory reading			
Author	Title, publisher	Year	Pages
Esslinger, H. M. (Ed.).	Handbook of brewing: processes, technology, markets. John Wiley & Sons	2009	(1-435)
Kanauchi, M. (Ed.).	Brewing Technology	2017	(1-210)
Additional reading			
Author	Title, publisher	Year	Pages
Kunze, W.	Technology brewing and malting - Kunze	2019	(1-948)
Obligations, assessment methods and grading system	Type of student evaluation	Grade points	Percentage
	Pre-exam obligations		
	Attendance	6	6 %
	Mid-term test I	20	20 %
	Mid-term test II	20	20 %
	Laboratory exercises	24	24 %
	Final examination		
	Final examination (oral)	30	30 %
Total	100	100 %	
Web page	www.tfzv.ues.rs.ba		
Date	2023		