Course name:

Food fermentations

ECTS	*2*
Course status	**obligatory**
Course final assessement/evaluation of outcomes	**credit**
Prerequisites	**example: passing the subject chemistry and bochemistry at the level of first-cycle studies**

Main field of study:

field of study name (capital letters)

Profile of study	**General-academic**
The code of studies (education level)	**SM**
Semester of studies	**WINTER exam**
Language of instruction	**English**

Course offered by:

Name of faculty offering the course	**Faculty of Food Technology**
Name of department offering the course	**Department of Biotechnology and General Technology of Food**
Course coordinator	**prof. dr hab. inż. Krzysztof Żyła**

Learning outcomes of the course:

Symbol of outcome	Description of learning outcome	Reference to	
		main field of study outcomes	discipline#
KNOWLEDGE – student knows and/or understands:			
FF2_W1	in English, the main metabolic pathways characteristic for bacteria, yeasts and filamentous fungi	BIOT 2_W04	RT
FF2_W2	in English, metods of molekular biology ueds to modify the metabolizm microorganisms	BIOT 2_W03	RT
FF2_W3	in English, molecular, microbiological and technological problems of fermentations technology	BIOT 2_W13	RT
FF2_W4	in English, schematic and technological diagrams of key fermentation technologies in the dairy, meat, bakery, fruit and vegetable, brewing and wine industries	BIOT 2_W13	RT
FF2_W5	in English, basic machines and devices used in the dairy, meat, bakery, fruit and vegetable, brewing and wine industries and knows their English names	BIOT 2_W13	RT
FF2_W6	in English, the historical meaning of traditional fermentation technologies implemented in Europe, Africa and the Middle and Far East	BIOT 2_W13	RT
FF2_W7	in English, meaning of fermentation technologies in the production of health-promoting food containing bioactive components.	BIOT 2_W13	RT
SKILLS – student is able to:			
FF2_U1	use the English language to describe technological problems of the food industry, especially in the field of fermentation technology	BIOT 2_U02 BIOT 2_U10	RT

FF2_U2	critically evaluate the usefulness of various technical and technological solutions used in food fermentation technologies	BIOT 2_U09	RT
SOCIAL COMPETENCE- student is ready to:			
FF2_K1	oral and written communication in foreign languages	BIOT 2_K03	RT

Teaching contents:

Lectures	**30**	**hours**

Topics of the lectures

Food fermentations – an overview. Traditional fermentations used to produce microbial cells or biomass. Production of microbial enzymes and metabolites. Production of fermented foods used for therapeutic purposes

Lactic acid bacteria and their metabolism . Sugar metabolism in lactic amid bacteria. Propionic acid pathway for Propionibacterium sp. Genetics of the thermophilic lactic acid bacteria, examples of genetically modified l.a.b

Yeast and mould metabolism . Induction and repression of carbohydrate enzymes. Ideal yeast- properties that need genetic changes. Examples of yeast transformation in the brewing and wine industries. Examples of filamentous fungi transformation

Fermentation cultures. Developments in fermentative cultures: Lactic acid bacteria bacteriophage, phage resistant starters

Dairy fermentations. Carbohydrate and nitrogen sources in milk. Fermented dairy foods. Cheesemaking – basic steps, texture and cheese ripening. Manufacture of Cheddar and Mozzarella cheese.

Fermented meats. Fermented sausages. Desirable properties of sausage starter cultures, flavor and aroma development in sausage

Fermentation of bread. Yeast-leavened products and short-time breadmaking systems. Conversion of dough components by microorganisms and enzymes. Sourdough starter microbials

Lactic acid fermentation of vegetables. Flow charts for fermented vegetables

Fermentation of beer and wine. Flow diagram and description of beer manufacture. Chemicals and enzymes in wine manufacture. Killer yeasts associated with wine.

Fermentation of organic acids by microorganisms. Citric acid, gluconic acid and glutamic acid production.

Fermentation of nucleic acids

Fermentation of soy sauce by the Koji cultures. Flow chart for the shoyu fermentation. New processing methods using immobilized systems. Fermentation of miso (Japan) and tauco (Indonesia), fermentation of tempeh and sufu.

Therapeutic uses of fermented foods. Bacteriocins produced by lactic.acid bacteria and propionic acid bacteria. Probiotics and intestinal replacement phenomena. Prebiotics and symbiotics, functional foods

Accomplished learning outcomes	*FF2_W01-07, FF2_U01-02, FF2_K01*
Verification methods, rules and criteria of outcome assessment	*Single-choice test plus one open-ended problematic-design question(100%)*

Classes	**0**	**hours**

Topics of the classes

Accomplished learning outcomes	*symbol of learning outcomes for the classes*
Verification methods, rules and criteria of outcome assessment	*together with participation in the final asessement (in %)*

Seminars	**0**	**hours**

Topics of the seminars	
Accomplished learning outcomes	*symbol of learning outcomesof the seminars*
Verification methods, rules and criteria of outcome assessment	*together with participation in the final asessement (in %)*

References:

Basic	*Bamforth, C. W. 20015. Food, Fermentation and Micro-organisms. Blackwell Science Publishing. University of California, Davis.* *Board, R.G.J., Jones, D., Jaris, B. 1995. Microbial Fermentations: Beverages, Foods and Feeds, Blackwell Science, Oxford, UK.* *Mazza, G. 2013. Handbook of Fermented Functional Foods, CRC Press, Boca Raton.*
Supplementary	*Shi, J., Mazza, G., Le Mauger, M. 2002. Functional Foods: Biochemical and Processing Aspects. CRC Press, Boca Raton.* *Wood, B.J.D. 1998. Microbiology of Fermented Foods, Volumes 1 and 2, Acedemic Press , New York*

Structure of learning outcomes:

Discipline: food technology and nutrition (DZ0104N)	*2*	ECTS**
Discipline: # (*provide appripriate symbol - if the course relates to more than one academic discipline*)	*0*	ECTS**

Structure of student activities:

Contact hours		32	hours	1,3	ECTS**
including:	lectures	30	hours		
	classes and seminars	0	hours		
	consultations	1	hours		
	participation in research	…	hours		
	mandatory trainerships	…	hours		
	participation in examinations	1	hours		
e-learning		…	hours	…	ECTS**
student own work		18	hours	0,7	ECTS**

Syllabus valid from the academic year 2021/2022

*** where 10 hours of classes = 1 ECTC (in case of 15 h → 2 ECTS)**

** stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25 - 30 hours of classes

academic discipline code: RZ - animal science and fishery, PB - biological sciences, etc.