

Course name: Food Biotechnology

ECTS	2
Course status	<i>optional, facultativ</i>
Course final assessment /evaluation of outcomes	<i>Exam</i>
Prerequisite	

Main field of study:**Dietetics**

Educational profile	General academic
Code of studies and education level	bachelor
Semester of studies	summer
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	Anna Starzyńska-Janiszewska, Robert Duliński

Learning outcomes:

Symbol of outcome	Description of the learning outcome	Reference to main field of study outcomes	Area symbol*
KNOWLEDGE – student knows and understands			
FB_W1	physiological, metabolic and molecular mechanisms of production and overproduction of organic acids, amino acids, proteins, enzymes, carbohydrates and other compounds; techniques for the production of biologically active substances for industrial use.	TŻ1_W01 TŻ1_W02	
FB_W2	molecular biology (genetic engineering) techniques and their areas of application in food science and food technology; the risks and hopes for man and the environment associated with the use of genetic manipulation.	TŻ1_W01 TŻ1_W02	
FB_W3	the role of microorganisms in carrying out bioprocesses; types of microorganisms; techniques for culturing microbial cells, plant, and animal tissue cultures.	TŻ1_W01 TŻ1_W02	
SKILLS – student is able to			
FB_U1	identify and analyse factors affecting the efficiency of nucleic acid isolation from food	TŻ1_U01	
FB_U2	plan the analytical procedure for the determination of the pectinolytic activity of preparations used in food processing.	TŻ1_U04	
FB_U3	select the best method and matrix for enzyme immobilisation	TŻ1_U07	
SOCIAL COMPETENCIES – student is ready to:			
FB_K1	work individually and as part of a team, make decisions, plan and organise work and manage time efficiently.	TŻ1_K02	
FB_K2	demonstrate responsibility for their own work and that of others in terms of safety.	TŻ1_K02	

Teaching contents

Lectures	15 hours
Topics	<p>Definition and classification of biotechnology. Food biotechnology as an interdisciplinary field of science. Development of food biotechnology over the years.</p> <p>Methods of genetic modification of organisms. Somatic hybridization by protoplast fusion. Induced mutagenesis - random and targeted (gene editing - techniques and perspectives). Transgenesis - methods and tools. Transgenic micro-organisms, plants and animals in food production. Examples of applications of the above in food biotechnology.</p> <p>Enzymatic modifications of food ingredients. Plant, animal, and microbial enzymes important for the food industry (e.g. recombinant chymosin). Immobilisation of enzymes and multi-enzyme systems - methods, advantages and limitations. Applications of immobilisation in food biotechnology and food industry (glucose isomerase, aspartase). Biosensors</p> <p>Selected bioprocesses in the food industry. Production of amino acids, organic acids, vitamins, biopreservatives, postbiotics by biosynthesis methods. Single cell oils. Microbial exopolysaccharides. Microbial protein. Products of extremophiles - enzymes, cryoprotectants.</p> <p>Introduction to in vitro plant and animal tissue culture techniques.</p> <p>Isolation and purification of proteins on an industrial scale. Conditions for biosynthesis processes involving microbial cells, plant, and animal cells. Solid-state and submerged fermentation systems. STR and PBR bioreactors. Biomass separation and disintegration equipment. Membrane and chromatographic techniques. Electrochemical methods and biological affinity.</p>

Accomplished learning outcomes	<i>FB_W1, FB_W2, FB_W3, FB_K1, FB_K2</i>
Means of verification, rules and criteria of assessment	<i>Written examination; a pass mark requires at least 51% correct answers to the questions asked. Contribution to the final course grade - 50%</i>

Classes:	15 hours
Topics	<p>Isolation, purification and detection of genomic DNA in food</p> <p>Immobilization of the enzyme by gel entrapment</p> <p>Determination of pectinesterase activity and amylolytic activity in preparations for industrial use</p>
Accomplished learning outcomes	<i>FB_U1, FB_U2, FB_U3, FB_K1, FB_K2</i>
Means of verification, rules and criteria of assessment	<i>Written test; a pass mark requires at least 51% correct answers to the questions asked. Contribution to the final course grade - 50%</i>

References:

Basic	<i>Basic Biotechnology, Ratledge C & Kristiansen B. (Eds.) Cambridge University Press, 2006</i> <i>Food Biotechnology, Shetty K., Paliyath G., Pometto A., Lavin R.E. (Eds.) Taylor & Francis Inc 2005</i>
Supplementary	Dysin, A. P., Egorov, A. R., Godzishhevskaya, A. A., Kirichuk, A. A., Tskhovrebov, A. G., & Kritchenkov, A. S. (2023). Biologically Active Supplements Affecting Producer Microorganisms in Food Biotechnology: A Review. <i>Molecules</i> , 28(3), 1413. https://doi.org/10.3390/molecules28031413

Structure of learning outcomes

Area of academic study: R – Agricultural, forestry and veterinary sciences	2 ECTS **
Area of academic study: T – technological sciences	ECTS**

Structure of student activity

Contact hours	32	hrs.	1.3	ECTS**
Including:	lectures	15	hrs.	
	classes and seminars	15	hrs.	

consultations	1	hrs.	
participation in research	0	hrs.	
obligatory traineeships	0	hrs.	
participation in examination	1	hrs.	
e-learning	0	hrs.	0 ECTS**
student own work	18	hrs.	0.7 ECTS**

*Areas of academic study in the fields of: H- humanities; S - social studies; P – biological sciences; T – technological sciences; M- medical, sport and health sciences; R – Agricultural, forestry and veterinary sciences; A – the arts

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