

**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*
<b>KNOWLEDGE – student knows and understands</b>			
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	
<b>SKILLS – student is able to</b>			
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	
<b>SOCIAL COMPETENCIES – student is ready to:</b>			

FB_K1	work individually and as part of a team, make decisions, plan and organise work and manage time efficiently.	TŽ1_K02	
FB_K2	demonstrate responsibility for their own work and that of others in terms of safety.	TŽ1_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).</p> <p>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>	
<b>References:</b>			
Basic	<p><i>Basic Biotechnology, Ratledge C &amp; Kristiansen B. (Eds.) Cambridge University Press, 2006</i></p> <p><i>Food Biotechnology, Shetty K., Paliyath G., Pometto A., Lavin R.E. (Eds.) Taylor &amp; Francis Inc 2005</i></p>		
Supplementary	<p>Dysin, A. P., Egorov, A. R., Godzishvskaya, A. A., Kirichuk, A. A., Tskhovrebov, A. G., &amp; Kritchenkov, A. S. (2023). Biologically Active Supplements</p>		

Affecting Producer Microorganisms in Food  
 Biotechnology: A Review. *Molecules*, 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