



Subject card

Subject name and code	Enzymatic Preparations Technology, PG_00058292						
Field of study	Biotechnology						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Optional subject group Subject group related to scientific research in the field of study		
Mode of study	Full-time studies	Mode of delivery			at the university		
Year of study	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Chemistry, Technology and Biochemistry of Food -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Izabela Sinkiewicz					
	Teachers	dr inż. Izabela Sinkiewicz dr inż. Paweł Filipkowski					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours		Self-study	SUM	
	Number of study hours	45	5.0		25.0	75	
Subject objectives	The aim of the lecture is to familiarize students with the currently available enzymes, present factors influencing the efficiency of enzymes, the ways of enzyme isolation and purification from biological material and the methods of immobilization and application of immobilized enzymes.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_U05] is able to apply instrumental methods of quantitative and qualitative analysis and studies on activity of biomolecules, select and apply diagnostic and analytical methods in the field of his/her specialty with particular emphasis on genetic, molecular and microbiological diagnostics and diagnostics based on antigen-antibody reaction	The student analyzes the factors affecting efficiency of enzyme. The student characterizes enzyme preparations. He chooses the type of preparation for a particular process in the food industry.			[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools		
	[K7_W08] has a profound knowledge of methods of obtaining biotechnological products, possibilities and limitations related to the design of biotechnological processes, understands the specificity of the biotechnological industry, both in terms of organization, management and economic analysis	Student describes methods of obtaining enzymes. He chooses the right way to isolate them. It measures the activity of enzyme preparations.			[SW1] Assessment of factual knowledge		
	[K7_W02] has advanced knowledge of structure and activity of enzymes and biologically active compounds also in pharmacological context, knows basic instrumental methods of qualitative and quantitative analysis and activity studies of biomolecules	The student describes industrial applications of enzymes. He studies changes in the activity and properties of enzymes after immobilization.			[SW1] Assessment of factual knowledge		

Subject contents	LECTURE. Properties of enzymes from different sources. Enzyme preparations used for food production. Principles of enzyme selection. Suitability of animal organs, plants and microorganism as enzyme sources. Advantageous consequences of microbiological methods of enzyme production. Preparation of enzymes from microorganisms: Influence of media composition and conditions, and time of microorganism cultivation on enzyme yield. Induction of enzyme synthesis. Selection and improvement of microorganism strains used as enzyme sources. Cultivations on liquid and solid media. Industrial methods of isolation and preliminary purification of enzymes: Methods of cell disruption. Extraction and preliminary purification of proteins by salting out, organic solvent fractionation and thermal precipitation. Chromatographic methods of enzyme purification. Recombinant enzymes and characteristic methods of their isolation and purification. Production and application of enzymes from animal and plant materials. Processes with immobilized cells and enzymes: Methods of immobilization and kinds of the supports. Changes of enzyme properties caused by immobilization. Examples of processes carried in membrane reactors. Applications of immobilized enzymes in industry and chemical analysis. Further improvement of enzymatic technologies: Application of enzymes which are active in enhanced or low temperatures. Development of membrane techniques and multienzyme systems. Application of genetic engineering in enzyme technology. LABORATORY. Isolation and making measurements of recombinant enzyme activity. Influence of temperature and pH on enzyme activity. Use of amylolytic preparations for the production of starch syrups. Use of proteolytic preparations for the production of protein hydrolysates.		
Prerequisites and co-requisites	Knowledge from the course of Biotechnology and Enzymology. Knowledge in area of enzyme structure and mechanism of enzyme catalysed reaction.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Lecture - written assessment	60.0%	50.0%
	Laboratory - laboratory practise	60.0%	50.0%
Recommended reading	Basic literature	<p>Praca zbiorowa pod redakcją J. Synowieckiego, Technologia preparatów enzymatycznych pochodzenia Mikrobiologicznego. Wyd. PG, Gdańsk, 2007.</p> <p>Whitehurst R.J., Van Oort M. (2016): Enzymy w technologii spożywczej. Wyd. PWN, Warszawa.</p> <p>Kołąkowski E., Bednarski W., Bielecki S. Enzymatyczna modyfikacja składników żywności. WAR, Szczecin, 2005.</p> <p>Ratledge C., Kristiansen B. (2011): Podstawy biotechnologii. PWN, Warszawa</p> <p>Bednarski W., Rejs A. (2001): Biotechnologia żywności. WNT, Warszawa.</p> <p>Porta R., Di Piero P., Mariniello L. (red.) (2008): Recent Research Developments in Food Biochemistry. Enzymes as Additives or processing aids. Research Signpost.</p> <p>Bednarski W., Rejs A. (2001): Biotechnologia żywności. WNT, Warszawa.</p> <p>Porta R., Di Piero P., Mariniello L. (red.) (2008): Recent Research Developments in Food Biochemistry. Enzymes as Additives or processing aids. Research Signpost.</p>	
	Supplementary literature	<p>Bednarski W., Rejs A. (2001): Biotechnologia żywności. WNT, Warszawa.</p> <p>Porta R., Di Piero P., Mariniello L. (red.) (2008): Recent Research Developments in Food Biochemistry. Enzymes as Additives or processing aids. Research Signpost.</p>	
	eResources addresses	<p>Adresy na platformie eNauzanie: Technologia preparatów enzymatycznych 2023/2024 - Moodle ID: 33531 https://enauzanie.pg.edu.pl/moodle/course/view.php?id=33531</p>	

Example issues/ example questions/ tasks being completed	Advantages and disadvantages of enzyme technology. Applications of proteolytic enzymes. Methods of enzyme immobilization.
Work placement	Not applicable