

SUBJECT/COURSE SYLLABUS

1.	Course name in Polish and English Enzymology Enzymologia
2.	Scientific discipline Medical sciences Biotechnology
3.	Language of instruction English
4.	Unit conducting the course Faculty of Biotechnology
5.	Type of course compulsory
6.	Field of study Biotechnology
7.	Level of study first-cycle
8.	Year of study 3rd
9.	Semester summer
10.	Course form and number of hours Laboratory, 45 h
11.	Prerequisites in terms of knowledge, skills and social competences for the course: <ul style="list-style-type: none"> • fundamental knowledge of general chemistry and protein structure-function relationships; • proficiency in biophysical methods (e.g., spectrophotometry) and biochemical calculations; • practical laboratory experience, including sample and buffer preparation; • skilled in basic office software like Excel and Word (or equivalent software).
12.	Learning objectives for the course are to equip students with: <ul style="list-style-type: none"> • the ability to calculate kinetic and thermodynamic parameters; • quantify enzyme-inhibitor binding;

	<ul style="list-style-type: none"> experimentally investigate the relationship between enzyme structure and catalytic function through targeted chemical modification. 		
13.	<p>Curriculum content:</p> <ul style="list-style-type: none"> determination of kinetic parameters (K_M, k_{cat}) for trypsin-catalyzed hydrolysis of the synthetic substrate BApNA. titration of active trypsin with the BPTI inhibitor to determine active enzyme and inhibitor concentrations. measurement of the association constant (K_a) for the chymotrypsin-BPTI interaction based on residual enzyme activity. site-specific chemical modification of serine residues in trypsin and chymotrypsin using PMSF and TLCK, and its subsequent effect on enzymatic activity. 		
14.	<table border="0"> <tr> <td style="vertical-align: top;"> <p>Description of learning outcomes</p> <p>Student:</p> <ul style="list-style-type: none"> defines and explains the physicochemical principles of enzymatic catalysis, including kinetic parameters (K_M, k_{cat}), substrate binding equilibria, and the thermodynamics of enzyme-catalyzed reactions; describes the molecular structure of enzymes and the chemical properties of amino acid residues that form the catalytic active site; applies advanced laboratory techniques to determine kinetic parameters and association constants; performs biochemical calculations and uses mathematical tools to analyze experimental data, such as titration curves and enzyme inhibition models; executes site-specific chemical modifications of proteins and evaluates their effect on biological function; prepares laboratory reports, including the analysis and interpretation of experimental data; demonstrates a commitment to lifelong learning and staying updated with new biotechnological trends by consulting scientific literature and expert resources; plans and organizes laboratory tasks, recognizing the need to consult with specialists when solving complex experimental problems; maintains ethical standards in scientific research and shows responsibility for the reliable presentation of experimental results. </td> <td style="vertical-align: top;"> <p>Symbols for relevant directional learning outcomes:</p> <p>K1_W01, K1_W02,</p> <p>K1_W04</p> <p>K1_U01, K1_U05</p> <p>K1_U06, K1_U07</p> <p>K1_U08</p> <p>K1_U09</p> <p>K1_K01, K1_K05</p> <p>K1_K02, K1_K03</p> <p>K1_K06</p> </td> </tr> </table>	<p>Description of learning outcomes</p> <p>Student:</p> <ul style="list-style-type: none"> defines and explains the physicochemical principles of enzymatic catalysis, including kinetic parameters (K_M, k_{cat}), substrate binding equilibria, and the thermodynamics of enzyme-catalyzed reactions; describes the molecular structure of enzymes and the chemical properties of amino acid residues that form the catalytic active site; applies advanced laboratory techniques to determine kinetic parameters and association constants; performs biochemical calculations and uses mathematical tools to analyze experimental data, such as titration curves and enzyme inhibition models; executes site-specific chemical modifications of proteins and evaluates their effect on biological function; prepares laboratory reports, including the analysis and interpretation of experimental data; demonstrates a commitment to lifelong learning and staying updated with new biotechnological trends by consulting scientific literature and expert resources; plans and organizes laboratory tasks, recognizing the need to consult with specialists when solving complex experimental problems; maintains ethical standards in scientific research and shows responsibility for the reliable presentation of experimental results. 	<p>Symbols for relevant directional learning outcomes:</p> <p>K1_W01, K1_W02,</p> <p>K1_W04</p> <p>K1_U01, K1_U05</p> <p>K1_U06, K1_U07</p> <p>K1_U08</p> <p>K1_U09</p> <p>K1_K01, K1_K05</p> <p>K1_K02, K1_K03</p> <p>K1_K06</p>
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15.	Mandatory literature: <ul style="list-style-type: none"> • Lab manual; Recommended literature: <ul style="list-style-type: none"> • Structure and Mechanism in Protein Science: A Guide to Enzyme Catalysis and Protein Folding: Alan Fersht, W. H. Freeman; • Enzyme Kinetics: Behavior and Analysis of Rapid Equilibrium and Steady-State Enzyme Systems: Irwin H. Segel, Wiley-Interscience. 	
16.	Methods of verification of the assumed learning outcomes: <ul style="list-style-type: none"> • lab report • written final test 	
17.	Conditions and form of credit for individual components of the course: <ul style="list-style-type: none"> • passing grade on a group lab report • passing the written examination. 	
18.	Student workload expressed in teaching hours and ECTS credits	number of hours allocated for the course of a given type of classes
	classes (according to the study plan) with the instructor: <ul style="list-style-type: none"> • theoretical introduction • laboratory 	45 h
	student's own work (including participation in group work) e.g.: <ul style="list-style-type: none"> • ongoing preparation for classes; • reviewing recommended literature; • preparation of a group lab report; • preparation for the final exam. 	30 h
	Total number of class hour	75 h
	Number of ECTS credits:	3 ECTS