



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Biocatalysis and biocatalysts [S1Bioinf1>BIOK]

### Course

Field of study  
Bioinformatics

Year/Semester  
3/6

Area of study (specialization)  
–

Profile of study  
general academic

Level of study  
first-cycle

Course offered in  
polish

Form of study  
full-time

Requirements  
elective

### Number of hours

Lecture  
15

Laboratory classes  
15

Other (e.g. online)  
0

Tutorials  
0

Projects/seminars  
0

### Number of credit points

2,00

### Coordinators

dr hab. inż. Jakub Zdarta prof. PP  
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### Lecturers

### Prerequisites

Knowledge of the basic issues of organic and bioorganic chemistry and biotechnology, as well as basic knowledge of the issues related to the processes of catalysis, biocatalysis and knowledge of enzymes as natural biocatalysts and their application.

### Course objective

Obtaining theoretical and practical knowledge about the processes of biocatalysis as well as about the properties and use of biocatalysts. Understanding the basic processes enabling the improvement of the properties of biocatalysts, with particular emphasis to the enzyme immobilization. Understanding the basic industrial and biotechnological processes in which biocatalysis and biocatalysts are used. Ability to select biocatalysts suitable for technological and biotechnological processes. Consolidation of knowledge through practical exercises.

### Course-related learning outcomes

Knowledge:

K\_W04 The student knows the issues of chemistry useful for formulating and solving simple bioinformatics tasks, covering the basic concepts and laws of chemistry, organic chemistry and

biochemistry

K\_W06 The student has knowledge of the structure of cells and functions of cell structures, biochemical basis of metabolic pathways

K\_W14 The student has knowledge of selected methods used in molecular biology, including methods using high-throughput technologies

K\_W20 The student knows the development trends of bioinformatics

K\_W19 The student has knowledge of the techniques and methods of identifying biomolecules and biologically active compounds

K\_W23 The student knows the basics of management, including quality management and running a business

Skills:

K\_U01 The student is able to obtain information from literature, databases and other properly selected sources, also in English

K\_U02 The student is able to integrate and interpret the information obtained, as well as draw conclusions and formulate and justify their opinions

K\_U03 The student is able to use basic laboratory techniques in the synthesis, isolation and purification of chemical compounds, including biomolecules and biologically active compounds

K\_U04 The student is able to use analytical methods for the quantitative and qualitative determination of biochemical compounds, assess their usefulness

K\_U07 The student is able to use analytical, simulation and experimental methods to formulate and solve research tasks under the supervision of a research tutor

Social competences:

K\_K01 The student is ready to learn throughout his life and improve his competences

K\_K05 The student is ready to take responsibility for the decisions made

K\_K07 The student is ready to think and act in an entrepreneurial manner

K\_K08 The student is ready to fulfill the social role of a university graduate

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Students' skills acquired as part of the lecturers and laboratory classes in both, stationary and remote (using ekursy platform) form are verified on the basis of the final test (stationary form of the test - exam (colloquium) in writing; evaluation criteria: 3 - 50.1% -70.0%, 4 - 70.1% -90.0%, 5 - from 90.1%; remote form of the test - exam (colloquium) in a multiple-choice test form using the ekursy platform; evaluation criteria: 3 - 50.1% -70.0%, 4 - 70.1% -90.0%, 5 - from 90.1%;) and on the basis of the developed and submitted documentation from the project and case studies carried out during the course (exercise reports).

## Programme content

The lectures include:

Description and characterization of biocatalytic processes; properties and characterization of biocatalysts; review of methods for the catalytic characterization and stability of enzymes; issues related to the improvement of the properties and stability of biocatalysts, with particular emphasis to the enzyme immobilization; properties and characterization of immobilized enzymes; application of free and immobilized enzymes for the production of biosensors and the basic characteristics of biosensors; practical use of enzymes and biocatalytic processes in the production of high-purity compounds and in the pharmaceutical industry; application of enzymes in biomass conversion processes and in environmental protection

Laboratory exercises include:

Characterization of catalytic properties of selected enzymes from different catalytic groups; preparation of immobilized enzyme systems; evaluation and comparison of thermal and chemical stability of free and immobilized enzymes; evaluation of the practical use of free and immobilized enzymes in biocatalytic reactions

## Teaching methods

Lectures, laboratory exercises.

## Bibliography

### Basic

1. J.M. Berg, J.L. Tymoczko, L. Stryer, Biochemia, Edycja siódma, PWN, Warszawa, 2010.
2. D.S. Sigman, Mechanisms of Catalysis, Academic Press, Cambridge, 1992.
3. P.D. Boyer, The Enzymes, Tom I-XVI, Academic Press, Cambridge, 1970.
4. T. Korzybski, Enzymy: nomenklatura i klasyfikacja, PWN, Warszawa, 1967.

### Additional

1. L. Cao, Carrier-bound Immobilized Enzymes: Principles, Applications and Design, Wiley-VCH Verlag GmbH, Weinheim, 2005
2. H. Uhlig, Industrial Enzymes and Their Applications, John Wiley & Sons, Inc., New York, 1998.
3. J. Zdzarta, A.S. Meye, T. Jesionowski, M. Pinelo, Multi-faceted strategy based on enzyme immobilization with reactant adsorption and membrane technology for biocatalytic removal of pollutants: A critical review, Biotechnology Advances, 37, 2010, 107401.
4. Publikacje naukowe związane z tematyką wykładu

## Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	0,50