



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

TECHNOLOGY OF ADVANCED BIOCATALYTIC SYSTEMS

### Course

Proposed by Discipline

Chemical sciences

Type of studies

Doctoral School

Form of study

full-time

Year/Semester

II/4, III/6

Course offered in

English

Requirements

elective

### Number of hours

Lecture

4

Tutorials

Projects/seminars

### Number of credit points

1

### Lecturers

Responsible for the course/lecturer:

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Faculty of Chemical Technology

Poznan University of Technology

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Responsible for the course/lecturer:

### Prerequisites

Knowledge: General information on organic chemistry, biochemistry, biotechnology and chemical technology/engineering. General knowledge on biocatalysis and its practical application. General knowledge on enzymes/peptides, their characteristic and practical application.

Skills: Ability of the student to obtain information from recommended literature sources. Ability of the student to use information obtained from the references to solve the existing problems related to biocatalysis and biocatalysts. Ability of the student to plan, design and develop basic solutions to improve process efficiency and its operational ability.

Social competencies: Thinking and critical assessment of the students knowledge. Understanding of the need for training, supplementing of the knowledge and improving students professional competences. Ability to work in a team and to collaborative solve the problems.



## Course objective

The main aim of the course is to familiarize PhD students with the most important issues of catalysis with particular attention to biocatalysis and biocatalysts. To familiarize students with the characterization and action of the enzymes and to present the most important issues related to characterization and practical application of the biocatalysis. Demonstration of the current large-scale applications of the enzymes. Presentation of the ways to improve properties of the enzymes with particular attention to enzyme immobilization. To familiarize students with advantages and disadvantages of the immobilization process and its requirements in order to obtain active and stable biocatalysts. Understanding the role of biocatalysis in the designing of novel catalytic solutions for various branches of industry. To familiarize students with the recent research trends and future directions for improve practical application of the biocatalysis.

## Course-related learning outcomes

### Knowledge

A PhD student who graduated from doctoral school knows and understands:

- 1) global achievements, covering theoretical foundations as well as general and selected specific issues that are relevant to scientific disciplines studied at the doctoral school, to the extent that enables revision of existing paradigms, [P8S\_WG/SzD\_W01]
- 2) key developmental trends of disciplines of science in which education at the doctoral school takes place, [P8S\_WG/SzD\_W02]
- 3) basic principles of knowledge transfer to the economic and social sphere as well as those of commercialization of results of scientific activities and know-how related to these results. [P8S\_WK/SzD\_W07]

### Skills

A PhD student who graduated from doctoral school can:

- 1) use knowledge from different branches of science to creatively identify, formulate and innovatively solve complex problems or to perform research tasks such as: - define the aim and subject of scientific research, form a research hypothesis, - develop research methods, techniques and tools and use them creatively, - draw conclusions on the basis of research results, [P8S\_UW/SzD\_U01]
- 2) critically analyze and assess scientific research results, work of experts and other creative activities together with their contribution into knowledge development, [P8S\_UW/SzD\_U02]
- 3) communicate on specialist issues on the level that allows active participation in the international scientific community. [P8S\_UK/SzD\_U04]

### Social competences

A PhD student who graduated from doctoral school is ready to:

- 1) critically assess achievements within a given scientific discipline, [P8S\_KK/SzD\_K01]
- 2) acknowledge the importance of knowledge in solving cognitive and practical problems, [P8S\_KK/SzD\_K03]
- 3) fulfilling the social obligations of researchers and creators, [P8S\_KO/SzD\_K04]
- 4) maintain and develop the ethos of research and creative communities, including:



- conducting independent scientific activity, - respecting the principle of public ownership of the results of scientific activities, including the principles of intellectual property protection. [P8S\_KR/SzD\_K07]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

PQF code	Methods for verification of learning outcomes	Assessment criteria
W01, W02, W07	Test - exam (colloquium) in writing	3 - 50.1%-70.0%, 4 - 70.1%-90.0%, 5 - from 90.1%
U01, U02, U04	Test - exam (colloquium) in writing	3 - 50.1%-70.0%, 4 - 70.1%-90.0%, 5 - from 90.1%
K01, U03, K04, K07	Test - exam (colloquium) in writing	3 - 50.1%-70.0%, 4 - 70.1%-90.0%, 5 - from 90.1%

### Programme content

1. Selected information on the catalysis, biocatalysis and biocatalysts.
2. Characterization and application of the biocatalytic reactions and their potential large-scale application.
3. Enzyme immobilization process, its advantages and disadvantages, process designing and its characterization.
4. Potential directions and reserach trends on practical application of biocatalysts.

### Teaching methods

Lecture: multimedia presentation including illustrations and examples.

### Bibliography

Basic

1. A. S. Bommarius, B. R. Riebel, Biocatalysis: Fundamentals and Applications, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, 2004.
2. L. Cao, Enzyme immobilization process, its advantages and disadvantages and process characterization, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, 2005.
3. A. J. J. Straathof, P. Adlercreutz, Applied Biocatalysis, CRC Press, Boca ranton, 2000.

Additional

1. C.T. Hou, Handbook of Industrial Biocatalysis, CRC Press, Boca Raton, 2019.



### Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,0
Classes requiring direct contact with the teacher	4	0,2
Student's own work (literature studies, preparation for tutorials, discussion, consultations with the teacher) <sup>1</sup>	21	0,8

<sup>1</sup> delete or add other activities as appropriate