



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Basic of Biotechnology

### Course

Field of study

Chemical Technology

Area of study (specialization)

Technical Electrochemistry

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

I/2

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

6

### Lecturers

Responsible for the course/lecturer:

prof. dr hab. inż. Ewa Kaczorek

Responsible for the course/lecturer:

### Prerequisites

The student should have basic knowledge in biology, chemistry of organic compounds and chemical technology. Is able to obtain information from the indicated sources, correctly interprets them and draws conclusions.

### Course objective

Transfer of knowledge to students on conducting biotechnological processes. The role of enzymes in biosynthesis, biodegradation and transformation processes. To become acquainted students with the



physiology and metabolomics of microorganisms. To familiarize students with the possibilities of practical use of microorganisms for the production of industrial compounds.

### Course-related learning outcomes

#### Knowledge

1. Student has knowledge of complex biotechnology processes involving correct selection of materials, raw materials, apparatus and equipment applied in the processes of neutralization and recovery and planning of laboratory experiments and drawing up the acquired results – [K\_W03]
2. Student has knowledge of materials, raw materials, products and biotechnological processes – [K\_W05]
3. Student has expanded knowledge about environmental protection associated with chemical processes and using their in a solving of biotechnological methods – [K\_W08]
4. Student has an established expertise in the field of safety and health at work in biotechnology – [K\_W10]

#### Skills

1. Student has skills to obtain the necessary information from the literature and other sources related to the biological sciences, the ability to link them with other sciences – [K\_U01]
2. Student can independently determine the direction of further education – [K\_U05]
3. Student is able to apply the acquired knowledge in order to develop a biotechnology process – [K\_U11]

#### Social competences

1. Student understands the need for self-study and improve their professional competence – [K\_K01]
2. Student is aware of the importance of microorganisms in the environment and biotechnological processes – [K\_K02]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Stationary exam / on-line exam through e-courses:

The knowledge acquired during the lecture is verified by a written exam consisting of 20 test questions and 5 open questions. Minimum number of points to pass: 50% of points. Multiple-choice test questions.

In the field of laboratory classes

The pass mark will be the correct execution of the planned exercises and passing the partial tests. In addition, the student is obliged to provide electronic reports on the conducted classes in electronic form for e-courses.



Assessment criteria In-class credit: test consisting of single-choice or multiple-choice test questions and open-ended questions. Minimum number of points to pass: 50% of points.

On-line credit: test consisting of single-choice or multiple-choice test questions and open questions. Minimum number of points to pass: 50% of points.

### Programme content

The course discusses issues related to the conduct of biotechnological processes and their use in various industries. These issues in particular concern: the history of biotechnology and its divisions, obtaining microorganisms for biotechnological processes, methods of cultivation of microorganisms: batch, fed-batch, continuous cultures; raw materials in the biotechnology industry; biocatalysis: the biochemistry of enzymes, enzymatic reactions and the factors determining its course, reaction kinetics, production and purification of enzymes, a class of enzymes, the use of industrial enzymes. Moreover, industrial microorganisms - technological and genetic characteristics. Fundamentals of genetic engineering. Biotechnology in environmental protection: bioremediation and composting, bio-fuels. Prospects for the development of biotechnology in the field of chemistry.

In the scope of laboratory classes:

1. Basic processes in biotechnology
2. Macro and microscopic observations of microorganisms
3. Preparation of microbiological preparations and structure of microorganisms
4. Conducting microbiological cultures
5. Enzymes and measurement of enzymatic activity
6. Isolation of bioactive compounds and natural dyes

### Teaching methods

Lecture with multimedia presentation, discussion with students, practical laboratory classes

### Bibliography

Basic

1. W. Bednarski, J. Fiedurka „Podstawy biotechnologii przemysłowej” Wydawnictwo Naukowo-Techniczne
2. A. Chmiel „Biotechnologia” Wydawnictwo Naukowe PWN
3. A. Jędrzcak „Biologiczne przetwarzanie odpadów” Wydawnictwo Naukowe PWN
4. E. Kołakowski, W. Bednarski, S. Bielecki „Enzymatyczna modyfikacja składników żywności” Wydawnictwo Akademii Rolniczej w Szczecinie, Szczecin 2005.



5. Z. Libudzisz, K. Kowal „Mikrobiologia techniczna” Wydawnictwo Politechniki Łódzkiej, Łódź, 2000.

Additional

1. M. K. Błaszczak „Mikroorganizmy w ochronie środowiska” Wydawnictwo Naukowe PWN

2. E. Klimiuk, M. Łebkowska „Biotechnologia w ochronie środowiska” Wydawnictwo Naukowe PWN, Warszawa 2003

3. S. Malepszy „Biotechnologia roślin” Wydawnictwo Naukowe PWN Warszawa 2004

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	80	3,2
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam) <sup>1</sup>	70	2,8

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