

<b>Course title</b> Procesy biotechnologiczne w przemyśle chemicznym / Biotechnological processes in the chemical industry		<b>ECTS code</b> 13.3.0720	
<b>Name of unit administrating study</b> Faculty of Chemistry			
<b>Studies</b>			
<b>Field of study</b>	<b>Type</b>	<b>Form</b>	
Chemical Business	Bachelor / Engineer	Full-time studies	
<b>Teaching staff</b> Dr Eng. Joanna Jeżewska-Fraćkowiak, dr Joanna Żebrowska			
<b>Forms of classes, the realization and number of hours</b>		<b>ECTS credits</b> 3	
<b>A. Forms of classes, in accordance with the UG Rector's regulations</b> lecture, laboratory classes		classes - 60 h tutorial classes – 5 h student's own work – 10 h	
<b>B. The realization of activities</b> in-class learning		Total: 75 h - 3 ECTS	
<b>C. Number of hours</b> 60 h (15 h lecture, 45 h laboratory classes)			
<b>The academic cycle</b> 2021/22 summer semester			
<b>Type of course</b> obligatory		<b>Language of instruction</b> Polish	
<b>Teaching methods</b> Experimental design Team work Conducting experiments Professional tour. Abstract and graphical abstract. Lecture with multimedia presentation.		<b>Form and method of assessment and basic criteria for evaluation or examination requirements</b> <b>A. Final evaluation, in accordance with the UG study regulations</b> lecture – exam laboratory classes – course completion (with a grade) <b>B. Assessment methods</b> Exam (activationg tasks during the lecture, followed by final test). Final grade assessment (Conducting the experiments during laboratory part, documentation and final test) <b>C. The basic criteria for evaluation or exam requirements</b> Lecture: 1. Test and open questions exam. 2. Final grade consistent with the scale given in UG Study Regulations 3. Additional term for the students, who didn't achieve 51% of possible assessment points. Laboratory 1. Conducting the experiments during laboratory part, according to the given protocol. 2. Technological project with tasks divided between students. 3. Laboratory report in a written form. 4. Participation in the professional tour. Abstract and graphical abstract presented. 5. Test.	
<b>Required courses and introductory requirements</b> None.			
<b>Aims of education</b> 1. Presenting the topics given in lecture course contents. 2. Presenting classical and molecular biotechnology processes in the chemical industry and molecular biotechnology applications perspective.			

### Course contents

#### A. Lecture topics:

Biotechnology process definitions and elements. Biotechnological process design for the purpose of chemical industry. Conventional and genetically modified organisms and their industrial applications. Native and recombinant enzymes sources for different branches of industry.

Characteristics of the chosen biotechnological processes in the chemical, pharmaceutical and plant protection products industry. Biotechnological processes in the waste management. Plants as bioreactors in the pharmacy. GMO, GMM main legal regulations in the biotechnological processes of the chemical industry.

#### B. Laboratory topics:

Biotechnological process of rennet cheese production. Microbiological composition of samples collected from the subsequent stages of the process. Biotechnological processes in the wastewater treatment.

### Bibliography of literature

#### A. Literature required to pass the course

Klimiuk E., Lebkowska M.: Biotechnologia w ochronie środowiska, PWN, 2005

Glick, B.R., Pasternak, J.J., Patten, C.L.: Molecular biotechnology: Principles and applications of recombinant DNA. ASM PRESS, 2009

#### B. Extracurricular readings

Libudzisz Z., Kowal K., Żakowska Z.: Mikrobiologia techniczna, tom 2, PWN 2008

Olańczuk-Neyman K.: Laboratorium z biologii środowiska, Wyd. PG, 1998

### Knowledge

1. Student knows the definitions of biotechnological process and its design principles, as well as biotechnological processes in different branches of the chemical, pharmaceutical and plant protection products industry.
2. Student knows conventional and genetically modified organisms applied in the chemical industry.
3. Student describes the mechanisms of wastewater treatment as well as waste neutralization biotechnological methods
4. Students knows basic principles of recruiting conventional and recombinant enzymes for industrial purposes.
5. Student knows possibilities of genetically modified organisms applications in different branches of chemical industry, as well as GMO, GMM main legal regulations and detection methodology.

### Skills

1. Student is able to plan tasks of the experiment in the biotechnological laboratory, applying GLP and safety rules.
2. Student plans biotechnological process of obtaining the product, involving usage of microorganisms and enzymes.
3. Student microbiologically characterizes samples, collected from the different stages of biotechnological process.
4. Student prepares written report of the performer laboratory work.
5. Student prepares written report with documentation in a form of abstract and graphical abstract.

### Social competence

1. Student understands need of further education.
2. Student carefully and critically expresses own opinions, bears in mind and values possibilities offered by modern biotechnology.
3. Student realizes the spectrum of possible biotechnological methods applications in the chemical industry.
4. Student plans and performs given tasks working independently and in team, is able to manage time and equipment. Prepares the schedule of tasks.