COURSE DESCRIPTION CARD - SYLLABUS

Course name
Biotechnology project - microbiological biotransformation [S1TOZ1>PBbm]

Course

Field of study
Circular System Technologies

Year/Semester
2/4

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
0

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
15

Number of credit points

1,00

Coordinators

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Lecturers

Prerequisites

Student has knowledge of the basic conceptual categories and terminology used in biotechnology and related industries (chemical, pharmaceutical and food). He knows the basics of functioning of biological systems and the basic characteristics of products obtained in these processes. They can obtain information from the indicated sources, interpret them correctly and draw conclusions.

Course objective

Learning to independently incorporate biotechnological processes into a series of classic chemical processes, with particular emphasis on biotransformation processes carried out by microorganisms

Course-related learning outcomes

Knowledge:
student:
has knowledge of mathematics, physics and chemistry necessary to describe the concepts, concepts and principles of closed-loop technology and the characteristics of connections and relationships between its components - k_w03
has knowledge of the development of ideas, goals, principles of operation and the organizational

structure of the circular economy; knows the economic, legal and administrative aspects of its functioning along with their interrelationships - k_w05
has a basic knowledge of the neutralization and recovery processes of industrial and municipal waste - k_w07
has knowledge of raw materials, products and processes used in closed-loop technologies - k_w10
has a basic knowledge of the life cycle of products, devices and installations used in closed-loop technologies - k_w12
he knows the nomenclature, construction and principle of operation of structural elements of machines and mechanical devices - k_w20
has basic knowledge related to the selection of devices used in closed-loop technologies - k_w21
has knowledge of the physical and chemical basis of unit operations of closed-loop technology - k_w22

Skills:
student:
can obtain information from literature, databases and other sources related to closed-loop technologies, also in a foreign language, integrate them, interpret them, draw conclusions and formulate opinions - k_u01
uses computer programs supporting the implementation of tasks typical for closed-loop technology - k_u02
has the ability to self-study, is able to use source information in polish and a foreign language in accordance with the principles of ethics, reads with understanding, conducts analyzes, syntheses, summaries, critical assessments and correct conclusions - k_u04
plans, selects equipment and scientific apparatus, carries out research, analyzes the results and formulates conclusions on this basis - k_u03
can interact with other people as part of work on closed-loop technology and of an interdisciplinary nature - k_u09
performs analysis, verifies existing technical solutions in the field of closed-loop technology - k_u11
is able to prepare mass and energy balances of both unit processes and entire installations occurring in closed loop technologies - k_u17
is able to make process designs of installations based on closed loop technologies - k_u20
is able to estimate production costs in installations based on closed loop technologies - k_u23

Social competences:
student:
independently determines and implements the action plan entrusted to him, defining priorities for its implementation, critically assesses the level of advancement in the implementation of the entrusted task - k_k03
thinks and acts in an entrepreneurial manner - k_k06
supports the idea of a harmonious, global civilization and economic development, promoting the principles of circular economy, sustainable development and rational management of natural environment resources on a local and global scale - k_k09

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Public presentation of the effects of the implementation of biological stages in the entire engineering process. The final grade is a weighted average of the grades from the preparation of multimedia presentations (weight 1), project documentation on bioprocesses (weight 2) and oral defense of the project (weight 2).

Programme content

As part of the course - biotechnology project - students learn the principles of conducting biotechnological processes and the necessary equipment, handling substrates, products as well as with microorganisms capable of effective biotransformation of substrates into desired products. In addition, they learn ways to separate end products for further technological processes. Students will have the opportunity to perform together with the person conducting the project a technological process based on the use of culturing microorganisms using biotechnological aspects, calculating the costs of such modernization, balance of profits and losses, as well as assessing the impact on the environment. In the

final stage, the student (groups of one or two) should complete and present a design of the selected technological process from the industry along with the adaptation of the appropriate biotechnological process to improve production. He/She should make a description, basic balance calculations, block diagram and technical and measurement diagram. The student will present the effects of work in the form of a short presentation of the project.

Teaching methods

Multimedia presentations, tasks for own work, consultations with the teacher, work with a computer

Bibliography

Basic
1. Chmiel A. Biotechnologia - Podstawy mikrobiologiczne i biochemiczne. Wydawnictwo Naukowe PWN , 1998.
2. Christi Y., Moo-Young M.: Bioreactor design. In: Basic Biotechnology. Ed. by Retledge and Christiansen B. Cambridge University Press, 2001.
3. Libudzisz Z., Kowal K. Mikrobiologia techniczna, tom I i II. Wydawnictwo Politechniki Łódzkiej.
4. Bednarski W., Fiedurka J. Podstawy biotechnologii przemysłowej. PWN
5. McNeil B., Harvey L.M. Fermentation a practical approach. IRL Press.
6. Immobilization of Enzymes and Cells. Second edition. Ed. By. Guisan J., M. In: Methods in Biotechnology 22, Humana Press Inc, Totowa, New Yersey, 2006.
7. Grajek W., Gumienna M., Lasik M., Czarnecki Z. (2008): Perspektywy rozwoju technologii produkcji bioetanolu z surowców skrobiowych. Przemysł Chemiczny 87 (11): 1094-1101.
8. Schűtte H.: Cell disruption. W: “Methods in biotechnology”. Red. Schmauder H.-P. Str.153-164, Taylor & Francis e-Library, 2005.
Additional
Current scientific articles in the field of biotechnology as well as chemical technology and industry.

Breakdown of average student's workload

	Hours	ECTS
Total workload	25	1,00
Classes requiring direct contact with the teacher	16	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	9	0,50