



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Principles of Biotechnology

Course

Field of study

Environmental Protection Technologies

Area of study (specialization)

-

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

3/6

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

60

Other (e.g. online)

0

Tutorials

15

Projects/seminars

0

Number of credit points

5

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Łukasz Chrzanowski

Responsible for the course/lecturer:

Prerequisites

Basic knowledge in the field of biology. The skills to use basic laboratory equipment with the respect to the Health and Safety rules. Presentation of short reports regarding a specific topic.

Course objective

The aim of this course is to familiarize the students with fundamental terms associated with biotechnology and to enhance their knowledge on the theoretical and practical aspects of working with microorganisms.

Course-related learning outcomes

Knowledge

K_W02 has knowledge of physics in the scope allowing to understand physical phenomena and processes occurring in chemical technology and environmental processes P6S_WG

K_W05 knows the principles of environmental protection related to chemical production and waste management P6S_WG P6S_WK



K_W11 has the knowledge sufficient to describe basic development trends related to environmental technologies P6S_WG P6S_WK

Skills

K_U01 obtains information from literature, databases and other sources related to chemical sciences, can integrate, interpret and draw conclusions from them as well as formulate opinions P6S_UW

K_U05 is able to prepare and present oral presentation on environmental technology issues in Polish and foreign languages P6S_UK

K_U18 is able to estimate the usefulness and selection of tools and methods for solving a problem in the field of environmental technology P6S_UW P6SI_UW

Social competences

K_K01 understands the need for further education and improvement of its professional and personal competences P6S_KKK

K_K04 is able to properly determine the priorities for the realisation of tasks set by themselves or others P6S_KKK

K_K07 understands the need to provide society - among others through the media - with information on the advantages and disadvantages of activities related to the production and use of chemicals, and is able to communicate such information in a way that is widely understood P6S_KO

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:

Exam in the form of a multiple choice test (with at least a single correct answer) – each question rated according to a 0-1 scale, completion at >50%.

Exercises:

A presentation on the most recent biotechnological achievements with a discussion.

Practical classes:

Tests based on the data from the previous lectures and extended with additional examples during the courses of exercises. Passing the exercises requires a total of >50% points.

Programme content

Lectures:

Historical outline of biotechnology and the directions of its further development. The selected aspects of biotechnology (agrobiotechnology, medical, industrial and environmental biotechnology). Definition



and basic classification of bioprocesses. The role of processes using microorganisms in different branches of biotechnology. Methods and techniques used for isolation and identification of microorganisms useful in biotechnology. Metabolic pathways as the basic principles of cellular biosynthesis. Relation between the growth phase of microorganisms and the products of their metabolism. Enzymes and biocatalysis. The means of achieving overproduction of metabolites. Characterisation of selected microbial traits, which are crucial for efficient biotechnological production. The basics behind genetic engineering. Kinetics and crucial parameters during biosynthesis of selected products (pharmaceuticals, biofuels, biosurfactants). Bioreactors and methods of conducting industrial production. Bioremediation and biological methods of decontaminating the environment.

Exercises:

Discussion on the most recent biotechnological achievements with an indication of the latest development trends (on examples). Preparation for an independent presentation of the selected topic during the last two units

Practical classes:

During the course, students will become familiar with the basic techniques used in microbiology: sterilization, culture establishment, culture holding and description of basic parameters for both microorganisms and individual microorganisms. Students are also acquainted with methods of modifying microorganisms in cultures (immobilization) and their abilities related to enzymatic properties of proteins.

Teaching methods

Lecture with a multimedia presentation, discussion with students.

Questioning of materials provided before the course: the preparation for sterilisation and understanding specifics of work with microorganisms. Preparation and microbial culture cultivation and assessing its parameters (optical density etc.). The analysis of enzymatic reactions performed by the students. The student makes calculations and summarizes the whole work with appropriate conclusions.

Bibliography

Basic

1. Basic Biotechnology, Colin Ratledge, Bjorn Kristiansen 2001
2. Biology of microorganisms, Brock, Madigan, Martinko, Dunlap, Clark 2009
3. Biotechnology: An Introduction, Susan R. Barnum 2006
4. Biotechnology from A to Z, Bains William Oxford University Press, 1998
5. Introduction to Biotechnology, William J. Thieman 2007



Additional

1. Introduction to molecular biology and molecular genetics, Wilczok, Tadeusz Tkacz, Magdalena A. Institute of Computer Science University of Silesia, 2009
2. Molecular biology and biotechnology: a comprehensive desk reference, Meyers, Robert Allen , Red. VCH, 1995
3. Environmental biotechnology : concepts and applications, Jördening Hans-Joachim. Red., Winter Josef. Red. Wiley-VCH, cop. 2005
4. Biochemistry, Voet Donald., Voet Judith G. John Wiley & Sons, 1995

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	5,0
Classes requiring direct contact with the teacher	105	3,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	45	1,5

¹ delete or add other activities as appropriate