



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Introduction to Biotechnology

Course

Field of study

Chemical Technology

Area of study (specialization)

Composites and Nanomaterials

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

I/2

Profile of study

general academic

Course offered in

English

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

30

Other (e.g. online)

0

Tutorials

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_W5 has knowledge of raw materials, products and biotechnological processes P7S_WG

K_W8 has an extended knowledge of environmental problems related to the implementation of chemical processes P7S_WG, P7S_WK

K_W7 knows modern methods of testing the structure and properties of materials, necessary to characterize raw materials and products of the chemical industry and related ones P7S_WG



Skills

K_U1 has the ability to obtain and critically evaluate information from literature, databases and other sources and formulate opinions and reports on this basis P7S_UW P7SI_UW

K_U6 has the ability to professionally present research results in the form of a report, dissertation or presentation P7S_UW P7S_UK

K_U15 is able to critically analyze industrial chemical processes and introduce modifications and improvements in this area, using the knowledge gained, including knowledge of the latest achievements of science and technology P7S_UW, P7SI_UW

Social competences

K_K1 is aware of the need for lifelong learning and further training P7S_KKK

K_K2 is well aware of the limitations of science and technology related to chemical technology, including environmental protection P7S_KKK

K_K6 can think and act in a creative and entrepreneurial way P7S_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%.

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.

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	125	5,0
Classes requiring direct contact with the teacher	65	2,6
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹	60	2,4

¹ delete or add other activities as appropriate