SZKOŁA GŁÓWNA GOSPODARSTWA WIEJSKIEGO

# Biotechnological use of bacteria

Educational subject description sheet

## Basic information

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| **Field of study**<br>Biotechnology<br>**Speciality**<br>-<br>**Organizational unit**<br>Faculty of Biology and Biotechnology<br>**Study level**<br>first cycle (engineering degree)<br>**Study form**<br>full-time studies<br>**Education profile**<br>General academic | **Didactic cycle**<br>2024/25<br>**Subject code**<br>BBTBTjS_D.310K.01612.24<br>**Lecture languages**<br>english<br>**Mandatory**<br>Elective subjects<br>**Block**<br>Major subjects<br>**Disciplines**<br>Biological sciences |

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| **Coordinator** | Iwona Gientka |
| **Teacher** | Iwona Gientka |

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| **Period**<br>Semester 5 | **Examination**<br>Pass with grade<br><br>**Activities and hours**<br>Lecture: 15<br>Laboratory exercises: 15 | **Number of ECTS points**<br>2 |

## Goals

| Code | Goal |
|---|---|
| C1 | The aim of the lectures is to familiarize students with the possibilities of biotechnological use of bacteria, regulation of biochemical pathways conditioning the overproduction of desired metabolites, technology of their production, purification and application. The aim of the exercises is to familiarize students with the biosynthesis of selected industrial metabolites. |

## Entry requirements

general microbiology, general biotechnology, biochemistry, physicochemical analytics
The student should know the general characteristics of prokaryotes, the basics of biochemistry and biotechnological processes, be able to perform basic physicochemical analyses, know and be able to use basic microbiological techniques.

## Subject's learning outcomes

| Code | Outcomes in terms of | Effects | Examination methods |
|---|---|---|---|
| **Knowledge – Student knows and understands:** | | | |
| W1 | the lists of prokaryotic organisms in biotechnology | BTj_K3_W06, BTj_K3_W09 | Written credit |
| W2 | the mechanisms of regulation of bacterial metabolism in order to overproduce metabolites | BTj_K3_W06, BTj_K3_W08, BTj_K3_W09, BTj_K3_W13_inz | Written credit |
| W3 | the bacteria used in the biotechnological process and the conditions of their cultivation in order to produce the desired metabolite | BTj_K3_W06, BTj_K3_W08, BTj_K3_W09, BTj_K3_W13_inz | Written credit |
| **Skills – Student can:** | | | |
| U1 | carry out the process of obtaining selected biotechnological products with the use of bacteria | BTj_K3_U01_inz, BTj_K3_U06_inz, BTj_K3_U21 | Written credit |
| U2 | use basic experimental and analytical techniques important in the control of biotechnological processes involving bacteria | BTj_K3_U01_inz, BTj_K3_U06_inz | Written credit |
| U3 | interpret the results of determinations important in biotechnological processes involving bacteria and formulate conclusions | BTj_K3_U21 | Written credit |
| **Social competences – Student is ready to:** | | | |
| K1 | apply knowledge in the microbial and biotechnological laboratory | BTj_K3_K03 | Report |

## Study content

| No. | Course content | Subject's learning outcomes | Activities |
|---|---|---|---|
| 1. | The student learns the methods and goals of the biotechnological use of bacteria for the overproduction of selected compounds. Overview of the conditions for obtaining selected biotechnological products with the participation of bacteria and the regulation of their metabolism. Traditional and innovative applications of bacteria in various branches of biotechnology. | W1, W2, W3 | Lecture |

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|---|---|---|---|
| 2. | The student is able to produce and purificate choosen bacterial metabolites. Conducting the processes of biosynthesis and secretion of selected biotechnological products with the participation of bacteria (independent work and in teams), with the analysis of their course (microbiological and physicochemical parameters), calculation of the efficiency of the process, interpretation of results and formulation of conclusions, as well as the practical application of the produced bacterial metabolites. | U1, U2, U3, K1 | Laboratory exercises |

## Course advanced

| Activities | Methods of conducting classes |
|---|---|
| Lecture | Lecture, E-learning - lecture part |
| Laboratory exercises | Teamwork, Laboratory (experiment), learning by experiment, Observation |

| Activities | Examination method | Percentage |
|---|---|---|
| Lecture | Written credit | 50% |
| Laboratory exercises | Written credit | 25% |
| Laboratory exercises | Report | 25% |

| Activities | Credit conditions |
|---|---|
| Lecture | Written credit |
| Laboratory exercises | tests during classes and preparation of a team analysis of a defined experiment |

## Literature

**Obligatory**

1. Glazer A.N., Nikaido H. Microbial biotechnology – Fundamentals of Applied Microbiology, Second Edition, Cambridge University Press 2007. eBook available for free.

**Optional**

1. Supportive materials (review papers, and books' chapters) will be provided by lecturer

## Calculation of ECTS points

| Activity form | Activity hours* |
|---|---|
| Lecture | 15 |
| Laboratory exercises | 15 |
| Preparing a report | 5 |
| Preparation for the test | 5 |

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| Preparation for the exam | 10 |
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| **Student workload** | **Hours**<br>50 |
| **Number of ECTS points** | **ECTS**<br>2 |

* hour means 45 minutes

## Effects

| Code | Content |
|---|---|
| BTj_K3_K03 | The graduate is ready to for safe work via the selection and application of a proper technique of handling, storing and disposing of laboratory materials (e.g. using proper techniques in terms of handling, storing and disposing of bacteria, chemical substances and dangerous bio-waste); |
| BTj_K3_U01_inz | The graduate can utilise proper techniques and knowledge related to biotechnology in practice, under the care of a supervisor; |
| BTj_K3_U06_inz | The graduate can use laboratory equipment in order to gather observations and data |
| BTj_K3_U21 | The graduate can coping with understanding, planning and analysing; being able to interpret and report biological data acquired while working individually and in a group; |
| BTj_K3_W06 | The graduate knows and understands the functions of various cells (prokaryotic and eukaryotic), being able to critically explain, how their properties are related to varying biological functions, knowing how they can be tested experimentally |
| BTj_K3_W08 | The graduate knows and understands the features of cellular metabolism and its control, including the knowledge of certain experimental techniques; |
| BTj_K3_W09 | The graduate knows and understands living organisms and their place in the natural environment, and how they can be used for the good of humanity; |
| BTj_K3_W13_inz | The graduate knows and understands the importance of processes necessary to asses and initiate research in the field of biotechnology; |