SZKOŁA GŁÓWNA GOSPODARSTWA WIEJSKIEGO

Biotechnological use of yeast

Educational subject description sheet

Basic information

Field of study Biotechnology **Speciality** - **Organizational unit** Faculty of Biology and Biotechnology **Study level** first cycle (engineering degree) **Study form** full-time studies **Education profile** General academic	**Didactic cycle** 2024/25 **Subject code** BBTBTjS_D.320.01626.24 **Lecture languages** english **Mandatory** Elective subjects **Block** Major subjects **Disciplines** Biological sciences

Coordinator	Kamil Piwowarek
Teacher	Kamil Piwowarek

Period Semester 6	**Examination** Pass with grade **Activities and hours** Lecture: 15 Laboratory exercises: 15	**Number of ECTS points** 2

Goals

Code	Goal
C1	Introduction of yeast characteristics and the use of yeast in biotechnology and fermentation industry

Entry requirements

Information of biochemistry, general microbiology, food microbiology.
Basic knowledge of the transformation of proteins, fats and carbohydrates and the participation of enzymes in these processes.

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	the morphological and physiological features of yeast enabling their identification and use in various biotechnological processes	BTj_K3_W06, BTj_K3_W08, BTj_K3_W09	Written credit, Report, Test (written or computer based)
W2	the technologies in which yeast is used	BTj_K3_W01_inz, BTj_K3_W08, BTj_K3_W09	Written credit, Report, Test (written or computer based)
Skills – Student can:			
U1	plan and carry out experiments on the use of biological material in the production process	BTj_K3_U12_inz, BTj_K3_U13_inz	Report, Test (written or computer based)
U2	critically assess the functionality and legitimacy of technical and technological solutions used in the biotechnological process (e.g. process conditions related to the multiplication of biological material, selected devices and unit operations related to the extraction, purification and preservation of the bioproduct)	BTj_K3_U09_inz, BTj_K3_U10_inz	Report, Test (written or computer based)
Social competences – Student is ready to:			
K1	update, store and increase knowledge on biotechnology topics	BTj_K3_K01, BTj_K3_K02	Report

Study content

No.	Course content	Subject's learning outcomes	Activities
1.	Systematic, morphological and physiological characteristics of yeasts important in biotechnology. Overview of the processes related to the use of yeast in the fermentation industry (yeast, baking, distilling, winemaking, brewing). Protein synthesis (SCP), obtaining vitamins, lipids, biosurfactants, etc. The use of yeast to obtain biopreparations (bioaccumulation of elements).	W1, W2, U1, U2, K1	Lecture

No.	Course content	Subject's learning outcomes	Activities
2.	The morphology of different yeast species. Study of the physiological properties of selected yeast species. Identification of a selected yeast species on the basis of morphological and physiological characteristics. Wine yeast. Fermentation properties of various strains of wine yeast. Preparation of settings and setting of wine fermentation. Assessment of different strains of wine yeast on the basis of chemical and organoleptic analysis of wine. Alcoholic fermentation - distilling. Grain mash and molasses wort as substrates for alcoholic fermentation. Preparation of substrates and inoculation. Analysis of the mash and evaluation of the efficiency of the alcoholic fermentation process. Production of baker's yeast biomass. Preparation of substrates and setting of the culture. Evaluation of the efficiency of the biomass breeding process.	W1, W2, U1, U2	Laboratory exercises

Course advanced

Activities	Methods of conducting classes
Lecture	Lecture, E-learning - lecture part
Laboratory exercises	Discussion, Teamwork, Individual work, Laboratory (experiment), learning by experiment

Activities	Examination method	Percentage
Lecture	Written credit	50%
Laboratory exercises	Test (written or computer based)	37.5%
Laboratory exercises	Report	12.5%

Activities	Credit conditions
Lecture	The student must pass the laboratory exercises before taking the credit. The credit is passed when the student obtains at least 51% of the points.
Laboratory exercises	Conditions for passing the classes: tests, reports from classes. The student must obtain a positive grade (at least 51%) in each component.

Literature

Obligatory

1. Bisson LF (2004) The Biotechnology of Wine Yeast, Food Biotechnology, 18(1), 63-96.
2. Nandya SK, Srivastava RK (2018) A review on sustainable yeast biotechnological processes and applications, Microbiological Research, 207, 83-90.
3. Willaert RG (2018) Yeast Biotechnology 2.0, Fermentation, 4(4), 98.
4. Willaert RG (2021) Yeast Biotechnology 4.0, Fermentation, 7, 69.
5. Mattanovich D, Sauer M, Gasser B (2014) Yeast biotechnology: teaching the old dog new tricks, Microbial Cell Factories, 13, 34.

Calculation of ECTS points

Activity form	Activity hours*
Lecture	15
Laboratory exercises	15
Preparing a report	5
Preparation for the test	10
Preparation for exercises	5
Student workload	**Hours** 50
Number of ECTS points	**ECTS** 2

* hour means 45 minutes

Effects

Code	Content
BTj_K3_K01	The graduate is ready to proper storage of data, updating and extending knowledge on topics related to biotechnology and the related sciences;
BTj_K3_K02	The graduate is ready to development and application of one’s skills in practice (including communication, teamwork), which enable effective lifelong learning with respect to biological sciences;
BTj_K3_U09_inz	The graduate can preliminarily asses the economic effect of the proposed modifications of a biotechnological process;
BTj_K3_U10_inz	The graduate can critically assess the functionality and validity of technical and technological solutions used in a biotechnological process;
BTj_K3_U12_inz	The graduate can plan and perform experiments related to the preparation, creation and utilisation of biological material in a production process;
BTj_K3_U13_inz	The graduate can propose analytical methods and plan an experiment for solving engineering tasks related to various stages of creating a biotechnological product;
BTj_K3_W01_inz	The graduate knows and understands technologies of performing biotechnological processes
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;