SZKOŁA GŁÓWNA GOSPODARSTWA WIEJSKIEGO

Green synthesis of metal nanoparticles

Educational subject description sheet

Basic information

Field of study Biotechnology	**Didactic cycle** 2024/25
Speciality -	**Subject code** BBTBTjS_D.310K.01615.24
Organizational unit Faculty of Biology and Biotechnology	**Lecture languages** english
Study level first cycle (engineering degree)	**Mandatory** Elective subjects
Study form full-time studies	**Block** Major subjects
Education profile General academic	**Disciplines** Biological sciences

Coordinator	Marta Kutwin, Malwina Sosnowska-Ławnicka
Teacher	Marta Kutwin

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

Goals

Code	Goal
C1	To acquaint students with the methods of nanostructure syntheses with the use of plant materials and microorganisms

Entry requirements

The student knows the structure of animal and plant cells as well as the basics of physics and biophysics in laboratory research

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	how to develop a task plan related to the researcher's needs	BTj_K3_W01_inz	Written credit
W2	the methods of synthesis of nanostructures employing plant materials	BTj_K3_W07_inz	Written credit, Project
Skills – Student can:			
U1	plan the synthesis of nanostructures with the use of selected plant materials	BTj_K3_U01_inz	Written credit, Project
U2	prepare a written study in the field of scientific discipline relevant for the field of study	BTj_K3_U02_inz, BTj_K3_U13_inz, BTj_K3_U14_inz	Written credit, Project
Social competences – Student is ready to:			
K1	develop research on the green synthesis of nanostructures	BTj_K3_K01	Written credit, Project

Study content

No.	Course content	Subject's learning outcomes	Activities
1.	Review of nanoparticle synthesis methods. Definitions of green synthesis. Ecological and economic aspects of the application of plant materials in the synthesis of nanostructures. Plant raw materials as a source of factors that reduce and stabilize the nucleation reactions of nanostructures. Selection of appropriate plant raw materials for nanoparticle syntheses in terms of the presence of active substances. Influence of the synthesis parameters on the reaction efficiency and the quality of the final product. Trends in green synthesis of nanoparticles.	W1, W2, U1, U2, K1	Lecture
2.	Synthesis and material analysis of nanoparticles from plant material obtained by students	W2, U1, U2, K1	Laboratory exercises

Course advanced

Activities	Methods of conducting classes
Lecture	Lecture, Discussion
Laboratory exercises	Teamwork, Laboratory (experiment), learning by experiment

Activities	Examination method	Percentage
Lecture	Written credit	50%
Laboratory exercises	Project	50%

Activities	Credit conditions
Lecture	Written work - credit -
Laboratory exercises	project

Literature

Obligatory

1. GOOD LABORATORY PRACTICE (GLP) Quality practices for regulated non-clinical research and development, World Health Organization 2009
2. Philip Moriarty. Nanotechnology: A Very Short Introduction. Oxford press. 2022
3. J. B. Ketterson. The Physics of Solids.Oxford press.2016

Optional

1. Sosnowska, Malwina, et al. "Green synthesis of silver nanoparticles by using aqueous mint (Mentha piperita) and cabbage (Brassica oleracea var. capitata) extracts and their antibacterial activity." Annals of Warsaw University of Life Sciences-SGGW. Animal Science 56 (2017).
2. Sharma, Virender K., Ria A. Yngard, and Yekaterina Lin. "Silver nanoparticles: green synthesis and their antimicrobial activities." Advances in colloid and interface science 145.1-2 (2009): 83-96.
3. Gour, Aman, and Narendra Kumar Jain. "Advances in green synthesis of nanoparticles." Artificial cells, nanomedicine, and biotechnology 47.1 (2019): 844-851.

Calculation of ECTS points

Activity form	Activity hours*
Lecture	15
Laboratory exercises	15
Preparation for the exam	10
Preparing the project	10
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_U01_inz	The graduate can utilise proper techniques and knowledge related to biotechnology in practice, under the care of a supervisor;
BTj_K3_U02_inz	The graduate can perform and present an independent experiment (a final diploma thesis), which reflects features such as: e.g. competences associated with the ability of proper time management, solving a research problem as well as performing tasks and interpreting the quality of results;
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_U14_inz	The graduate can translate the results of experiments into practical solutions;
BTj_K3_W01_inz	The graduate knows and understands technologies of performing biotechnological processes
BTj_K3_W07_inz	The graduate knows and understands experimental methods serving the examination of important areas in the field of biotechnology, chemistry, biochemistry, biophysics, molecular biology and the related sciences;