SZKOŁA GŁÓWNA GOSPODARSTWA WIEJSKIEGO

Principles of Nanobiotechnology

Educational subject description sheet

Basic information

Field of study
Course Offer for exchange students - second cycle studies, including uniform master studies (MA programmes)

Speciality
-

Organizational unit
Course Offer for exchange students

Study level
second cycle studies, including uniform master studies (MA programmes)

Study form
full-time studies

Education profile
General academic

Didactic cycle
2024/25

Subject code
PWMPWM2S_D.B100000P.06422.24

Lecture languages
english

Mandatory
Elective subjects

Block
Basic subjects

Disciplines

Coordinator	Marta Kutwin
Teacher	Marta Kutwin

Period	**Examination**	**Number of ECTS points**
Winter semester	Pass with grade **Activities and hours** Lecture: 15 Laboratory exercises: 26 Ćwiczenia seminaryjne: 4	5

Goals

Code	Goal
C1	The course will focus on the use of biological systems in the research area of nanomedicine.

Entry requirements

basic knowledge from biology, chemistry and physic

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	know definitions of nanotechnology and nanobiotechnology		Project, Test (written or computer based)
W2	know and understand the principles of methods and techniques of preliminary evaluation of toxicity and biocompatibility of nanomaterials		Project, Test (written or computer based), Assessment of activity during classes
Skills – Student can:			
U1	perform experiments on the biocompatibility of selected nanomaterials		Project, Test (written or computer based)
U2	perform experiments on the toxicity of nanomaterials using chicken embryo model		Project, Test (written or computer based), Assessment of activity during classes
U3	apply knowledge about nanomaterials for designing new experiments regarding the current issue of nanomedicine		Project, Test (written or computer based)
Social competences – Student is ready to:			
K1	can combine theoretical and practical knowledge		Project, Test (written or computer based), Assessment of activity during classes
K2	is ready to use his/her knowledge and skills in further stages of education		Project, Test (written or computer based), Assessment of activity during classes

Study content

No.	Course content	Subject's learning outcomes	Activities

1.	• Principle of nanotechnology. Nanomaterials in practice and in medicine – past, present and future. Lectures. • Nanomaterials (nanoparticles of metals, carbon allotropes and others) and their visualization and physicochemical characterization. Lectures and laboratory practice. • Interaction of the nanomaterials with the structures of living organism. Evaluation of nanomaterials with DNA and proteins. Laboratory practice and seminar. • Evaluation of the toxicity and biocompatibility of nanomaterials in the experiments with chicken embryo model. Lectures and laboratory practice. • The angiogenesis as an assay of nanoparticles bioactivities. Chicken embryo implants model. Lecture and laboratory practice. • Evaluation of toxicity and biocompatibilities of nanomaterials using mesenchymal stem cells, collected from chicken embryo. Laboratory practice. • Evaluation, preparation, presentation and discussion of the results of experiments.	W1, W2, U1, U2, U3, K1, K2	Lecture, Laboratory exercises, Ćwiczenia seminaryjne

Course advanced

Activities	Methods of conducting classes
Lecture	Conversation lecture
Laboratory exercises	Laboratory (experiment), learning by experiment
Ćwiczenia seminaryjne	Individual work

Activities	Examination method	Percentage
Lecture	Test (written or computer based)	50%
Laboratory exercises	Project	45%
Ćwiczenia seminaryjne	Assessment of activity during classes	5%

Activities	Credit conditions
Lecture	>51%
Laboratory exercises	>51%
Ćwiczenia seminaryjne	attendance at classes

Literature

Obligatory

1. Niemeyer, C. M., & Mirkin, C. A. (Eds.). (2004). Nanobiotechnology: concepts, applications and perspectives (Vol. 1). John Wiley & Sons.
2. Morais, M. G. D., Martins, V. G., Steffens, D., Pranke, P., & da Costa, J. A. V. (2014). Biological applications of nanobiotechnology. Journal of nanoscience and nanotechnology, 14(1), 1007-1017.
3. Prasad, R., Kumar, V., Kumar, M., & Choudhary, D. K. (Eds.). (2019). Nanobiotechnology in bioformulations. Cham: Springer International Publishing.

Optional

1. Chavda, V. P. (2019). Nanotherapeutics and nanobiotechnology. In Applications of Targeted Nano Drugs and Delivery Systems (pp. 1-13). Elsevier.
2. Reddy, M. C., Murthy, K. R., Srilakshmi, A., Rao, K. S., & Pullaiah, T. (2015). Phytosynthesis of eco-friendly silver nanoparticles and biological applications–a novel concept in nanobiotechnology. African Journal of Biotechnology, 14(3), 222-247.
3. Thangavelu, R. M., Gunasekaran, D., Jesse, M. I., SU, M. R., Sundarajan, D., & Krishnan, K. (2018). Nanobiotechnology approach using plant rooting hormone synthesized silver nanoparticle as “nanobullets” for the dynamic applications in horticulture–an in vitro and ex vitro study. Arabian Journal of Chemistry, 11(1), 48-61.
4. Srivastava, S., & Bhargava, A. (2022). Green nanoparticles: the future of nanobiotechnology (pp. 1-352). Berlin/Heidelberg, Germany: Springer.
5. Vadlapudi, V., & Kaladhar, D. S. V. G. K. (2014). Green synthesis of silver and gold nanoparticles. Middle East J Sci Res, 19(6), 834-842.

Calculation of ECTS points

Activity form	**Activity hours***
Lecture	15
Laboratory exercises	26
Ćwiczenia seminaryjne	4
Preparing a report	30
Preparation for the exam	30
Self-study on the content covered in class	45
Student workload	**Hours** 150
Number of ECTS points	**ECTS** 5

* hour means 45 minutes