SZKOŁA GŁÓWNA GOSPODARSTWA WIEJSKIEGO

Nanotechnology and Neurobiology

Educational subject description sheet

Basic information

Field of study Biotechnology	**Didactic cycle** 2024/25
Speciality -	**Subject code** BBTBTjS_D.320.01622.24
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	Michał Godlewski
Teacher	Michał Godlewski

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

Goals

Code	Goal
C1	The aim of monographic lectures of neurobiology is to give students current knowledge regarding neurophysiology and nerve system
C2	The aim of seminars is to give students current knowledge on selected topics about use and potential of nanotechnology in biotechnology and medicine, nanomaterials interactions with living organism and nanotoxicity

Entry requirements

Information on animal physiology.
Scientific curiosity, critical thinking, analytical skills

Subject's learning outcomes

Code	Outcomes in terms of	Effects	Examination methods
Knowledge – Student knows and understands:			
W1	the terms and theories regarding neurophysiology and nerve cells as well as interplay between elements of nerve system in the living organism	BTj_K3_W06, BTj_K3_W07_inz, BTj_K3_W09, BTj_K3_W10	Written credit
W2	the terms and theories regarding nanotechnology and utilization of nanotechnology in biotechnology and medicine	BTj_K3_W01_inz, BTj_K3_W06, BTj_K3_W07_inz, BTj_K3_W08, BTj_K3_W10, BTj_K3_W13_inz	Presentation
Skills – Student can:			
U1	critically review available scientific knowledge and can draw his own opinion and conclusions from researched topic	BTj_K3_U04_inz, BTj_K3_U08_inz, BTj_K3_U22	Presentation
U2	present and discuss researched topic on the group forum	BTj_K3_U18, BTj_K3_U22	Presentation
Social competences – Student is ready to:			
K1	perform individual and group work and communication	BTj_K3_K01, BTj_K3_K02, BTj_K3_K06, BTj_K3_K07	Presentation
K2	formulate strategy regarding storage, actualization and enhancement of biotechnological knowledge	BTj_K3_K01, BTj_K3_K02, BTj_K3_K05, BTj_K3_K06, BTj_K3_K07	Presentation
K3	prepare and give a presentation of the thesis and defend presented arguments	BTj_K3_K01, BTj_K3_K02, BTj_K3_K05, BTj_K3_K06, BTj_K3_K07	Presentation

Study content

No.	Course content	Subject's learning outcomes	Activities
1.	Nerve cells; Blood-brain barrier; Neuron and neuronal theory; Signal conduction and modulation; Degeneration, regeneration, neuronal growth, Cannon-Rosenbluth law; Development of nerve system; Development of brain; Migration of nerve cells; Synaptogenesis; Neuronal plasticity; Neurotrophic factors; Sex dimorphism of brain; Central and peripheral nerve system; Somatic nerve system; Autonomic nerve system; Limbic system; Instinct and control of behaviour; Pain; Sensory integration.	W1	Lecture

No.	Course content	Subject's learning outcomes	Activities
2.	Student seminars on selected topics about use and potential of nanotechnology in biotechnology and medicine: Nanoscale; Surface effect vs. volume effect; nanoparticles; Nanointerface; Nanodetectors; Nanomaterials in the industry; Nanomaterials in the medicine; Nanomaterials in food production; Nanomaterials interactions with living organism; Nanotoxicity.	W2, U1, U2, K1, K2, K3	Auditorium exercises

Course advanced

Activities	Methods of conducting classes
Lecture	Lecture
Auditorium exercises	Analysis of source materials

Activities	Examination method	Percentage
Lecture	Written credit	62.5%
Auditorium exercises	Presentation	37.5%

Activities	Credit conditions
Lecture	Neurobiology: written credit with 5 open questions, maximum 25 points. Student must accumulate at least 13 points from exam.
Auditorium exercises	Nanotechnology: maximum 15 points for presented seminar (10 for merit, 5 for presentation skills). Student must accumulate at least 8 points from seminar.

Literature

Obligatory

1. JG Cunningham BG Klein Saunders, ELSEVIER, 2007, Textbook of Veterinary Physiology.
2. WF Boron, EL Boulpaep. Medical Physiology Updated Ed.: With STUDENT CONSULT Online Access; Saunders, 2004,
3. Schmidt-Nielsen. Animal physiology. Adaptation and environment. V ed. Cambridge University Press 1997

Optional

1. R. Jelinek. “Biomimetics, a molecular perspective”. De Gruyter, 2013.
2. A. Mendez-Vilas. “Current Microscopy Contributions to Advances in Science and Technology, Microscopy Book Series #5”. Formatex, Spain, 2012.
3. A. Mendez-Vilas. “Microscopy and imaging science: practical approaches to applied research and education, Microscopy Book Series #7”. Formatex, Spain, 2017
4. E.M. Goldys. Fluorescence applications in biotechnology and the life sciences. Wiley-Blackwell 2009
5. https://www.pubmed.ncbi.nlm.nih.gov

Calculation of ECTS points

Activity form	Activity hours*

Lecture	15
Auditorium exercises	15
Conducting literature research	10
Preparation for the exam	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_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_K05	The graduate is ready to for thinking and acting in an entrepreneurial way
BTj_K3_K06	The graduate is ready to presenting justified arguments supporting one’s standpoint regarding scientific, ethical and social topics influencing the progress in biological sciences;
BTj_K3_K07	The graduate is ready to recognising the scope and ethical nature of the effects of utilising biotechnology and its impact on the society; settling ethical dilemmas related to the work of a biotechnologist;
BTj_K3_U04_inz	The graduate can present and discuss key principles of scientific interdisciplinary bases, as well as a multidisciplinary approach to the processes and mechanisms of life;
BTj_K3_U08_inz	The graduate can assess the social, economic and legal conditions of the activities of a biotechnologist;
BTj_K3_U18	The graduate can coherently communicate within the scope of the topics pertaining to biotechnology both with specialists and with outside receivers;
BTj_K3_U22	The graduate can find and assess information from various sources, including from original research, and present in a well organised manner (e.g. essays, reports and laboratory reports);
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_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;
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_W10	The graduate knows and understands terms, principles and theories related to processes and mechanisms which have shaped the world of nature, knowing how they can be used efficiently;
BTj_K3_W13_inz	The graduate knows and understands the importance of processes necessary to asses and initiate research in the field of biotechnology;