KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI

Projekt współfinansowany przez Unię Europejską w ramach Europejskiego Funduszu Społecznego

UNIA EUROPEJSKA
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FUNDUSZ SPOŁECZNY

Course title	ECTS code
Biotechnology in environmental protection	13.3.0399

Name of unit administrating study

null

Studies

faculty	field of study	type	drugiego stopnia
Wydział Chemii	Chemia	form	stacjonarne
		specialty	chemia i technologia środowiska
		specialization	wszystkie

Teaching staff

dr Joanna Jeżewska-Frąckowiak; dr Joanna Żebrowska; dr Daria Krefft; dr hab. Elżbieta Kamysz, profesor uczelni; mgr Maciej Prusinowski; mgr Małgorzata Witkowska

Forms of classes, the realization and number of hours	ECTS credits
Forms of classes	3
Laboratory classes, Lecture	classes 45 h
The realization of activities	Tutorial classes 5 h
classroom instruction	Student's own work 25 h
Number of hours	TOTAL: 75 h - 3 ECTS
Lecture: 15 hours, Laboratory classes: 30 hours	

The academic cycle

2022/2023 summer semester

Type of course	Language of instruction
obligatory	polish

Teaching methods	Form and method of assessment and basic criteria for eveluation or examination requirements
- conducting experiments	**Final evaluation**
- discussion	- Graded credit
- multimedia-based lecture	- Examination
	Assessment methods
	- written exam with open questions
	- (mid-term / end-term) test
	- assignment work – project or presentation
	- assignment work – completing a specific practical assignment
	- written exam (test)
	The basic criteria for evaluation
	• Lecture The final grade combines the results from the test exam and student's involvement and activity during the semester (voice in the discussion, presentation during the lecture, lecture test). Final grade consistent with the scale given in UG Study Regulations • Laboratory: Performing the experiments given for the lab course and completing the test.

Method of verifying required learning outcomes

Required courses and introductory requirements

A. Formal requirements

B. Prerequisites	
none	

Aims of education

1. Presenting the topics given in lecture course contents.

2. Presenting the topics of classical biotechnology in environmental protection and introducing the modern problems and perspectives of molecular biotechnology methods application

Course contents

A. Lecture topics:

Definitions and spectrum of interests of the biotechnology in environmental protection, phylogenetic tree of life, molecular cloning, cloning of organisms, microorganisms number in the environmental samples, PCR methodology, GMO detection principle, modern biotechnology applications, anthropogenic pollutions, biotechnological processes in the environment protection, cellular localization of biodegradation processes, genetic engineering of biodegradative pathways, activated sludge wastewater treatment, bioindicators, hydrocarbons biodegradation, biodegradable polymers, petroleum products contaminated soils treatment, conventional and recombinant enzymes, starch biodegradation, cellulose utilization, vitamin C biosynthesis, lactic acid bacteria and Bacillus genus bacteria, biodiveristy protection, transgenic plants and animals, plants as bioreactors, bacterial derived insecticides, bioethical issues connected with genetic modifications, GMO legal regulations.

B. Laboratory topics:

1. Basic legal regulations of GMO in Poland.

2. Biotechnological aspects of environment protection.

3. Diagnostic methods for GM plants detection.

4. Popular GM plant species and their genetic modifications.

5. Morphological and microscopic characterization of water and soil biodiversity.

6. Surface streak and microorganisms titer methods of microbial count.

7. Plant sample DNA purification principle.

8. Identification principle of the plant DNA genetic modification.

9. PCR amplification processes.

10. Electrophoretic separation principle and interpretation of the results from PCR reaction products separation.

Bibliography of literature

A. Literature required to pass the course

A.1. Literature used during classes

1. Glick B.R., Pasternak J.J., Patten Ch. L. Molecular biotechnology 4th Ed. , ASM PRESS 2010

2. Libudzisz Z., Kowal K. Żakowska Z. Mikrobiologia techniczna T 2 , PWN 2008

3. Klimiuk E., Łebkowska M. Biotechnologia w ochronie środowiska, PWN 2005

4. Ministerstwo Środowiska http://www.mos.gov.pl/ , http://gmo.ekoportal.pl/

5. Querci M., Maretti M., Mazzara M. Badanie próbek żywności na obecność Genetycznie Zmodyfikowanych Organizmów. European Comission Joint Research Centre, World Health Organization, Regional Office for Europe

6. Klimiuk E., Łebkowska M.: Biotechnologia w ochronie środowiska, PWN, 2005

7. Glick, B.R., Pasternak, J.J., Patten, C.L.: Molecular biotechnology: Principles and applications of recombinant DNA. ASM PRESS, 2009

8. Libudzisz Z., Kowal K., Żakowska Z.: Mikrobiologia techniczna, tom 2, PWN 2008

9. Olańczuk-Neyman K.: Laboratorium z biologii środowiska, Wyd. PG, 1998

The learning outcomes (for the field of study and specialization)	Knowledge
	1. Students know biotechnological methods of gas, wastewater and soil treatment.
	2. Students know the influence of microorganisms and their metabolites on the environment and possible applications in the environment protection.
	3. Students describe biohydrometallurgic mechanisms and list the features of microorganisms capable of heavy metals removal.
	4. Students know hydrocarbons biodegradation methods.
	5. Students know the methodology for GMO species construction and understand the point of GMO application in the environment protection.
	6. Students know GMO legal regulations and GMO detection methods.
	7. Students know basic terms and processes of biotechnology in the environment protection.
	Skills
	1. Students characterizes quantitatively and qualitatively microbiological composition of wastewater from different origin.
	2. Students observe microscopic preparations and describe qualitatively microbiological composition of environmental samples.

	3. Students isolate genetic material from plant samples and detect the presence of GMO in the sample. 4. Students select the valuable source material and present essential arguments in the discussion. 5. Students are able to point biotechnological methods, microorganisms and biotechnological products applications in the close environment.
	Social competence
	1. Students understand need of further education. 2. Student carefully i criticically express own opinions, bear in mind and value possibilities offered by modern biotechnology. Select reliable sources of information in the field of biotechnology. 3. Students recognize the potential spectrum of biotechnological methods application in the environment protection. 4. Students individually plan and proceed given laboratory tasks, managing available equipment and timecourse. 5. Students undertake the leading role of a team.
Contact	
j.jezewska-frackowiak@ug.edu.pl	