Załącznik Nr 5
do Zasad

COURSE/MODULE DESCRIPTION (SYLLABUS)

1.	Course/module **Biogeochemistry and geomicrobiology**
2.	Language of instruction **English**
3.	University department **Faculty of Earth Science and Environmental Management, Institute of Geological Sciences, Department of Applied Geology, Geochemistry and Environmental Management**
4.	Course/module code **USOS**
5.	Course/module type – mandatory (compulsory) or elective (optional) **Elective**
6.	University subject (programme/major) **Geologic Engineery**
7.	Degree: *(master, bachelor)* **Master**
8.	Year **I**
9.	Semester *(autumn, spring)* **Autumn**
10.	Form of tuition and number of hours **Lecture: 12 h** **Laboratory: 18 h**
11.	Name, Surname, academic title **Lecture: Dr Adriana Trojanowska-Olichwer** **Lab classes: Dr Adriana Trojanowska-Olichwer, Dr Wojciech Drzewicki**
12.	Initial requirements (knowledge, skills, social competences) regarding the course/module and its completion **Basics of environmental chemistry and geochemistry.**
13.	Objectives **Exposure to address the complexity of the natural environment and awareness of the close relationship between the components of the abiotic and biotic. Acquainted with the possibilities of utility and / or industrial use of biogeochemistry and geomicrobiology.**

14.	Learning outcomes	Outcome symbols, *e.g.: K_W01*, K_U05, K_K03*
	P_W01 understands interdisciplinary and holistic nature of the knowledge of the Earth system and has adequate knowledge in the field of biogeochemistry.	**K2_W01,**
	P_W02 Has knowledge on global biogeochemical cycles and the research methods used to track them down.	**K2_W03, InżK2_W01**
	P_U01 student is able to acquire, synthesize and communicate current knowledge on the biogeochemical cycles in English	**K2_U04**
	P_U02 He can perform a simple experiment under the supervision of a tutor.	**InżK2_U02**
	P_U03 student is able to work constructively in the team of project or experiment	**K2_U05**
	P_K01 Student updates and expands his knowledge based on the latest information from various sources and critically evaluates his credibility.	**K2_K03, K2_K01**

15. Content

Lectures:
Biogeochemical cycles and their changes due to anthropogenic pressure;
Fundamentals of physiology of microorganisms and the role of microorganisms in the fundamental biogeochemical cycles, microorganisms of the extreme environments.
Circulation of elements and processes of primary production and decomposition; overproductivity of the environment as a result of anthropopressure, effects, significance.
Enzymes as catalysts of biochemical reactions in the environment and their application in the diagnosis of water and soil quality.
Tracking the elements pathways in the environment - application of stable isotopes - role in monitoring of selected elements.
Remediation: bioremediation and phytoremediation; the use of bacteria, fungi and plants for treatment of soils and water with contaminants and rehabilitation of former.
The role of microorganisms in the formation of selected minerals.
Application of microorganisms in the bioleaching as an alternative to conventional metal recovery processes.

Laboratory:
Simple experiments carried out in the groups:
1. changes in physical, chemical and microbiological parameters of water in conjunction with changes in the hydrological dynamics of the river on the example of the Oder in Wroclaw;
2. the impact of phosphorus and nitrogen on the rate of primary production - laboratory experiment;
3. observation of mycorrhizal fungi used in the remediation of heavy metals from the soil.
4. The importance of hydrolytic enzymes in the environment on the example of phosphatase j or arylsulphatase;
5. Biogas production - laboratory experiment
6. Methods of assessment the size and / or microbial activity.
7. Analysis of carbon isotopic composition as a tool in tracking biogeochemical processes.

16.	**Recommended literature** William H. Schlesinger and Emily S. Bernhardt.2013. Biogeochemistry. An analysis of global change. (Third edition). Kurt Konhauser, 2007. Introduction to geomicrobiology. Blackwell Publishing. Volodymyr Ivanov. 2015. Environmental Micobiology for Engineers. CRC Press	
17.	Methods of verification of learning outcomes: lecture: test laboratory: reports from the laboratory experiments	
18.	Ways of learning credits for the completion of a course /particular component, methods of assessing academic progress: **lecture:** test, required 60% correct answers to pass. (P_W01, P_W02, P_W03, P_K01) **laboratory:** reports from the laboratory experiments. (P_U01, P_U02, P_U03) The final mark is the arithmetic average of the marks from the exercises and the lecture	
19.	Student's workload	
	Activity	Average number of hours for the activity
	Hours of instruction (as stipulated in study programme) : - lecture: **12** - laboratory: **18** - consultations: **8** - test: **1**	**39**
	student's own work, e.g.: - preparation before class (lecture, etc.): **8** - research outcomes: **5** - reading set literature: **5** - writing course report: **5** - preparing for exam: **15**	**38**
	Hours	**77**
	Number of ECTS	**3**