Annex No. 5

to Ordinance No. 21/2019

**COURSE/MODULE SYLLABUS FOR UNIVERSITY COURSES/PhD STUDIES**

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|  | Course/module name in Polish and English  Biogeochemistry and geomicrobiology/Biogeochemia i geomikrobiologia | | |
|  | Discipline  Earth and Environmental Science | | |
|  | Language of instruction  English | | |
|  | Teaching unit  Faculty of Earth Science and Environmental Management, Institute of Geological Sciences, Department of Isotopic and Applied Geology | | |
|  | Course/module code  USOS | | |
|  | Type of course/module *(mandatory or optional)*  optional | | |
|  | Field of studies (major, if applicable)  Geology (spec. Applied Geoscience) | | |
|  | Level of higher education *(undergraduate (I cycle), Master’s (II cycle), 5 year uniform Master’s studies)*  Master’s (II cycle) | | |
|  | Year of studies *(if applicable*)  II | | |
|  | Semester *(winter or summer)*  summer | | |
|  | Form of classes and number of hours  Lectures: 10  Lab classes:14  Teaching methods  Multimedia lecture, mini-lecture, presentation, practical exercises, individual work, group work, preparation of reports, etc. | | |
|  | Name, title/degree of the teacher/instructor  Coordinator: Dr Adriana Trojanowska-Olichwer  Lecturer: Dr Adriana Trojanowska-Olichwer  Classes instructor: Dr Adriana Trojanowska-Olichwer, Dr Wojciech Drzewicki | | |
|  | Course/module prerequisites, in terms of knowledge, skills, social competences  Basics of environmental chemistry and geochemistry. | | |
|  | Course 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. | | |
|  | Course 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. | | |
|  | Intended learning outcomes  P\_W01 understands interdisciplinary and holistic nature of the knowledge of the Earth system and has adequate knowledge in the field of biogeochemistry.  P\_W02 Has knowledge on global biogeochemical cycles and the research methods used to track them down.  P\_W03 has knowledge on the possible use of organisms to improve the environment and for technological purposes.  P\_U01 student is able to acquire, synthesize and communicate current knowledge on the biogeochemical cycles.  P\_U02. He can perform a simple experiment under the supervision of a tutor.  P\_U03 Can apply advanced techniques and research tools in the field of biogeochemistry.  P\_K01 Updates and expands their knowledge based on the latest information from various sources and critically evaluates their credibility.  P\_K02 student is able to work constructively in the project team or experiment | Symbols of learning outcomes for particular fields of studies, *e.g. K\_W01\**, *K\_U05,K\_K03*  K2\_W01, K2\_W02  K2\_W02, K2\_W03, K2\_W06  K2\_W04  K2\_U03  K2\_U04  K2\_U05  K2\_K01, K2\_K06  K2\_K02 | |
|  | Required and recommended reading *(sources, studies, manuals, etc.)*  Required reading  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 | | |
|  | Assessment methods for the intended learning outcomes:  Lecture: test. K2\_W01, K2\_W02, K2\_W03, K2\_W04, K2\_W06, K2\_K01, K2\_K06.  Lab classes: reports from the laboratory experiments. K2\_U03, K2\_U04, K2\_U05, K2\_K02. | | |
|  | Credit requirements for individual components of the course/module:  Lectures:  - 1-hour test (in English): required 60% of correct answers to pass  Laboratory classes:  - reports from the laboratory experiments, monitoring of attendance.  Final grade is the average of grades from lecture and laboratory. | | |
|  | Total student effort | | |
| form of student activities | | number of hours for the implementation of activities |
| classes (according to the plan of studies) with a teacher/instructor:  - lectures: 10  - lab classes: 14 | | 24 |
| student's own work (including group-work) such as:  - consultation: 14  - being prepared for classes: 5  - reading the suggested literature: 7  - preparing papers/presentations/projects: 5  - writing a class report: 10  - preparing for tests and exam: 10 | | 51 |
| Total number of hours | | 75 |
| Number of ECTS credits | | 3 |