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  Methods in recultivation and remediation/Metody rekultywacji i remediacji | | |
|  | 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)*  elective | | |
|  | 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)*  winter | | |
|  | Form of classes and number of hours  Lectures: 14  Teaching methods  Multimedia lecture. | | |
|  | Name, title/degree of the teacher/instructor  Coordinator: Dr Adriana Trojanowska-Olichwer  Lecturer: Dr Adriana Trojanowska-Olichwer | | |
|  | Course/module prerequisites, in terms of knowledge, skills, social competences  Basics of environmental chemistry, o geochemistry, hydrology | | |
|  | Course objectives  Gaining skills in diagnosing the state of the environment, especially soil and water. To familiarize students with the methods of reclamation and remediation of contaminated soil and water and / or brownfields, planning remediation activities. | | |
|  | Course content  Lectures:  Pollution in the environment. Rehabilitation of ex-situ, in-situ, revitalization, restoration - general concepts.  Technical reclamation areas after mining.  Reclamation of landfill sites.  Technical reclamation of soils contaminated with heavy metals and hydrocarbons: the benefits, limitations and costs. Examples of completed projects.  Biological reclamation of soils contaminated with heavy metals and hydrocarbons: the benefits, limitations and costs. Examples of completed projects.  Revitalization of eutrophic waters: guidelines, benefits, limitations and costs. Examples of completed projects.  Revitalization and restoration of rivers: the guidelines, benefits, limitations and costs. Examples of completed projects. | | |
|  | Intended learning outcomes  P\_W01: Student knows the processes occurring in contaminated areas and understands the interdisciplinary nature of the approach to their rehabilitation.  P\_W02: He knows the groups of pollutants in ground (soil) and water.  P\_W03: He knows the methods and principles of reclamation and revitalization of contaminated or degraded sites.  P\_U01: Student is able to propose remediation intervention in contaminated sites.  P\_K01: Student seeks to update and extend his/her knowledge and skills in the field of new technologies in environmental restoration. | Symbols of learning outcomes for particular fields of studies, *e.g. K\_W01\**, *K\_U05,K\_K03*  K2\_W01, K2\_W03, K2\_W09  K2\_W01, K2\_W09  K2\_W02  K2\_U01, K2\_U07,  K2\_K01 | |
|  | Required and recommended reading *(sources, studies, manuals, etc.)*  Required reading  Mary Ann Wright, Practical Guide for reclamation Utah. (https://fs.ogm.utah.gov/pub/MINES/Coal\_Related/RecMan/Reclamation\_Manual.pdf)  Introduction to phytoremediation. 2000. EPA (EPA/600/R-99/107) , s.82  D.M. Hamby, 1996. SITE REMEDIATION TECHNIQUES SUPPORTING ENVIRONMENTAL RESTORATION ACTIVITIES: A REVIEW. [Science of The Total Environment](http://www.sciencedirect.com/science/journal/00489697) [191 (3](http://www.sciencedirect.com/science/journal/00489697/191/3)): 203-224  Helmut KLAPPER, 2003. Technologies for lake restoration J. Limnol., 62(Suppl. 1): 73-90.  US EPA Technology, Innovation And Field Services Divition website.: <https://clu-in.org/remediation/>  The River Restoration Centre website: http://www.therrc.co.uk/manual-river-restoration-techniques | | |
|  | Assessment methods for the intended learning outcomes:  Test. K2\_W01, K2\_W02, K2\_W03, K2\_W09, K2\_U01, K2\_U07, K2\_K01. | | |
|  | Credit requirements for individual components of the course/module:  Lecture:  -test, 60% of correct answers required to pass. | | |
|  | 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: 14 | | 14 |
| student's own work (including group-work) such as:  - consultation: 11  - being prepared for classes: 5  - reading the suggested literature: 5  - preparing for tests and exam: 15 | | 36 |
| Total number of hours | | 50 |
| Number of ECTS credits | | 2 |