

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

1.	Course/module name in Polish and English Applications of Ground Penetrating Radar (GPR)/ Metody georadarowe
2.	Discipline Earth and Environmental Science
3.	Language of instruction English
4.	Teaching unit Faculty of Earth Science and Environmental Management, Institute of Geological Sciences
5.	Course/module code USOS
6.	Type of course/module ( <i>mandatory or optional</i> ) optional
7.	Field of studies (major, if applicable) Geology
8.	Level of higher education ( <i>undergraduate (I cycle), Master's (II cycle), 5 year uniform Master's studies</i> ) Master's (II cycle)
9.	Year of studies ( <i>if applicable</i> ) I/II
10.	Semester ( <i>winter or summer</i> ) winter/summer
11.	Form of classes and number of hours Lectures: 8 Lab classes: 8 Field classes: 8 Teaching methods: Multimedia lecture, mini-lecture, presentation, discussion, practical exercises, individual work, group work, preparation of reports.
12.	Name, title/degree of the teacher/instructor Coordinator: dr Artur Sobczyk Lecturer: dr Artur Sobczyk Classes instructor: dr Artur Sobczyk Field classes instructor: dr Artur Sobczyk
13.	Course/module prerequisites, in terms of knowledge, skills, social competences

	Knowledge and skills in physics (electromagnetic), basics of exploration geophysics, sedimentology, geomorphology and geological mapping.	
14.	<p>Course objectives</p> <p>The main aim of the course is to gain understanding of ground penetrating radar (GPR) technique and its application to geological sciences, emphasizing methodological issues.</p>	
15.	<p>Course content</p> <p>Lectures:</p> <p>Ground Penetrating Radar - principles and method presentation. GPR construction, antenna types and research methodology. Introduction to electromagnetic wave propagation laws, with special reference to different geological media. Regulations, norms and radiological data in GPR technique. An overview for the most popular and common used ground penetrating radar equipment. Signal optimization, modulation, processing and filtration. GPR software for data analysis and visualization. Method application: geology, archaeology, geomorphology, sedimentology, civil engineering. Research planning, study realization and results presentation.</p> <p>Lab classes:</p> <p>GPR construction, equipment configuration and running. Terrain research methodology. Parameters for data collection. Collecting field data. Data processing techniques and its visualization. Echoes presentation and preparing of research reports.</p> <p>Field classes:</p> <p>GPR construction, equipment configuration and running. Terrain research methodology. Parameters for data collection. Collecting field data.</p>	
16.	<p>Intended learning outcomes</p> <p>W_1 Student has knowledge of the ground penetrating radar technique associated with selected aspects of the geological and related sciences (e.g., geophysics, archaeology, civil engineering).</p> <p>W_2 Student knows the general principles for planning GPR research actively using techniques and tools used in geology and transferring them to other fields.</p> <p>U_1 Student can planned and carried out GPR research tasks and prepare final reports and documentation, is able to configure the equipment according to the project duties.</p> <p>U_2 Student can used specialized GPR techniques and software for the description of phenomena and data analysis, as well as collect and interpret empirical data and prepare final reports.</p> <p>U_3 Student has the ability to write scientific reports in the English language.</p>	<p>Symbols of learning outcomes for particular fields of studies:</p> <p>K2_W02, K2_W03</p> <p>K2_W06</p> <p>K2_U04</p> <p>K2_U05</p> <p>K2_U06</p>

	K_1 Student has the ability to work in a team and lead the work team during the GPR survey.	K2_K02
	K_2 Student has the ability to identify and solve problems and dilemmas associated with the pursuit geologist.	K2_K07
17.	Required and recommended reading ( <i>sources, studies, manuals, etc.</i> )  Required reading  Daniels D.J., 2004. Ground Penetrating Radar (2 <sup>nd</sup> edition). The Institution of Electrical Engineers, London, 734 pp. Neal A., 2004. Ground-penetrating radar and its use in sedimentology: principles, problems and progress. Earth-Science Reviews, 66, 261-330.  Recommended reading  Bristow C.S., Jol H.M. (eds.), 2003. Ground Penetrating Radar in Sediments. Geol. Soc. London Spec. Publ., 211, 335 pp. Goodman D., Piro S., 2013. GPR remote sensing in archeology, Springer Verlag. Berlin-Heidelberg, 233 pp.	
18.	Assessment methods for the intended learning outcomes: - preparation and implementation of field work project presented in a form of written report: K2_W02, K2_W03, K2_W06, K2_U04, K2_U05, K2_U06, K2_K02, K2_K07.	
19.	Credit requirements for individual components of the course/module: - monitoring attendance and progress on the course subject matter, - assessed paper (final), - preparing and implementing a project (individual or group), min. 60% required, - writing a class report.	
20.	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: 8 - lab classes: 8 - field classes: 8	24
	student's own work (including group-work) such as: - reading the suggested literature: 4 - preparing results from fieldwork: 10 - writing a class report: 10	24
	Total number of hours	48
	Number of ECTS credits	2