Faculty of CivilEngineering and Environmental Sciences						
Study programme:	**Civil Engineering**	Degree level: full-time/part-time programme:			**Bachelor's degree/Master's degree/Doctoral degree**	
Specialization	**General Construction Engieering**	Diploma path:			**–**	
Module name:	**Geoengineering**					
Module type:	**obligatory/elective**	Semester:	**I**	ECTS **4**	Module ID:	**EN-B2S11006**
No. of hrs in semester:	L - 15 C - LC- P- 15 SW- 15 S-					
Prerequisites:	*Complete with prerequisites or "-"*					
Aims and objectives:	*Description of the assumed knowledge, skills and social competence the student should have acquired after the completion of the module:*	Acquisition of the basic knowledge for design and execution of ground improvement and stabilisation of slopes and excavations depending on soil-water conditions and building in neighbourhood. Skill of design of stabilisation of slopes and excavations as reinforced earth construction. Acquisition of essential knowledge for design and execution of underground cubature objects.				
Forms of teaching activities:	*lecture, classes, laboratory classes, project, specialization workshop, seminar*	*Assessment:*	*Evaluation must be relevant to the intended learning outcomes*			
		e.g.: lecture – written exam, oral exam, tests; classes – two tests; laboratory classes – evaluation of reports, verification of preparation for classes, tests; project – project completion, presentation and discussion				
Module content:	*Complete with the module content: (max. 1000 characters)*	Geosynthetic used in geotechnics; physical and mechanical properties of geosynthetic. Stabilisation of slopes and excavations using geosynthetic reinforcement of soil and nailing. Soil improvement technology depending on soil-water conditions. Opencast methods of tunnel construction and types of trench wall protections. Linings of excavations.				
Teaching methods:		*lecture - written exam, project - completion, presentation and discussion of the project, specialization workshop - completion, presentation and discussion of the project carried out by means of computer programme*				

Learning outcome	*Specify min. 4, max. 8 learning outcomes in the following order: knowledge – skills – competence. Each learning outcome must be verifiable*	*Reference to the programme learning outcomes*
LO1	Student (graduate) has profound knowledge of geosynthetics, testing methods and knows how they are manufactured	K_B2_W05
LO2	Student (graduate) has profound knowledge of ground reinforcing and geosinthetic choice	K_B2_W05, K_B2_W16
LO3	Student (graduate) has profound knowledge of stabilisation of slopes and excavation and can evaluate and combine any loads on eaeth structure, can design complex earth structure	K_B2_W07, K_B2_W16, K_B2_U02, K_B2_U08
LO4	Student (graduate) knows methods, techniques and tools to solve complex geoengineering tasks as imroving ground in dependence on soil-water conditions.	K_B2_W16
LO5	Student (graduate) can properly choose methods and tools for solving problems and is able to recognize limits of these methods and tools.	K_B2_W12

LO6	Student (graduate) has theoretically based knowledge of structure analysis, interaction issues and designing of complex structural systems, can evaluate and combine any loads on building objects, can design complex earth structure	K_B2_W07, K_B2_U02, K_B2_U08
LO7	Student (graduate) can determine priorities in the process of completion of a task.	K_B2_K04
LO8		

No. of learning outcome	Methods of assessing the learning outcome	Type of teaching activities (if more than one) during which the outcome is assessed
LO1	evaluating the student's tests on lecture content	L
LO2	evaluating the student's reports and preparation for the classes , tests on lecture conte	L, P, SW
LO3	evaluating the student's reports and preparation for the classes , tests on lecture content	L, P, SW
LO4	evaluating the student's tests on lecture content	L
LO5	evaluating the student's tests on lecture content	L
LO6	evaluating the student's reports and performance in classes	P, SW
LO7	discussion of the student's reports, evaluation of the student's performance in classes	P, SW
LO8		

Student workload (in hours)		
lecture attendance		10
participation in classes, laboratory classes, etc.		20
preparation for classes, laboratory classes, projects, seminars, etc.		17
working on projects, reports, etc.		20
participation in student-teacher sessions related to the classes/seminar/project		6
implementation of project tasks		25
preparation for and participation in exams/tests		22
	TOTAL:	120

Quantitative indicators			
Student workload – activities that require direct teacher participation:	42	ECTS	
		1.5	
Student workload – practical activities:	90	3	

Basic references:	*1. Shukla S. K., Yin J.-H.: Fundamentals of Geosynthetic Engineering. Taylor & Francis, London 2006. 2. Puller M.: Deep Excavations. A practical manual. Thomas Telford, London 1998. 3. Recommendations for design and analysis of earth structures using geosynthetic reinforcements - EBGE. Wilhelm Ernst & Sohn, Munchen 2011. 4. Kirsch K., Kirsch F.: Ground improvement by deep vibratory methods. Spon Press, London&New York 2010.*
Supplementary references:	*1. Jarominiak A.: Lekkie konstrukcje oporowe. WKŁ, Warszawa 1999. 2. Bond A. and Harris A.: Decoding Eurocode 7, Taylor & Francis,London 2008.3. Siemińska-Lewandowska A.: Głębokie wykopy. Projektowanie i wykonawstwo. WKŁ, Warszawa 2011.*

Unit:	Department of Geotechnics and Structural Mchanics		Katarzyna Zabielska-Adamska, PhD, DSc, Eng Mariola Wasil, MSc, Eng
Date of issuing the programme:	22.12.2019	Author of the programme:	Katarzyna Zabielska-Adamska, PhD, DSc, Eng

L - lecture C - classes LC - laboratory classes P-project
SW - specialization workshop S - seminar