



MODULE SPECIFICATION

Module code	
Module title in Polish	Technologie Bezwykopowe
Module title in English	Trenchless Technologies
Module running from the academic year	2016/2017

A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	Environmental Engineering
Level of qualification	first cycle (first cycle, second cycle)
Programme type	academic (academic/practical)
Mode of study	full-time (full-time/part-time)
Specialism	Sanitary Pipelines and Systems; Water Supply, Treatment of Wastewater and Solid Waste
Organisational unit responsible for module delivery	Department of Piped Utility Systems
Module co-ordinator	Agata Zwierzchowska, PhD, Eng.
Approved by:	Prof. Andrzej Kulickowski, PhD hab., Eng.

B. MODULE OVERVIEW

Module type	core module (core/programme-specific/elective HES*)
Module status	compulsory module (compulsory/optional)
Language of module delivery	Polish/English
Semester in the programme of study in which the module is taught	semester 4
Semester in the academic year in which the module is taught	summer semester (winter semester/summer semester)
Pre-requisites	None (module code/module title, where appropriate)
Examination required	Yes (Yes/No)
ECTS credits	3

* elective HES – elective modules in the Humanities and Economic and Social Sciences

Mode of instruction	lectures	classes	laboratories	project	others
Total hours per semester	15		15		

C. LEARNING OUTCOMES AND ASSESSMENT METHODS



Module aims	The aim of the module is to acquaint students with the knowledge of trenchless technologies, i.e. the division of trenchless technologies, the scope of application, the characteristics as well as examples of realisations in Poland and abroad.
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Module outcome code	Module learning outcomes	Mode of instruction (l/lab/p/others)	Corresponding programme outcome code	Corresponding discipline-specific outcome code
W_01	A student is familiar with the division of trenchless technologies.	l	IS_W09	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_02	A student knows basic technologies of trenchless renovation.	l/lab	IS_W09	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_03	A student knows basic trenchless pipe laying technologies.	l/lab	IS_W09	T1A_W03, T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_04	A student knows basic types of multi-duct tunnel structure.	l/lab	IS_W09	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
U_01	A student can characterise basic trenchless technologies.	l/lab	IS_U16	T1A_U03 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U10 T1A_U11 T1A_U13 T1A_U14 T1A_U15 T1A_U16
U_02	A student can place the ducts of underground infrastructure in a multi-duct tunnel.	lab	IS_U16	T1A_U03 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U10 T1A_U11 T1A_U13 T1A_U14 T1A_U15 T1A_U16
U_03	A student can list and shortly characterise the required elements of multi-duct tunnel equipment connected with its appropriate and safe exploitation.	lab	IS_U16	T1A_U03 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U10 T1A_U11 T1A_U13 T1A_U14 T1A_U15 T1A_U16
U_04	A student can independently prepare and coherently give a multimedia presentation.	lab	IS_U05	T1A_U03 T1A_U04
U_05	A student can measure the circumferential rigidity of rehabilitation liners and interpret the obtained results.	lab	IS_U08	T1A_K08 T1A_K09 T1A_K015
K_01	A student can work individually on the assigned project.	lab	IS_K01	T1A_K03
K_02	A student is responsible for the reliability of the obtained results and their interpretation.	lab	IS_K02	T1A_K02 T1A_K05
K_03	A student independently improves and broadens his/her knowledge in terms of trenchless technologies.	l/lab	IS_K03	T1A_K01 T1A_K02 T1A_K04
K_04	A student formulates conclusions and describes the results of their own work, is communicative in media presentations.	lab	IS_K07	T1A_K07



Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1	Familiarising students with the syllabus of the lectures, the form of conducting classes as well as the conditions of obtaining a credit. Providing students with the literature on the subject. Development trends as regards trenchless construction and renovation of urban underground infrastructure.	W_01 W_02 K_03
2	Trenchless repairs and exchanges of underground ducts.	W_01 W_02 U_01 K_03
3	Trenchless renovations and reconstructions of underground ducts.	W_01 W_02 U_01 K_03
4	The division of the trenchless method of building underground ducts. The historical outline. The biggest projects executions in Poland and abroad with the use of trenchless methods.	W_01 W_03 U_01 K_03
5	Non-controllable technologies of trenchless construction.	W_01 W_03 U_01 K_03
6	Controllable technologies of trenchless construction.	W_01 W_03 U_01 K_03
7	Tunnelling as a trenchless technology of building underground infrastructure.	W_01 W_03, W_04 U_01 K_03
8	Plough-setting.	W_01 W_03 U_01 K_03

2. Topics to be covered in the laboratories

No.	Topics	Module outcome code
1	Designing the structure of a multi-duct tunnel; initial determining tunnel dimensions and its situation on a plan. Selecting construction materials.	W_04 U_02 K_01 K_02 K_03
2-3	Positioning underground infrastructure network in a multi-duct tunnel. Selecting the diameters of particular network types. Planning working space (taking the required minimum distances between particular networks into consideration).	W_04 U_02 U_03 K_01 K_02 K_03
4	Placing network in soil on the basis of guidelines of the existing underground and ground infrastructure; dimensioning safe vertical and horizontal distances between the adjacent infrastructure.	W_04 U_02 K_01 K_02 K_03
5	Sampling the rehabilitation liners and the measurement of the circumferential rigidity.	U_05



6-8	Multimedia presentations concerning the newest achievements and solutions in trenchless techniques.	W_01 W_02 W_03 U_01 U_04 K_01 K_02 K_03 K_04
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Assessment methods

Module outcome code	Assessment methods <i>(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)</i>
W_01	An examination
W_02	An examination
W_03	An examination
W_04	A project
U_01	An examination
U_02	A project
U_03	A project
U_04	A presentation
U_05	Observation of the students work during the classes
K_01	A project. Observation of the students work during the classes
K_02	A project. Observation of the students work during the classes
K_03	An examination and a project with its assessment. Observation of the students work during the classes
K_04	Presentation.

D. STUDENT LEARNING ACTIVITIES

ECTS summary		
	Type of learning activity	Study time/ credits
1	Contact hours: participation in lectures	15
2	Contact hours: participation in classes	
3	Contact hours: participation in laboratories	15
4	Contact hours: attendance at office hours (2-3 appointments per semester)	3
5	Contact hours: participation in project-based classes	
6	Contact hours: meetings with a project module leader	
7	Contact hours: attendance at an examination	2
8		
9	Number of contact hours	35 <i>(total)</i>
10	Number of ECTS credits for contact hours <i>(1 ECTS credit = 25-30 hours of study time)</i>	1.4
11	Private study hours: background reading for lectures	8
12	Private study hours: preparation for classes	



13	Private study hours: preparation for tests	
14	Private study hours: preparation for laboratories	7
15	Private study hours: writing reports	8
16	Private study hours: preparation for a final test in laboratories	5
17	Private study hours: preparation of a project/a design specification	7
18	Private study hours: preparation for an examination	5
19		
20	Number of private study hours	40 <i>(total)</i>
21	Number of ECTS credits for private study hours <i>(1 ECTS credit = 25-30 hours of study time)</i>	1.6
22	Total study time	75
23	Total ECTS credits for the module <i>(1 ECTS credit = 25-30 hours of study time)</i>	3
24	Number of practice-based hours <i>Total practice-based hours</i>	42
25	Number of ECTS credits for practice-based hours <i>(1 ECTS credit = 25-30 hours of study time)</i>	1.68

E. READING LIST

References	<ol style="list-style-type: none">1. Najafi, M.: Trenchless technology. Pipeline and utility design, construction, and renewal. McGraw-Hill Education Publisher 2005.2. Stein D.: Trenchless Technology for Installation of Cables and Pipelines. Stein and Partner. Germany 2005.3. Stein D.: Practical Guidelines for the Application of Microtunnelling. Verlag Stein and Partner 2005.4. Stein, R., Stein, D., 2012. Trenchless technology for installation of cables and pipelines, 2nd Volume: Horizontal Directional Drilling. Stein & Partner. Bochum.
Module website	