MODULE SPECIFICATION

Module code	
Module title in Polish	**Hydrogeologia 2**
Module title in English	**Hydrogeology 2**
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	
Organisational unit responsible for module delivery	**The Department of Geotechnical, Geomatics and Waste Management**
Module co-ordinator	**Bartosz Szeląg, PhD, Eng.**
Approved by:	**Maria Żygadło, Professor, 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	**No** (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	

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C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to familiarise students with the methods of specifying a determined and undetermined flow of underground water. Other aims include: discussing the issues connected with the inflow of water to horizontal drainage devices; discussing the selected issues connected with the sources of underground water; chemical mechanism of underground water; water degradation; and the protection of water resources.

Module outcome code	Module learning outcomes	Mode of instruction *(l/c/lab/p/ others)*	Corresponding programme outcome code	Corresponding discipline-specific outcome code
W_01	A student has general knowledge as regards hydrogeology, hydraulics, fluid mechanics, and hydrogeochemistry.	l	IŚ_W13	T1A_W03 T1A_W04 T1A_W07
W_02	A student is knowledgeable about the dynamics of underground waters which enables designing water inflows to the underground water intake.	l/p	IŚ_W12 IŚ_W13	T1A_W03 T1A_W04 T1A_W07
W_03	A student knows the causes of changes taking place in the water and soil environment caused by the activity of a man (together with the consequences connected with the protection of underground water.	l	IŚ_W16	T1A_W03 T1A_W05 T1A_W07 T1A_W08
W_04	A student knows the selected computer programs which support calculating and designing basic hydrogeological parameters.	l/p	IŚ_W05	T1A_W07 T1A_W05
U_01	A student is able to select an appropriate calculation method to calculate given hydrogeological parameters, the inflow of water to underground water intakes, inflow to ditches and drains.	l/p	IŚ_U01 IŚ_U02 IŚ_U03 IŚ_U07 IŚ_U09	T1A_U01 T1A_U02 T1A_U04 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U10
U_02	A student can use maps and verify basic data from maps in order to analyse the terrain of examination and make appropriate hydrogeological interpretation.	l/p	IŚ_U11	T1A_U02 T1A_U07
U_03	A student can analyse the terrain of examination and design appropriate hydrogeological, hydrogeochemical works (also in order to assess the impact of an investment on the water and soil environment).	l/p	IŚ_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 make basic calculations concerning displacement velocity of a conservative indicator in surface water; moreover, a student can determine natural susceptibility of underground water to contamination.	l/p	IŚ_U17	T1A_U07 T1A_U08 T1A_U09
U_05	A student can correctly interpret and present the activity of a man on the environment (at the same time hydraulic management).	l/p	IŚ_U08	T1A_U08 T1A_U09 T1A_U15

K_01	A student can work individually and co-operate in a team on the assigned task; moreover, a student is also aware of the responsibility for his/her own work; additionally, a student is ready to comply with the principles of teamwork and bear responsibility for the collectively realised tasks.	p	IŚ_K01	T1A_K03
K_02	A student is responsible for the reliability of the obtained results of his/her own work and their interpretation. A student is also aware of independently raising his/her professional competences.	l/p	IŚ_K02	T1A_K02 T1A_K05
K_03	A student aware of the necessity of raising his/her professional and personal competences; a student also independently improves and broadens his/her knowledge as regards designing in hydrogeology.	l/p	IŚ_K03 IŚ_K08 IŚ_K09	T1A_K01 T1A_K02 T1A_K04 T1A_K05

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1	Springs (their division and spring regime.	W_01 U_02 K_03
2	The methods of specifying a determined and undetermined flow of underground water (general assumptions, the flow of single-dimensional and plane streams).	W_01 W_02 U_01 K_03
3-4	Water inflow to well underground water intake as well as complete and incomplete wells. Sample pumping, the methods of interpreting the results of sample pumping.	W_01 W_02 U_01 K_03
5	Underground water resources. Static, dynamics, spring, disposition, and exploitation resources. The protection of underground water.	W_01 W_02 W_03 U_02 U_05 K_03
6	Chemical mechanism of underground water; the types and scope of analyses; presenting examination results; chemical classification and hydrogeochemical zones of underground water.	W_01 K_03
7-8	Contamination in the water and soil environment; the characteristics of basic contamination sources; modelling the migration of contaminations in underground water.	W_01 W_04 K_03

2. Topics to be covered in the project

No.	Topics	Module outcome code
1-2	Making the map of underground water table; the analysis and interpretation of hydrogeological conditions.	U_02 K_01 K_02 K_03
3	Determining the coefficient of filtration on the basis of well examination pumping (the express method). Examination of pumping during the undetermined flow in the aquiferous layer.	U_01 K_01 K_02

		K_03
4	Assessing natural susceptibility of underground water to contamination.	U_03 U_04 U_05 K_01 K_02 K_03
5-6	Designing the inflow of underground water to well intakes of underground water in determined filtration conditions.	U_01 K_01 K_02 K_03
7-8	Hydrogeological calculations of horizontal drainage devices, inflows to ditches and drains.	U_01 K_01 K_02 K_03

Assessment methods

Module outcome code	Assessment methods *(Method of assessment; for module skills – reference to specific project, laboratory and similar tasks)*
W_01	A test
W_02	A test
W_03	A test
W_04	A test and a project
W_05	A test and a project
U_01	A test and a project
U_02	A test and a project
U_03	A test and a project
U_04	A test and a project
U_05	A test and a project
U_06	A test and a project
K_01	A test and a project
K_02	A test and a project
K_03	A test and a project

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	**-**
4	Contact hours: attendance at office hours (2-3 appointments per semester)	**-**
5	Contact hours: participation in project-based classes	**15**
6	Contact hours: meetings with a project module leader	**3**
7	Contact hours: attendance at an examination	**-**

8		
9	**Number of contact hours**	**33** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**1.32**
11	Private study hours: background reading for lectures	**7**
12	Private study hours: preparation for classes	**-**
13	Private study hours: preparation for tests	**-**
14	Private study hours: preparation for laboratories	**-**
15	Private study hours: writing reports	**-**
16	Private study hours: preparation for a final test in laboratories	**-**
17	Private study hours: preparation of a project/a design specification	**10**
18	Private study hours: preparation for an examination	**-**
19		
20	**Number of private study hours**	**17** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**0.64**
22	**Total study time**	**50**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**2.0**
24	**Number of practice-based hours** *Total practice-based hours*	**28**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**1,12**

E. READING LIST

References	1. E. Gilli (2012). Hydrogeology: Objectives, Methods, Applications. CRC Press 2. Charles R. Fitts (2012). Groundwater Science, 2nd Edition. Elsevier 3. A. Zuber, P. Maloszewski (2012). Groundwater Quality Sustainability. CRC Press 4. K. R. Rushton (2003). Groundwater Hydrology: Conceptual and Computational Models. Wiley. 5. G. F. Pinder (2002). Groundwater Modeling Using Geographical Information Systems. Wiley.
Module website	

MODULE SPECIFICATION

Module code	
Module title in Polish	**Hydrogeologia 2**
Module title in English	**Hydrogeology 2**
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	
Organisational unit responsible for module delivery	**The Department of Geotechnical, Geomatics and Waste Management**
Module co-ordinator	**Bartosz Szeląg, PhD, Eng.**
Approved by:	**Maria Żygadło, Professor, 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	**No** (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	

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E. LEARNING OUTCOMES AND ASSESSMENT METHODS

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Module outcome code	Module learning outcomes	Mode of instruction *(l/c/lab/p/ others)*	Corresponding programme outcome code	Corresponding discipline-specific outcome code
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W_02	A student is knowledgeable about the dynamics of underground waters which enables designing water inflows to the underground water intake.	l/p	IŚ_W12 IŚ_W13	T1A_W03 T1A_W04 T1A_W07
W_03	A student knows the causes of changes taking place in the water and soil environment caused by the activity of a man (together with the consequences connected with the protection of underground water.	l	IŚ_W16	T1A_W03 T1A_W05 T1A_W07 T1A_W08
W_04	A student knows the selected computer programs which support calculating and designing basic hydrogeological parameters.	l/p	IŚ_W05	T1A_W07 T1A_W05
U_01	A student is able to select an appropriate calculation method to calculate given hydrogeological parameters, the inflow of water to underground water intakes, inflow to ditches and drains.	l/p	IŚ_U01 IŚ_U02 IŚ_U03 IŚ_U07 IŚ_U09	T1A_U01 T1A_U02 T1A_U04 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U10
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U_05	A student can correctly interpret and present the activity of a man on the environment (at the same time hydraulic management).	l/p	IŚ_U08	T1A_U08 T1A_U09 T1A_U15

K_01	A student can work individually and co-operate in a team on the assigned task; moreover, a student is also aware of the responsibility for his/her own work; additionally, a student is ready to comply with the principles of teamwork and bear responsibility for the collectively realised tasks.	p	IŚ_K01	T1A_K03
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Module content:

3. Topics to be covered in the lectures

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2	The methods of specifying a determined and undetermined flow of underground water (general assumptions, the flow of single-dimensional and plane streams).	W_01 W_02 U_01 K_03
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7-8	Contamination in the water and soil environment; the characteristics of basic contamination sources; modelling the migration of contaminations in underground water.	W_01 W_04 K_03

4. Topics to be covered in the project

No.	Topics	Module outcome code
1-2	Making the map of underground water table; the analysis and interpretation of hydrogeological conditions.	U_02 K_01 K_02 K_03
3	Determining the coefficient of filtration on the basis of well examination pumping (the express method). Examination of pumping during the undetermined flow in the aquiferous layer.	U_01 K_01 K_02

		K_03
4	Assessing natural susceptibility of underground water to contamination.	U_03 U_04 U_05 K_01 K_02 K_03
5-6	Designing the inflow of underground water to well intakes of underground water in determined filtration conditions.	U_01 K_01 K_02 K_03
7-8	Hydrogeological calculations of horizontal drainage devices, inflows to ditches and drains.	U_01 K_01 K_02 K_03

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