MODULE SPECIFICATION

Module code	
Module title in Polish	• *Oczyszczanie Wody 2*
Module title in English	Water Treatment 2
Module running from the academic year	2017/2018

A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	Environmental Engineering First-cycle full-time programme
Level of qualification	1st degree (first cycle, second cycle)
Programme type	academic (academic/practical)
Mode of study	Full-time (full-time/part-time)
Specialism	Water Supply, Treatment of Wastewater and Solid Waste
Organisational unit responsible for module delivery	Department of Water and Wastewater Technology
Module co-ordinator	Jarosław Gawdzik, PhD hab.
Approved by:	Lidia Dąbek, PhD hab., Professor of the University

B. MODULE OVERVIEW

Module type	core module (core/programme-specific/elective HES*)
Module status	compulsory module (compulsory/optional)
Language of module delivery	English
Semester in the programme of study in which the module is taught	semester 5
Semester in the academic year in which the module is taught	winter semester (winter semester/summer semester)
Pre-requisites	None (module code/module title, where appropriate)
Examination required	(Yes/No)
ECTS credits	4

* 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			45	

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C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to familiarise students with the issues of theoretical fundamentals of treatment processes of surface water. The following issues are discussed: devices and parameters which are indispensable for their design; natural purification processes. As part of the classes, students can learn practical effectiveness of particular elementary processes applied as part of the water treatment system.

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 fundamental knowledge on the systems of treating underground water treatment.	l/p	IŚ_W01 IŚ_W07 IŚ_W09	T1A_W01 T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_02	A student knows the conditions of exploiting water conditioning plant devices.	l/p	IŚ_W09 IŚ_W10 IŚ_W15	T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_03	A student is knowledgeable about the fundamentals of designing typical devices applied in the system of the treatment of underground water.	l/p	IŚ_W02 IŚ_W09	T1A_W02 T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_04	A student knows the selected computer program supporting designing.	p	IŚ_W05	T1A_W07
W_05	A student has fundamental knowledge as regards hydraulics and fluid mechanics.	p	IŚ_W12	T1A_W03
U_01	A student can obtain information from the literature on the subject, databases, and other sources; a student can also evaluate this information.	l	IŚ_U02	T1A_U01; T1A_U05 T1A_U07
U_02	A student is capable of self-education in order to raise his/her professional competences.	p	IŚ_U07	T1A_U05
U_03	A student can design water treatment devices.	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
K_01	A student can work individually and in a team. Furthermore, a student can organize teamwork which will realise the given task. In addition, a student can divide work among team members as regards tasks according to their competences.	p	IŚ_K01 IŚ_K05 IŚ_K07	T1A_K03 T1A_K04 T1A_K05 T1A_K01 T1A_K07
K_02	A student can formulate conclusion and describe the results of	p	IŚ_K02 IŚ_K05	T1A_K02 T1A_K05

	the obtained work. A student is responsible for the reliability of the obtained results.		IŚ_K07	T1A_K04 T1A_K05 T1A_K01 T1A_K07
K_03	A student is aware of technological progress and the necessity of implementing modern systems of water treatment.	l/p	IŚ_K09	T1A_K02
K_04	A student acts according to the principles of ethics.	p	IŚ_K08	T1A_K05

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1.	Discussing the subject matter of the lectures. Discussing the literature on the subject. The contamination of underground water. The systems of the treatment of underground water depending of their composition and the amount of the treated water.	W_01 W_03
2.	Deacidifaction of water. Removing carbon dioxide depending on water alkalinity. Pressure aeration containers. Hydraulic and mechanical aspirators.	W_01 W_02 U_01 U_03 K_03
3.	The principles of designing water aeration devices. Standard ejections. Cascade aeration. Collision nozzles. Trickle-beds with natural and artificial air flow.	W_01 W_02 W_03 U_03 K_03
4.	The elements of fillings applied in open aerators. Chemical bonding of aggressive carbon dioxide. Filtering material mass. Selecting granulation. Determining indispensable water-substrate time.	W_02 W_03 U_01 U_03 K_03
5.	Water desferrasisation inhibitors. Chelate bonds. The principles of designing and exploiting deferrisasiation devices. The Vyrodeox method.	W_02 W_03 U_01 K_03
6.	The fundamentals of removing manganese from water. Factors inhibiting removing manganese from water. The impact of a reaction, redox potential, ammonia concentration, hydrogen sulphide, iron (II) and water hardness on the dynamics of removing manganese from water. Catalytic deposits applied in removing manganese from water.	W_01 W_02 W_03 U_01 K_03
7.	Filtration materials applied in filters for the treatment underground water. Softening water with thermal and chemical methods.	W_03 U_01 U_03
8.	Fluorine in pipeline water. The methods of removing fluorine from water. Adsorption on the activated aluminium oxide.	W_01 W_02 U_03
9.	Ionic exchange. Kation and anion exchangers (their division and application). Water deionisation. Removing heavy metals from water.	W_01 W_02 U_03
10.	Removing nitrogen compounds from water. Reactors used for biological nitrification of	W_01

	ammonia nitrogen. Dry filters. The problem of the excess of nitrates in underground water. Heterotrophic denitrification.	W_02 U_03 K_03
11.	Sedimentation management in pipeline stations; sedimentation basins. The methods of dehydrating deposits. Coagulants reclamation.	W_01 W_02 U_03 K_03
12.	Chemical and biological stability of water in pipeline systems. The corrosion of devices and pipelines. Technical methods of limiting unfavourable changes in the composition of water during its distribution.	W_01 K_03
13.	Preparing water supplying high-pressure boilers. The methods of removing silicon dioxides.	W_01 W_02 U_03 K_03
14.	Membrane methods in the water treatment technology. Membrane phenomena. Reverse osmosis water filter parameters. The coefficient of eliminating dissolved substance. Membranes. Fouling. Scaling.	W_01 W_02 U_03 K_03
15.	Architectural and constructional solutions of water treatment plants. OHS in water treatment plants. The principles binding during transport, warehousing, and applying chemical reagents.	W_01 W_02 W_03

Module content:

2. Topics to be covered in the project

No.	**Topics**	**Module outcome code**
1-2	Discussing the principles and project assumptions. Terrain topography, issuing topographical plans of the terrain.	W_01 W_02 W_03 W_04 U_02
3- 7	The analysis and assessment of the water taken. Determining the processes of treating it and accepting the water conditioning plant technological diagram; justifying the selection of devices. Calculating plant efficiency (the balance of water for municipal and industrial purposes).	W_01 W_02 W_03 W_04 U_02 K_01 K_03
8-12	Calculating and selecting devices to prepare the solutions of reagents.	W_01 W_02 W_03 W_04 U_03
13-16	Calculating geometrical and hydraulic parameters of a sedimentation basin as well as sedimentation chamber.	W_01 W_02 W_03 W_04 W_05 U_03 K_01 K_03

		K_04
17-19	Selecting the solution of water filtration; determining the height and granulation of the filtration deposit, work cycle, and rinsing. Calculating geometrical parameters of filters as well as drainage and hydraulic losses.	W_01 W_02 W_03 W_04 U_02 K_01 K_02 K_03 K_04
20-21	Selecting a disinfectant. Calculating its daily portion; selecting water disinfection devices; calculating warehousing surface. Calculating the volume of a water retention basin.	W_01 W_02 W_03 W_04 U_02 K_01 K_02 K_03 K_04
22-23	Completing a development plan as well as discussing project guideline to prepare a projection and a section of particular devices in water conditioning plant. Selecting water ducts from nomographs and air.	W_01 W_02 W_03 W_04 U_02 K_01 K_02 K_03 K_04

Assessment methods

Module outcome code	**Assessment methods** *(Method of assessment; for module skills − reference to specific project, laboratory and similar tasks)*
W_01	An examination and a project
W_02	An examination and a project
W_03	An examination and a project
W_04	A project
W_05	A project
U_01	An examination
U_02	A project
U_03	An examination and a project
K_01	A project
K_02	A project
K_03	An examination and a project
K_04	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)	**2**
5	Contact hours: participation in project-based classes	**45**
6	Contact hours: meetings with a project module leader	**2**
7	Contact hours: attendance at an examination	**2**
8		
9	**Number of contact hours**	***66 (total)***
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**2.6**
11	Private study hours: background reading for lectures	**2**
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	**30**
18	Private study hours: preparation for an examination	**2**
19		
20	**Number of private study hours**	***34 (total)***
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**1.4**
22	**Total study time**	**100**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**4.0**
24	**Number of practice-based hours** *Total practice-based hours*	**77**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**3.1**

E. READING LIST

References	1.Droste, L. Ronald: „Theory and practice of water and wastewater treatment" New York: John Wiley & Sons, 1997

	2.Shun Dar Lin, C. Lee: "Water and Wastewater Calculations Manual " McGraw Hill Professional, 2007 3.McGraw Hill Professional „Water Treatment Plant Design, Fifth" Edition American Water Works Association, American Society of Civil Engineers, 2012 4.A.D. Patwardhan: „Industrial waste water treatment" PHI Learning Pvt. Ltd., 2008 5. J.Edzwald „Water Quality & Treatment: A Handbook on Drinking" Water American Water Works Association, Mcgraw - hill, 2010 6. Gary W vanLoon, Stephen J.Duffy: „Environmental Chemistry", Oxford Univesity Press 2010. 7. Gray N.F.: „Water Technology: An Introduction for Environmental Scientists and Engineers, 3rd Edition", Butterworth-Heinemann, 2010.
Module website	