MODULE SPECIFICATION

Module code	
Module title in Polish	*Oczyszczanie Wody 1*
Module title in English	Water Treatment 1
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	**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~~/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	15	30		

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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 surface water treatment.	l/l/c	IŚ_W09	T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_02	A student knows the conditions of exploiting water conditioning station devices.	l	IŚ_W09 IŚ_W10	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 surface water treatment.	l/c	IŚ_W09	T1A_W04 T1A_W05 T1A_W06 T1A_W07
U_01	A student can design an experiment which facilitates the reduction level of basic contaminations of surface water.	l/c	IŚ_U02 IŚ_U11 IŚ_U15	T1A_U02 T1A_U03 T1A_U07 T1A_U08 T1A_U09 T1A_U10 T1A_U11 T1A_U13 T1A_U14 T1A_U15
U_02	A student can conduct an experiment which facilitates the assessment of effectiveness as regards the elementary operations examined.	l	IŚ_U02 IŚ_U07	T1A_U02 T1A_U08 T1A_U09 T1A_U15
U_03	A student has general knowledge of solving exploitation problems concerning water treatment stations.	l	IŚ_U01 IŚ_U06 IŚ_U15	T1A_U01 T1A_U06 T1A_U03 T1A_U07 T1A_U08 T1A_U09 T1A_U10 T1A_U11 T1A_U13 T1A_U14 T1A_U15
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.	l/c	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 the obtained work. A student is responsible for the reliability of the obtained results.	l/c	IŚ_K02 IŚ_K05 IŚ_K07	T1A_K02 T1A_K05 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/l/c	IŚ_K09	T1A_K02

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. Contamination concerning natural water; the types of additions (soluble compounds in the ionic and non-ionic state; colloids; microsuspensions and suspensions; the requirements concerning drinkable and industrial water).	W_01 W_03
2.	Theoretical fundamentals of contamination removal processes from natural water; precipitating suspensions, removing contaminations with divisions; sifting – trusses, sieves, and microsieves.	W_01 U_01
3.	Filtration from porous materials, filtration with a cake filtration, nanofiltration, inverse osmosis; slow filters, precoated (diatomic) filters; filtering water intakes.	W_01 U_03
4.	Output data for designing surface water treatment stations; technological systems of treating surface water.	W_03 U_01 U_03
5.	Coagulation – the types of coagulants; polielectrolytes; activated silicate; devices for preparing chemical reagents; alkalinity balance.	W_01
6.	The methods of correcting water reactions; the principles of designing them and technical solutions.	W_01 W_03 U_01
7.	Sedimentation of grain and floc suspension (fluid state); clarifiers (their classification).	W_03 U_01
8.	Constructional solutions of settling tanks and their technological parameters.	W_02 U _03
9.	Contact filters; materials applied as fillings of rapid filters; constructional solutions of gravitational filters.	W_01 W_02 W_03
10.	Constructional solutions of pressure filters; the phenomena taking place in deposits during filtration.	W_02 U_01 U_03
11.	Disinfection methods as regards pipeline water. Chlorine, chlorine dioxide (their properties and application). The reactions of chlorine with ammonia. The principles of designing chlorination plants.	W_03 U_01
12.	The creation of THMs during the disinfection of water with chlorine. Henry's law. Removing ethereal organic compounds from water. Constructional solutions.	W_02 W_03 U_01 U_03
13.	Filtration water intakes. Location conditions. The objects of supplying water bearing stratum. The systems of treating filtrating water.	W_02
14.	Removing organic compounds from water; sorption (theoretical fundamentals). Sorption isotherms.	W_01
15.	Ozone in water technologies. The Picabol method. Removing algae from water.	W_02 W_03 U_01 U_03 K_03

Module content:

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1.	The methods of calculating the volume of reagents on the basis of the assigned values of samples.	W_01 U_01 K_01
2.	Sedimentation of the grain and floc suspension. Introduction to settling tanks.	W_03 U_01 K_01 K_02
3.	The methods of correcting water reaction. Calculating the exponent of hydrogen and hydroxide ions. Calculating the coagulation process.	W_01 U_01 K_01 K_02 K_03
4.	The fundamentals of designing the process of iron removal form water.	W_01 W_03 U_01 K_01 K_02
5.	Numerical determining adsorption isotherms.	U_01 K_01 K_02
6.	Calculations concerning water disinfection devices.	W_01 W_03 U_01 K_03

Module content:

3. Topics to be covered in the laboratories

No.	Topics	Module outcome code
1.	Orientation class. Discussing the scope of laboratory classes. Familiarising students with OHS regulations as well as with the principles of behaving in the Water Treatment Laboratory.	W_01
2.	Sieve analysis of filtration sand.	W_01 U_02 K_01 K_02
3.	Water coagulation with aluminium and iron salts.	W_01 U_02 K_01 K_02 K_03
4.	Softening water with precipitation methods.	W_01 U_02 K_01 K_02
5.	Removing iron and manganese from water.	W_01 U_02 K_01 K_02
6.	Determining adsorption effectiveness on active carbon.	W_01 U_02 K_01 K_02
7.	Demineralisation of water on ion exchangers.	W_01 U_02 K_01 K_02

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 and a report
W_02	A test
W_03	A test
U_01	A test
U_02	A test and a report
U_03	A test
K_01	A test, a report, and observing a student's involvement during laboratory classes
K_02	A test and a report
K_03	A test and a report

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	**15**
3	Contact hours: participation in laboratories	**30**
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	**4**
8		
9	**Number of contact hours**	***67 (total)***
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**2.7**
11	Private study hours: background reading for lectures	**3**
12	Private study hours: preparation for classes	**4**
13	Private study hours: preparation for tests	**3**
14	Private study hours: preparation for laboratories	**3**
15	Private study hours: writing reports	**6**
16	Private study hours: preparation for a final test in laboratories	**4**
17	Private study hours: preparation of a project/a design specification	
18	Private study hours: preparation for an examination	**10**
19		
20	**Number of private study hours**	***33 (total)***
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**1.3**
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*	**62**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**2.5**

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	