MODULE SPECIFICATION

Module code	
Module title in Polish	Procesy jednostkowe w inżynierii środowiska
Module title in English	Unit Processes for Environmental Engineering
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	optional module (compulsory/optional)
Language of module delivery	**Polish/English**
Semester in the programme of study in which the module is taught	semester 3
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	1

* 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				

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C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The lectures cover such issues as unitary processes applied in environmental engineering, e.g. sedimentation, coagulation, ionic exchange, absorption, adsorption and membrane processes. Each of the above-mentioned subjects has theoretical fundamentals and practical applications.

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 basic knowledge as regards elementary processes applied in water treatment.	l	IŚ_W01 IŚ_W07 IŚ_W09 IŚ_W15	T1A_W01 T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_02	A student has basic knowledge as regards unitary operations applied in environmental engineering.	l	IŚ_W01 IŚ_W07 IŚ_W09 IŚ_W15	T1A_W01 T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_03	A student has basic knowledge as regards process engineering.	l	IŚ_W01 IŚ_W07 IŚ_W09 IŚ_W15	T1A_W01 T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
U_01	A student can obtain information from the literature on the subject and databases as regards the operations and unitary processes in environmental engineering.	l	IŚ_U01 IŚ_U06	T1A_U01 T1A_U05
U_02	A student can model basic unitary processes in order to obtain the required remediation process.	l	IŚ_U11	T1A_U08 T1A_U09
U_03	A student is capable of assessing the usefulness of operations and unitary processes to solve engineering and non-engineering processes.	l	IŚ_U24 IŚ_U26	T1A_U10 T1A_U15
K_01	A student is aware of raising his/her professional competences; a student also independently improves and broadens his/her knowledge as regards modern processes in environmental engineering.	l	IŚ_K03	T1A_K01 T1A_K02
K_02	A student understands the necessity of passing knowledge as regards engineering and environmental protection to the society.	l	IŚ_K06	T1A_K06 T1A_K07
K_03	A student is aware of the technological progress and the necessity of implementing modern remediation systems.	l	IŚ_K09	T1A_K02

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1.	Modelling deposition processes. The deposition of grain and floccular suspensions. Determining deposition characteristics according to Camp. Zone deposition.	W_01 U_01 U_03 K_03
2.	Mixing. Fluid motion velocity gradient. Mixing power, circulation time, mixing time, torque, non-dimensional circulation number, non-dimensional mixing time.	W_01 W_03 U_03 K_01
3.	Modelling filtrations in a porous centre. Modelling water flow through a filtration deposit. Application for the selected application in water treatment systems.	W_01 W_03 U_02 K_03
4.	Absorption. Modelling absorption processes. The balance of mass exchange in the gas-fluid system. Calculating minimum deposition height.	W_01 W_02 W_03 U_02 K_03
5.	Sorption processes. Adsorption on the boundary of fluid-gas phase. Adsorption on the surface of solid bodies. Adsorption isotherms. The application of sorption.	W_01 W_02 W_03 U_02 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
U_01	A test
U_02	A test
U_03	A test
K_01	A test
K_02	A test
K_03	A test

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	
6	Contact hours: meetings with a project module leader	
7	Contact hours: attendance at an examination	
8		
9	**Number of contact hours**	***17 (total)***
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**0.68**
11	Private study hours: background reading for lectures	**4**
12	Private study hours: preparation for classes	
13	Private study hours: preparation for tests	**4**
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	
18	Private study hours: preparation for an examination	
19		
20	**Number of private study hours**	***8 (total)***
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**0.32**
22	**Total study time**	**25**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**1.0**
24	**Number of practice-based hours** *Total practice-based hours*	**0**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**0**

E. READING LIST

References	1. Gary W vanLoon, Stephen J.Duffy: „Environmental Chemistry", Oxford Univesity Press 2010. 2.Tom G. Spiro, Kathleen L. Purvis-Roberts, and William M. Stigliani:"Chemistry of the Environment", 3rd Edition, August 2011 by University Science Books 3. Gray N.F.: „Water Technology: An Introduction for Environmental Scientists and Engineers, 3rd Edition", Butterworth-Heinemann, 2010. 4. Frank R. Spellman: „Handbook of Water and Wastewater Treatment Plant Operations", Third Edition by CRC Press, 2013 5. Nicholas P. Cheremisinoff: „Handbook of Water and Wastewater Treatment Technology" by CRC Press, 1994 6. Droste, L. Ronald: „Theory and practice of water and wastewater treatment" New York: John Wiley & Sons, 1997 7.McGraw Hill Professional „Water Treatment Plant Design, Fifth" Edition American Water Works Association, American Society of Civil Engineers, 2012 8. A.D. Patwardhan: „Industrial waste water treatment" PHI Learning Pvt. Ltd., 2008 9. Gray N.F.: „Water Technology: An Introduction for Environmental Scientists and Engineers, 3rd Edition", Butterworth-Heinemann, 2010.
Module website	