MODULE SPECIFICATION

Module code	
Module title in Polish	**Oczyszczanie ścieków 1**
Module title in English	**Wastewater Treatment 1**
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	Water Supply, Treatment of Wastewater and Solid Waste, Sanitary Pipelines and Systems
Organisational unit responsible for module delivery	Department of Water and Wastewater Engineering
Module co-ordinator	Lidia Bartkiewicz, PhD, Eng. Magdalena Dańczuk, PhD, Eng
Approved by:	Lidia Dąbek, PhD hab., Professor of the Kielce University of Technology

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	No (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 module covers mechanical, biological, and chemical processes which are indispensable to obtain treated sewage with the required quality by the Polish legislation (while removing them to receivers, i.e. surface water or soil. The scope of the lectures includes sewage treatment systems with biological deposition as well as active deposition adjusted to remove carbon, carbon and nitrogen, nitrogen and phosphorus compounds.

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 is familiar with the impact of municipal sewage, household sewage on the quality of natural water.	l/c/l	IŚ_W16	T1A_W03 T1A_W05 T1A_W07 T1A_W08
W_02	A student knows the methods of mechanical purification and technological devices applied in mechanical parts of sewage treatment plants.	l/c	IŚ_W06 IŚ_W09	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_03	A student knows the principles of interaction concerning biological and active deposits as well as the types of chambers of devices applied in these technologies of treating sewage.	l/c/l	IŚ_W09 IŚ_W06	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_04	A student knows technological solutions of local sewage treatment plants and deposit processing.	l/l	IŚ_W09 IŚ_W06	T1A_W03 T1A_W04 T1A_W05 T1A_W06, T1A_W07
W_05	A student knows technological systems for removing carbon, nitrogen, and phosphorus compounds from sewage.	l/c/l	IŚ_W09 IŚ_W06	T1A_W03 T1A_W04 T1A_W05 T1A_W06, T1A_W07
U_01	A student can independently determine the balance of the volume concerning sewage and its contents.	l/c	IŚ_U02 IŚ_U09	T1A_U01 T1A_U04 T1A_U05 T1A_U07 T1A_U10
U_02	A student is capable of selecting devices for mechanical treatment of sewage and processing deposits.	l	IŚ_U02 IŚ_U19	T1A_U01 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 determine a technological system of a sewage treatment system on the basis of population equivalents.	l/c/l	IŚ_U02 IŚ-U15 IŚ_U16	T1A_U01 T1A_U05 T1A_U03 T1A_U07 T1A_U08 T1A_U09 T1A_U10 T1A_U11 T1A_U13 T1A_U14 T1A_U15
U_04	A student is capable of determining the composition of sewage as well as the effects of sewage treatment.	l/c/l	IŚ_U17	T1A_U07 T1A_U08 T1A_U09
U_05	A student can determine the parameters of deposit and determine the portions of coagulants to precipitate chemical phosphorus.	l/l	IŚ_U17	T1A_U07 T1A_U08 T1A_U09
U_06	A student is able to characterise sewage deposits which are generated on sewage treatment plant; a student can also assess their ability to dehydrate.	l	IŚ_U01 IŚ_U18	T1A_U03 T1A_U08 T1A_U09 T1A_U10 T1A_U12 T1A_U14 T1A_U15
K_01	A student is responsible for the reliability of the obtained results of his/her work and its interpretation.	c/l	IŚ_K02	T1A_K02 T1A_K05
K_02	A student formulates conclusions and describes the results of his/her work. A student is also communicative in multimedia presentations.	c/l	IŚ_K07	T1A_K07
K_03	A student understands the significance of a technological progress and the necessity of implementing new technical solutions in environmental engineering; a student also understands non-technical aspects of engineering activity.	l	IŚ_K09	T1A_K02

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module

		outcome code
1-2	Introduction. The types, quantity and quality of sewage. Municipal waste. Loads and sewage concentration. Biogenic elements in sewage. Elementary processes in sewage treatment.	W_01 U_01 U_04
3-4	The methods of measuring sewage flow which are applied in sewage treatment plants. Samplers. Unit qualities of sewage and contamination loads, non-uniformity of sewage flow to sewage treatment plants interacting with the general-flow and division sewage treatment plants.	W_01 U_01 U_04
5-6	Determining balanced population equivalents. The requirements concerning sewage introduced to water, soils and the sewage system. The characteristics of sewage transported with the gully emptier fleet, decantation plants and their equipment.	W_01 W_05 U_01 U_04 K_03
7-8	The diagrams of sewage treatment plants depending on population equivalent (process efficiency). Initial mechanical treatment (trusses, sieves, and grit chambers: constructional and project solutions. The methods of reprocessing sand and screenings.	W_02 W_04 U_03 K_03
9-10	Suspension sedimentation. The types of initial clarifiers applied in sewage treatment plants (decay, longitudinal, radial, and Imhoff clarifiers). Technological parameters and guidelines concerning designing).	W_04 U_03 K_03
11-12	Biological deposits. Technological parameters and guidelines concerning designing. The principles of designing deposits for reduction the compounds of carbon and general nitrogen. Secondary clarifiers after deposits and active deposit reactors. Technological parameters and guidelines concerning designing.	W_03 U_02 K_03
13-14	Classical systems of sewage treatment in active deposit technology. The parameters of the nitration, denitration, and dephosphoration processes. The system of removing phosphorous from sewage with biological and chemical methods.	W_03 U_02 U_05 K_03
15	Systems for removing carbon and nitrogen compounds from sewage. The principles of designing. SBR reactors.	W_03 U_02 K_03

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1 - 2	The balance and sewage and contamination contents balance. Determining population equivalent. The coefficients of hourly inequality of sewage inflow to the sewage treatment plant. Determining the capacity of the sewage treatment plant for general-flow and division sewage system.	W_01 W_02 U_01 U_03 U_04 K_01
3 - 7	Dimensioning biological deposits, active deposit chambers, initial and secondary clarifiers.	W_02 W_03 W_05 U_01 U_03 U_04 K_02

3. Topics to be covered in the laboratories

4.

No.	Topics	Module outcome code
1-2	Orientation class. Discussing the subject range of laboratory classes. Familiarising students with OHS regulation as well as regulations binding in the Technological Laboratory. The amount and composition of sewage. Examining a physical and chemical composition of household sewage (untreated and treated).	W_01 U_04 K_01 K_02
3	Sewage treatment with the active deposit method. Controlling sewage treatment effect. Determining technological parameters of the active deposit method.	W_03 W_05 U_03 U_04 K_01 K_02
4 - 5	Processing and the disposal of sewage deposits. The process of gravitational solidification of deposits. Determining characteristic values as regards the capability of the deposit for dehydration: measuring capillary suction time; determining a proper filtration resistance (the process of vacuum filtration on Buchner's funnel.	W_04 U_06 K_01 K_02
6	Testing the impact of the coagulant portion on removing phosphorus from sewage.	W_05 U_05 K_01 K_02

5. Topics to be covered in the project

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 and a report
W_04	A test and a report
W_05	A test and a report
U_01	A test
U_02	A test
U_03	A test and a report
U_04	A test and a report
U_05	A test and a report
U_06	A test and a report
K_01	A test and a report
K_02	A test and a report
K_03	A test

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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)	**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**	**62** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**2,48**
11	Private study hours: background reading for lectures	**10**
12	Private study hours: preparation for classes	**5**
13	Private study hours: preparation for tests	**5**
14	Private study hours: preparation for laboratories	**5**
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	
18	Private study hours: preparation for an examination	
19		
20	**Number of private study hours**	**38** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**1,52**
22	**Total study time**	**100**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**4**
24	**Number of practice-based hours** *Total practice-based hours*	**38**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**1,52**

E. READING LIST

References	Metcalf & Eddy , George Tchobanoglous , H. David Stensel Ryujiro Tsuchihashi , Franklin Burton *Wastewater Engineering: Treatment and Resource* , McGraw-Hill Education, Boston, 2013 Ronald L. Droste , *Theory and practice of water and wastewater treatment*, New York, John Wiley & Sons, 1997 Frank R. Spellman, *Mathematics Manual for Water and Wastewater Treatment Plant Operators, Second Edition: Wastewater Treatment Operations: Math Concepts and*

	Calculations, CRC Press, 2014 *Ronald W. Crites, E. Joe Middlebrooks, Robert K. Bastian,* Natural Wastewater Treatment Systems, Second Edition*, CRC Press, 2014* *Rumana Riffat ,* Fundamentals of Wastewater Treatment and Engineering, *CRC Press, 2012* D. G. Rao, R. Senthilkumar, J. Anthony Byrne, S. Feroz, *Wastewater Treatment: Advanced Processes and Technologies,* CRC Press, 2012
Module website	