MODULE SPECIFICATION

Module code	
Module title in Polish	**Modele wodno – ściekowe w aglomeracjach miejskich**
Module title in English	**Water and Wastewater Models for Urban Agglomerations**
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	optional module (compulsory/optional)
Language of module delivery	**Polish/English**
Semester in the programme of study in which the module is taught	semester 6
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 (Yes/No)
ECTS credits	5

* elective HES – elective modules in the Humanities and Economic and Social Sciences

Mode of instruction	lectures	classes	laboratories	project	others
Total hours per semester	15E			45	

Politechnika Świętokrzyska
al. Tysiąclecia Państwa Polskiego 7; 25-314 Kielce
tel.: 41 34 24 850, fax: 41 34 42 860
e-mail: wisge@tu.kielce.pl

C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to indicate that control systems of complex processes, technical and technological systems in the water and sewage industry (more and more frequently refer to optimisation based on expert systems which utilise artificial intelligence methods). Other aims as follows: - acquainting students with data mining methods (also referred to as data exploration or knowledge discovery methods) - indicating to what extent the use of data mining methods is applicable in determining forecast models of balancing water demand as well as the inflow of sewage to sewage treatment plants - learning the impact of particular factors influencing the amount of demand for water and producing sewage - comparing different mathematical apparatuses and indicating the most convenient one for designing - theoretical and practical preparation of students for skilful utilisation of databases gathered with SCADA systems - assessing the exploitation of water and sewage systems (as well as other technical systems based on economic accounting in enterprises) - familiarising students with determining components which have an impact on the prediction of water and sewage systems states (during the change of external factors in time)

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 knows the aims and benefits from implementing integrated management systems concerning water and sewage infrastructure.	l	IŚ_W09 IŚ_W19	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07 T1A_W08 T1A_W09 T1A_W11
W_02	A student knows the fundamentals of GIS systems utilised in water and sewage management.	l	IŚ_W09	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_03	A student knows information tools for modelling pipeline and sewage networks as well as the processes of sewage and water treatment.	l/p	IŚ_W09 IŚ_W11	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
W_04	A student knows the need and benefits resulting from monitoring water and sewage infrastructure.	l	IŚ_W06 IŚ_W09 IŚ_W11 IŚ_W21	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07 T1A_W11
W_05	A student knows basic assumptions of the modelling process as regards exploitation systems of pipeline and sewage systems.	l/p	IŚ_W11 IŚ_W21	T1A_W03 T1A_W04 T1A_W05 T1A_W11
U_01	A student can utilise available information tools for the	l/p	IŚ_U06	T1A_U01

	simulation of work parameters concerning pipeline and sewage networks (together with monitoring them).		IŚ_U16	T1A_U02 T1A_U03 T1A_U04 T1A_U05 T1A_U06 T1A_W08 T1A_W09 T1A_W10 T1A_W11 T1A_W13 T1A_W14 T1A_W15 T1A_W16
U_02	A student can recognise the links between particular elements of the exploitation system; a student can also recognise the possibilities of improving their efficiency.	I	IŚ_U02 IŚ_U13	T1A_U01 T1A_U05 T1A_U07 T1A_U10 T1A_U12
U_03	A student can link and utilise particular elements of the integrated management system as regards technical infrastructure of urban agglomerations.	I/p	IŚ_U02 IŚ_U09	T1A_U01 T1A_U04 T1A_U05 T1A_U07 T1A_U10
U_04	A student can (with the use of the GIS system) obtain, process, and present data connected with management processes as regards pipeline and sewage systems.	I	IŚ_U02 IŚ_U06 IŚ_U15	T1A_U01 T1A_U02 T1A_U03 T1A_U04 T1A_U05 T1A_U06 T1A_U07 T1A_U10 T1A_U14 T1A_U15
U_05	A student is capable of utilising available information tools to forecast the composition and amount of sewage inflow to sewage treatment plants as well as simulate the processes of water and sewage treatment.	I/p	IŚ_U02 IŚ_U13 IŚ_U15	T1A_U01 T1A_U05 T1A_U07 T1A_U10 T1A_U12 T1A_U14 T1A_U15
K_01	A student understands the necessity of implementing information technologies to manage water and sewage systems.	I/p	IŚ_K03	T1A_K01 T1A_K02 T1A_K04
K_02	A student understands the necessity to implement information models to assess current and anticipated states in water and sewage systems.	I/p	IŚ_K03	T1A_K01 T1A_K02 T1A_K04
K_03	A student understands the need of independent education in order to increase his/her professional competences.	I	IŚ_K03	T1A_K01 T1A_K02 T1A_K04

K_04	A student understands the significance of technical progress and the necessity of implementing new technical solutions in environmental engineering; moreover, a student understands non-technical aspects of engineering activity.	1	IŚ_K09	T1A_K02

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1	Integrated systems of managing water and sewage systems.	W_01 U_03 K_02 K_03 K_04
2-3	GIS in pipeline and sewage systems.	W_02 U_04 K_03 K_04
4-5	Monitoring of water and sewage infrastructure. The applied information tools.	W_04 U_01 K_03 K_04
6-8	Modelling work parameters of sewage and pipeline networks.	W_03 U_01 K_01 K_03 K_04
9	The exploitation of pipeline and sewage systems in a model approach.	W_05 U_02 K_03 K_04
10-11	Modelling biological processes of sewage treatment.	W_03 U_05 K_01 K_03 K_04
12- 13	Computer techniques in modelling water treatment processes, assessing water chemical stability, and sewage treatment processes.	W_03 U_05 K_01 K_03

		K_04
14-15	The optimisation of the exploitation process concerning sewage treatment plant with the use of computer simulations.	W_03 U_05 K_01 K_03 K_04

2. Topics to be covered in the classes
3. Topics to be covered in the laboratories
4. Topics to be covered in the project

No.	Topics	Module outcome code
1	The simulation of work as regards a pipeline network. Hydraulic calculations with the use of the Epanet program.	W_03 W_05 U_01 K_01 K_02
2	Forecasting the amount of sewage with the Idol program (which utilises the methods of time series to model the amount of water and sewage).	W_03 U_01 U_03 U_05 K_01 K_02
3	Utilising the models of neural networks to forecast the amount of water and sewage with the use of the Statistica program.	W_03 U_01 U_03 U_05 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	An examination
W_02	An examination
W_03	An examination and a project
W_04	An examination
W_05	An examination and a project
U_01	An examination and a project
U_02	An examination
U_03	An examination and a project
U_04	An examination

U_05	A project
K_01	An examination and a project
K_02	An examination and a project
K_03	An examination
K_04	An examination

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)	**3**
5	Contact hours: participation in project-based classes	**45**
6	Contact hours: meetings with a project module leader	**3**
7	Contact hours: attendance at an examination	**2**
8		
9	**Number of contact hours**	**68** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**2,72**
11	Private study hours: background reading for lectures	**20**
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	**25**
18	Private study hours: preparation for an examination	**12**
19		
20	**Number of private study hours**	**57** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**2,28**
22	**Total study time**	**125**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**5**
24	**Number of practice-based hours** *Total practice-based hours*	**73**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**2,92**

E. READING LIST

References	Lynn E. Johnson, Geographic Information Systems in Water Resources Engineering, CRC Press, 2008 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 Computers program: Statistica , Matlab
Module website	