MODULE SPECIFICATION

Module code	
Module title in Polish	Miernictwo cieplno - przepływowe
Module title in English	Heat- and Fluid Flow Measurements
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	Sanitary Pipelines and Systems; Water Supply, Treatment of Wastewater and Solid Waste
Organisational unit responsible for module delivery	Department of Piped Utility Systems
Module co-ordinator	Łukasz Orman, PhD hab., Eng.
Approved by:	Prof. Andrzej Kuliczkowski, PhD hab., Eng.

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	No (Yes/No)
ECTS credits	2

* 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		

C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to familiarise students with the principles of operation and using basic devices for measuring temperature with contact and non-contact methods, absolute pressure, and excess pressure, the stream of mass and heat, humidity as well as the selected photometric values.

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 theoretical fundamentals of taking measurements and analysing results.	l/l	IŚ_W01	T1A_W01 T1A_W02
W_02	A student knows the methods and theoretical fundamentals of measuring mass and volume stream.	l/l	IŚ_W12	T1A_W03 T1A_W04 T1A_W07
W_03	A student knows the methods of measuring absolute pressure, excess pressure (together with the principle of operation of devices and their application).	l/l	IŚ_W08	T1A_W03 T1A_W04
W_04	A student knows the methods and principles of measuring temperature, humidity, and photometric values.	l/l	IŚ_W08	T1A_W03 T1A_W04
U_01	A student can take measurements and analyse the obtained results.	l/l	IŚ_U08 IŚ_U22 IŚ_U27	T1A_U07 T1A_U08 T1A_U09 T1A_U15
U_02	A student can take measurements of fluid mass and volume.	l/l	IŚ_U08 IŚ_U22 IŚ_U27	T1A_U07 T1A_U08 T1A_U09 T1A_U15
U_03	A student can take measurements of pressure, temperature, humidity, and photometric values.	l/l	IŚ_U08 IŚ_U22 IŚ_U27	T1A_U07 T1A_U08 T1A_U09 T1A_U15
K_01	A student can work individually and in a team. Moreover, a student can organise teamwork which will realise the assigned task.	l	IŚ_K01 IŚ_K05	T1A_K03 T1A_K04
K_02	A student is responsible for the reliability of the obtained results.	l	IŚ_K02 IŚ_K07	T1A_K02 T1A_K05 T1A_K07
K_03	A student can formulate conclusions and describe the results of the obtained work.	l	IŚ_K07	T1A_K07

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1.	Discussing the syllabus of the lectures. Errors and measurement uncertainty.	W_01 U_01
2.	Measuring the stream of mass and volume (measurement methods and devices).	W_02 U_02
3.	The measurement of absolute pressure, excess pressure; the principle of operation and application.	W_03 U_03
4.	Temperature measurement: measurement method, the types of thermometers, contact and non-contact methods.	W_04 U_03
5.	Humidity measurements.	W_04 U_03

6.	Measuring basic photometric values.	W_04 U_03

2. Topics to be covered in the laboratories

No.	Topics	Module outcome code
1.	Familiarising students with the syllabus of laboratory classes and the apparatus utilised during tests.	W_01
2.	Taking velocity measurement of air, mass and volume stream flow.	W_02 U_01 U_02
3.	Taking measurements of pressure drop in pipes.	W_03 U_01 U_03
4.	Determining material emission with the use if pyrometric tests.	W_04 U_01 U_03
5.	Taking air humidity measurements in a closed chamber.	W_04 U_01 U_03
6.	Taking light intensity measurements in the conditions of various lighting.	W_04 U_01 U_03
7.	Taking measurements in a heat center.	W_04 U_01 U_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 and a report
W_02	A test and a report
W_03	A test and a report
W_04	A test and a report
U_01	A test and a report
U_02	A test and a report
U_03	A test and a report
K_01	A report, observations of students in the lecture
K_02	A report, observations of students in the lecture
K_03	A report, observations of students in the lecture

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	**15**
4	Contact hours: attendance at office hours (2-3 appointments per semester)	**5**
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**	**35** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**1.4**
11	Private study hours: background reading for lectures	**3**
12	Private study hours: preparation for classes	
13	Private study hours: preparation for tests	**3**
14	Private study hours: preparation for laboratories	**3**
15	Private study hours: writing reports	**3**
16	Private study hours: preparation for a final test in laboratories	**3**
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**	**15** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**0.6**
22	**Total study time**	**50**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**2**
24	**Number of practice-based hours** *Total practice-based hours*	**24**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**0.96**

E. READING LIST

References	1. Wright, Gary R., Applied measurement engineering: how to design effective mechanical measurement systems, Englewood Cliffs: Prentice Hall PTR, 1995 2. Michael J. Moran, Introduction to thermal systems engineering: thermodynamics, fluid mechanics, and heat transfer, New York : John Wiley & Sons, Inc., 2003 3. Cengel Y.A., Heat Transfer – a practical approach, McGraw-Hill Higher Education, 2003 4. Cengel Y.A., Turner R.H., Fundamentals of Thermal – Fluid Sciences, McGraw-Hill Higher Education, 2001 5. Lee, Tae-Woo, Thermal and flow measurements, Boca Raton [etc.] : CRC Press, cop. 2008
Module website	