MODULE SPECIFICATION

Module code	
Module title in Polish	**Fizyka**
Module title in English	**Physics**
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	All
Organisational unit responsible for module delivery	**Department od Mathematics and Physics**
Module co-ordinator	**Medard Makrenek, PhD**
Approved by:	**Prof. Andrzej Okniński, Dr. habil.**

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 2
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	**30**	**15**	15		

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C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to acquaint students with basic physical phenomena and processes in nature; the possibilities of utilising the laws of nature in technology, in environmental protection and everyday life, particularly: the fundamentals of classical mechanics, conservation laws in physics and their utilisation to solve basic technical problems.

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 knowledge as regards the fundamentals of physics which covers knowledge on the mechanics of a material point (including the kinematics of translatory and rotational motion); moreover, a student knows the laws of dynamics of a material point. In addition, a student knows and is able to describe simple physical phenomena (by utilising mathematical equations).	l/c	IŚ_W01 IŚ_W14	T1A_W01 T1A_W02 T1A_W06
W_02	A student knows and is able to utilise physical conservation laws in solving simple technical issues.	l/c	IŚ_W01	T1A_W01 T1A_W02
W_03	A student has knowledge as regards the generation and propagation of acoustic and electromagnetic waves (as well as concerning classical thermodynamics).	l/c	IŚ_W08	T1A_W04 T1A_K03
W_04.	A student has knowledge as regards the fundamentals of fluid mechanics (and is able to utilise it).	l/c	IŚ_W12	T1A_W03 T1A_W05
U_01	A student can utilise the laws of physics to solve simple issues occurring in environmental engineering.	l/c/l	IŚ_U01	T1A_U08 T1A_U09
U_02	A student can work individually and in a team. Moreover, a student is able to estimate work time to complete the assigned tasks. Furthermore, a student can take measurements of physical values by applying various measuring instruments.	c/l	IŚ_U03	T1A_U02 T1A_U08
U_03	A student can take simple physical measurements, present their results and interpret them.	l	IŚ_U01	T1A_U08 T1A_U09
U_04	A student is capable of self-education and independent preparation of a determined part of material.	l/c/l	IŚ_U02	T1A_U01 T1A_U05 T1A_U07
K_01	A student is aware of the responsibility for his/her own work (as well as teamwork). In addition, a student can comply with the principles of teamwork.	c/l	IŚ_K01 IŚ_K05	T1A_K03 T1A_K04
K_02	A student understands the necessity of raising his/her professional competences.	c/l	IŚ_K03	T1A_K01 T1A_K02 T1A_K04

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1	Introduction to physics: fundamental interactions and their characteristics. Gravitational field.	W_01 W_02, U_04
2	The kinematics of a material particle (motion trajectory, kinematic values – linear and angular; kinematic equations of motion in various coordinate systems.	W_01, W_02
3, 4	The dynamics of a material particle (the first law of Newtonian dynamics, inertial systems, the hypothesis of Galileo's invariability; second Newtonian law; equations of motion in inertial and non-inertial reference systems (forces of inertia); third Newtonian law; the principle of conservation of momentum.	W_01, W_02
5	Work, power, and energy (work, kinetic energy, the field of potential forces, potential energy, the principle of conservation of mechanical energy).	W_01, W_02
6	The elements of fluid mechanics. The equation of continuity, Bernoulli's equation.	W_02, U_01, U-04
7, 8	Harmonic and wave motion (blocking and non-blocking harmonic oscillator; induced harmonic oscillations; the phenomenon of resonance, wave motion, running and stationary wave, wave interference).	W_01, W_02 , U-04
9, 10	The fundamentals of acoustics (the sources of sound, the velocity of wave propagation). Deflection and refraction, standing waves. Doppler's phenomenon. Absorbing and dispersing sound waves, the elements of physiological acoustics.	W_03, U-04
11, 12	Temperature scales and thermometers. Heat, work, and internal energy (the first law of thermodynamics).	W_01,
13, 14	Kinetic theory of gases (an ideal gas model, the distribution of particle velocity, the equation of state concerning an ideal gas, gaseous transitions, a model of a real gas). The second law of thermodynamics (thermodynamic engines, Carnot's engine).	W_01,W_02 W_03
15	Electrostatics (field sources, force lines, voltage, and stream). Coulomb's law, the divergence theorem. The potential of an electric field. Electric current. Ohm's and Kirchhoff's law.	W_01 W_04

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1	The kinematics of a material point. Motion description. Relative motion.	W_01, W_02, U_01, U_02, K_01
2	A diagonal projection as a compound of two straight motions (a test).	W_01, U_01

3	The dynamics of a material point.	W_01, U_01, U_02, K_01
4	Dynamic equations of motion. Motion influenced by a few forces.	W_01, U_01
5	The principles of conservation of mass, momentum, and angular momentum.	W_02, U_01, U_02, K_01
6	A mathematical pendulum (determining resonance frequency).	W_01, W_03 U_01
7	A final test.	W_01, W_02 W_03, U_01 U_02, K_01

3. Topics to be covered in the laboratories

Students complete 6 tasks from among those listed below:

No.	Topics	Module outcome code
1	Orientation class.	K_01
2	Determining the characteristics of a diode and transistor.	U_01, U_02, U_03, K_01, K_02
3	Examining resonance in the RLC circuit.	U_01, U_02, U_03, K_01 K_02
4	Electrolysis.	U_01, U_02, U_03, K_01 K_02
5	Determining C_p/C_v ratio.	U_01, U_02, U_03, K_01 K_02
6	Hooke's law. Harmonic oscillations.	U_01, U_02, U_03, K_01 K_02
7	Determining sound velocity.	U_01, U_02, U_03, K_01 K_02
8	Examining optical spectrums.	U_01, U_02, U_03, 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, oral tests before laboratory class assignments and written tests during laboratory classes
W_02	An examination, tests during the classes
W_03	An examination, an oral test before laboratory class assignments
W_04.	An examination, an oral test before laboratory class assignments

U_01	An oral test before laboratory class assignments, a report on laboratory classes, tests during the classes
U_02	Observing a student's involvement during laboratory classes
U_03	Observing a student's involvement during laboratory classes
U_04	Preparing material part for laboratory classes and controlling it before the classes
K_01	Observing a student's involvement during laboratory classes
K_02	Observing a student's involvement during laboratory classes

D. STUDENT LEARNING ACTIVITIES

ECTS summary		
	Type of learning activity	**Study time/ credits**
1	Contact hours: participation in lectures	**30**
2	Contact hours: participation in classes	**15**
3	Contact hours: participation in laboratories	**15**
4	Contact hours: attendance at office hours (2-3 appointments per semester)	**4**
5	Contact hours: participation in project-based classes	
6	Contact hours: meetings with a project module leader	
7	Contact hours: attendance at an examination	**2**
8		
9	**Number of contact hours**	**66** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**2,64**
11	Private study hours: background reading for lectures	**5**
12	Private study hours: preparation for classes	**10**
13	Private study hours: preparation for tests	**10**
14	Private study hours: preparation for laboratories	**10**
15	Private study hours: writing reports	**10**
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	**14**
19		
20	**Number of private study hours**	**59** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**2,36**
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*	**37**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**1,48**

E. READING LIST

References	David Halliday, Robert Resnick, Jearl Walker, Fundamentals of Physics Extended 10th Edition, Wiley, 2013
Module website	