MODULE DESCRIPTION

Module code	**Z-099z**
Module name	**Fizyka II**
Module name in English	**Physics**
Valid from academic year	**2016/2017**

A. MODULE PLACEMENT IN THE SYLLABUS

Field of study	**Management and Production Engineering**
Level of education	**1st degree** *(1st degree / 2nd degree)*
Studies profile	**General** *(general / practical)*
Form and method of conducting classes	**Full-time** *(full-time / part-time)*
Specialisation	**All**
Unit conducting the module	**The Department of Mathematics and Physics**
Module co-ordinator	**Professor Andrzej Okniński**
Approved by:	

B. MODULE OVERVIEW

Type of subject/group of subjects	**Basic** *(basic / major / specialist subject / conjoint / other HES)*
Module status	**Compulsory** *(compulsory / non-compulsory)*
Language of conducting classes	**English**
Module placement in the syllabus - semester	**2nd semester**
Subject realisation in the academic year	**Summer semester** *(winter semester/ summer)*
Initial requirements	**No requirements** *(module codes / module names)*
Examination	**No** *(yes / no)*
Number of ECTS credit points	**4**

Method of conducting classes	Lecture	Classes	Laboratory	Project	Other
Per semester	**15**	**15**	**15**		

C. TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Module target	The aim of the module is to acquaint students with basic notions and laws of thermodynamics, based on the formalism of calculus of probability. Another aim is to present kinetic theory of gases and basic mechanisms of heat transfer.

Effect symbol	Teaching results	Teaching methods *(l/c/lab/p/other)*	Reference to subject effects	Reference to effects of a field of study
W_01	A student has knowledge of principles of thermodynamics, ideal gas model, as well as knowledge about necessary mathematical methods such as calculus and differential equations.	l/c/lab	K_W02	T1A_W01 T1A_W02 T1A_W07
W_02	A student has knowledge of Brownian motion and thermodynamical paradoxes.	l/c/lab	K_W02	T1A_W01 T1A_W02 T1A_W07
W_03	A student has knowledge about temperature scales.	l/c/lab	K_W02	T1A_W01 T1A_W02 T1A_W07
U_01	A student is able to analyse simple thermodynamic processes, uses the ideal gas equation of state.	c/lab	K_U17	TA1_U09
U_02	A student is able to analyse all thermodynamical processes.	c/lab	K_U17	TA1_U09
U_03	A student is able to compute entropy.	c/lab	K_U17	TA1_U09
U_04	A student is able to estimate usefulness of thermodynamic analysis to solve simple thermodynamical problems.	c/lab	K_U19	TA1_U15
K_01	A student understands the need of permanent follow-up of her/his knowledge of foundations of physics.	l/c/lab	K_K01	TA1_K01

Teaching contents:

1. Teaching contents as regards lectures

Lecture number	Teaching contents	Reference to teaching results for a module
1	General information, elements of vector calculus, basic notions of classical thermodynamics and statistical physics.	W_01 K_01
2	Irreversible processes and ideal gas model.	W_01 K_01
3	Fluctuations and Brownian motion, examples.	W_01 U_04 K_01
4	Mean free path.	W_01 W_02 W_04 K_01
5	Principles of thermodynamics.	W_02 U_04 K_01
6	Entropy.	W_03 K_01
7	The Clapeyron equation.	W_01 W_02 U_04 K_01

8	Thermodynamical paradoxes, examples.	

2. Teaching contents as regards classes

Class number	Teaching contents	Reference to teaching results for a module
1	Repetitions of vector calculus. Thermodynamical paradoxes, examples.	W_01 K_01
2	State of equilibriursible processes.mas the most probable state. Irreversible processes.	W_01 U_01 U_04 K_01
3	Assumptions of the ideal gas model.	W_01 U_01 U_04 K_01
4	Test #1. Fluctuations.	W_01 W_02 U_01 U_02 U_04 K_01
5	Brownian motions. Maen free path.	W_02 U_02 U_04 K_01
6	The zeroth law of thermodynamics. Absolute scale of temperature.	W_03 U_03 U_04 K_01
7	The first law of thermodynamics. Entropy.	W_01 U_01 U_04 K_01
8	Test #2.	W_01 W_02 W_03 U_01 U_02 U_03 U_04 K_01

3. Teaching contents as regards laboratory classes

Laboratory class number	Teaching contents	Reference to teaching results for a module

4. The characteristics of project assignments

The methods of assessing teaching results

Assessment of classes on the basis of two tests.
Assessment of lectures on the basis of final test.

Effect symbol	**Methods of assessing teaching results** *(assessment method, including skills – reference to a particular project, laboratory assignments, etc.)*
W_01	Test during lecture, test at classes and in the laboratory.
W_02	Test during lecture, test at classes and in the laboratory.
W_03	Test during lecture, test at classes and in the laboratory.
U_01	Test and assessment of student's activity at classes and in the laboratory
U_02	Test and assessment of student's activity at classes and in the laboratory
U_03	Test and assessment of student's activity at classes and in the laboratory
U_04	Test and assessment of student's activity at classes and in the laboratory
K_01	Test during lecture, tests during classes and in the lab, observation of student's activity at lectures, classes and in the lab.

D. STUDENT'S INPUT

ECTS credit points		
	Type of student's activity	**Student's workload**
1	Participation in lectures	**15**
2	Participation in classes	**15**
3	Participation in laboratories	**15**
4	Participation in tutorials (2-3 times per semester)	**3l+3c=6**
5	Participation in project classes	
6	Project tutorials	
7	Participation in an examination	
8		
9	**Number of hours requiring a lecturer's assistance**	**51** *(sum)*
10	**Number of ECTS credit points which are allocated for assisted work** *(1 ECTS point=25-30 hours)*	**2**
11	Unassisted study of lecture subjects	**10**
12	Unassisted preparation for classes	**15**
13	Unassisted preparation for tests	**10**
14	Unassisted preparation for laboratories	**15**
15	Preparing reports	
15	Preparing for a final laboratory test	
17	Preparing a project or documentation	
18	Preparing for an examination	
19	Preparing for a test at a lecture	**10**
20	**Number of hours of a student's unassisted work**	**60** *(sum)*
21	**Number of ECTS credit points which a student receives for unassisted work** *(1 ECTS point=25-30 hours)*	**2**
22	**Total number of hours of a student's work**	**11**
23	**ECTS points per module** *1 ECTS point=25-30 hours*	**4**
24	**Work input connected with practical classes** *Total number of hours connected with practical classes*	**63**
25	**Number of ECTS credit points which a student receives for practical classes** (1 ECTS point=25-30 hours)	**2.3**

E. LITERATURE

Literature list	1. Resnick R., Halliday D., Walker J., *Fundamentals of Physics Extended*, 10th edition, John Wiley and Sons, Inc., 2011.
Module website	