SYLLABUS OF A MODULE

Polish name of a module	**Termodynamika**
English name of a module	**Thermodynamics**
ISCED classification - Code	0715
ISCED classification - Field of study	0715
Languages of instruction	*English*
Level of qualification: ***1 – BSc (EQF 6)*** ***2 – MSc (EQF 7)*** ***3 – PhD (EQF 8)***	***1 – BSc (EQF 6)***
Number of ECTS credit points	*6*
Examination: ***EO – exam oral*** ***EW – exam written*** ***A - assignment***	*A*
Available in semester: S – Spring only A – autumn only Y - booth	*A*

Number of hours per semester:

Lecture	Exercises	Laboratory	Seminar	E-learning	Project
30	30	15	0	0	0

MODULE DESCRIPTION

MODULE OBJECTIVES

O1. To familiarize with the issues of thermodynamics.
O2. To acquire the ability to solve tasks and examples connected with thermodynamics issues.
O3. To acquire practical skills in measuring physical quantities used in thermodynamics and interpretation of measurement results.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Fundamentals of mathematics, physics and chemistry.
2. Capability to use various information sources.
3. Ability of individual work and collaboration in a group.

LEARNING OUTCOMES

LO 1 - The student has knowledge of the content of lectures.

LO 2 - The student can solve tasks related to selected issues in thermodynamics.

LO 3 - The student has knowledge of the content of laboratory classes, and able to prepare a reports on conducted laboratory exercise.

MODULE CONTENT

Type of classes – Lecture	**Number of hours**
Lec 1-2 - Basic concepts	**2**
Lec 3-6 - Forms of energy, energy transfer by heat, energy transfer by work, the first law of thermodynamics, energy conversion efficiencies	**4**
Lec 7-10 - Properties of pure substances, property diagrams for phase-change processes, the ideal gas equation of state	**4**
Lec 11-14 - Energy analysis of closed systems, mass and energy analysis of control volumes	**4**
Lec 15-18 - The second law of thermodynamics, heat engines, refrigerators and heat pumps, the Carnot cycle	**4**
Lec 19-20 - Entropy and exergy analysis	**2**
Lec 21-22 - Gas power cycles	**2**
Lec 23-24 - Thermodynamic property relations	**2**
Lec 25-28 - Gas mixtures, gas-vapour mixtures	**4**
Lec 29-30 - Chemical reactions	**2**
Sum	**30**
Type of classes– Tutorials	**Number of hours**
Tut 1-2 - Basic concepts, in examples	**2**
Tut 3-6 - Forms of energy, energy transfer by heat, energy transfer by work, the first law of thermodynamics, energy conversion efficiencies, in examples	**4**
Tut 7-10 - Properties of pure substances, property diagrams for phase-change processes, the ideal gas equation of state, in examples	**4**
Tut 11 -14 - Energy analysis of closed systems, mass and energy analysis of control volumes, in examples	**4**
Tut 15-18 - The second law of thermodynamics, heat engines, refrigerators and heat pumps, the Carnot cycle, in examples	**4**
Tut 19-20 - Entropy and exergy analysis, in examples	**2**
Tut 21-22 - Gas power cycles, in examples	**2**
Tut 23-24 - Thermodynamic property relations, in examples	**2**
Tut 25-28 - Gas mixtures, gas-vapour mixtures, in examples	**4**
Tut 29-30 - Chemical reactions, in examples	**2**
Sum	**30**
Type of classes– Laboratory	**Number of hours**
Lab 1-3 - Temperature measurements	**3**
Lab 4-6 - Pressure measurements	**3**
Lab 7-9 - Mass flow rate measurements	**3**
Lab 10-12 - Humidity measurements	**3**
Lab 13-15 - Density measurements	**3**
Sum	**15**

TEACHING TOOLS

1 - Multimedia presentations

2 - Laboratory measuring equipment
3 - Literature

WAYS OF ASSESSMENT (F – FORMATIVE, S – SUMMATIVE)

F1. - assessment of activity during lectures
F2. - assessment of activity during exercises
F3. - assessment of activity during laboratory
S1. - assessment of mastery of the teaching material being the subject of the laboratory and ability to prepare reports on the implementation of laboratory exercises*
S2. - assessment of mastery of the teaching material being the subject of the exercises*
S3. - assessment of mastery of the teaching material being the subject of the lecture*

*) in order to receive a credit for the module, the student is obliged to attain a passing grades in all laboratory classes as well as in achievement tests.

STUDENT'S WORKLOAD

L.p.	Forms of activity	Average number of hours required for realization of activity
1.	**Contact hours with teacher**	
1.1	Lectures	30
1.2	Tutorials	30
1.3	Laboratory	15
1.4	Seminar	0
1.5	Project	0
1.6	Examination	0
	Total number of contact hours with teacher:	75
2.	**Student's individual work**	
2.1	Preparation for tutorials and tests	25
2.2	Preparation for laboratory exercises, writing reports on laboratories	25
2.3	Preparation of project	0
2.4	Preparation for final lecture assessment	15
2.5	Preparation for examination	0
2.6	Individual study of literature	10
	Total number of hours of student's individual work:	75
	Overall student's workload:	150
Overall number of ECTS credits for the module		6 ECTS
Number of ECTS points that student receives in classes requiring teacher's supervision:		3 ECTS
Number of **ECTS** credits acquired during practical classes including laboratory exercises and projects:		1.8 ECTS

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

1. Cengel, Y.A., Boles M.A., Canoglu M.: Thermodynamics. An engineering approach, 9th ed. New York, McGraw-Hill Education, 2019.

2. Moran M.J., Shapiro H.N.: Fundamentals of engineering thermodynamics, 5th ed. John Wiley & Sons, 2006.
3. Boxer G.: Engineering thermodynamics. Theory, worked examples and problems. THE MACMILLAN PRESS LTD London and Basingstoke, 1976.
4. Skačej G., Ziherl P.: Solved Problems in Thermodynamics and Statistical Physics. Springer, 2005.
5. Szargut J.: Technical thermodynamics (Termodynamika techniczna, in Polish). Wydawnictwo Politechniki Śląskiej, Gliwice, 2005.
6. Laboratory materials.

MODULE COORDINATOR (NAME, SURNAME, E-MAIL ADDRESS)

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