STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Technical Thermodynamics		**1010601131010630911**
Field of study: **Aerospace Engineering**	Profile of study (general academic, practical): **(brak)**	Year /Semester: **2 / 3**
Elective path/specialty: **Aircraft Piloting**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **2** Classes: **1** Laboratory: **1** Project/seminars: **-**		No. of credits: **3**
Status of the course in the study program (Basic, major, other): **(brak)**	(university-wide, from another field): **(brak)**	
Education areas and fields of science and art: **technical sciences** **Technical sciences**		ECTS distribution (number and %): **3 100%** **3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of the basics of thermodynamics and processes of energy flow and conversion in thermal and flow machines and devices - [PRK4]
2	**Skills**	Ability to describe and calculate basic thermodynamic processes and simple thermal energy conversion systems. The ability of effective self-education in the field related to the chosen field of study - [PRK4]
3	**Social competencies**	Is aware of the need to expand their competences, readiness to cooperate within the team - [PRK4]

Assumptions and objectives of the course:

Acquainting with basic thermodynamic processes, thermodynamic transformations and energy conservation equations. Understanding the methods of description of various thermodynamic factors and thermodynamic cycles that implement the assumed processes of thermal and mechanical energy conversion for the purpose of modernization or reconstruction of technological systems in the area of thermal energy. Practical mastering the ability to describe the implementation of thermal processes.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. has advanced knowledge in physics, including mechanics, thermodynamics, fluid mechanics, electricity and magnetism, optics, nuclear physics and solid state physics, including knowledge necessary to understand the basic physical phenomena occurring in electrical, energy and electronic components and systems, and in their surroundings - [[K1_W02 (P6S_WG)]]

2. has ordered and theoretically founded knowledge in the field of basic technologies of primary energy conversion into work, heat and electricity, knows the construction and principles of operation of power machines - [[[K1_W06 (P6S_WG)]]

3. knows and understands the impact of energy transformation processes on the natural environment - [[K1_W08 (P6S_WK)]]

Skills:

1. is able to obtain information from literature, databases and other sources; can integrate the obtained information, make their interpretation, as well as infer and formulate and justify opinions - [[K1_U01 (P6S_UW)]

2. can work individually and in a team; knows how to estimate the time needed to complete the task ordered; is able to develop and implement a schedule of works to ensure that deadlines are met - [[K1_U02 (P6S_UO)]]

Social competencies:

1. understands the need and knows the possibilities of continuous training, raising professional, personal and social competences (eg by second and third cycle studies, postgraduate studies, courses); and is ready to critically assess his knowledge, recognizes its importance in solving cognitive and practical problems - [[K1_K01 (P6S_KK)]]
2. is aware of the importance and understands the non-technical aspects and effects of the engineer-energy industry, including its impact on the environment and the related responsibility for the decisions made; is ready to fulfill social obligations, co-organize activities for the social environment and initiate activities for the public interest - [[K1_K02 (P6S_KO)]]
3. . is aware of responsibility for their own work and readiness to submit to the principles of working in a team and bearing the responsibility of their professional role in jointly implemented tasks - [[K1_K04 (P6S_KR)]]

Assessment methods of study outcomes

Lecture:

- assessment of knowledge and skills demonstrated on written exam

Exercises classes:

- assessing the ability to solve accounting problems in the field of basic thermodynamics, colloquia during the semester

Course description

Introduction - basic dependencies, thermodynamic factor model. The first law of thermodynamics. Gases perfect. Basic relationships for open systems. The second law of thermodynamics. Efficiency of circulations and transformations. Typical transformations of perfect gas. Thermodynamics of water vapor. Thermodynamics of moist air. Real gases. Basics of description of combustion processes. Engine circuits. Revolutions. Steam train cycles. Basics of heat flow.

Basic bibliography:

1. Kalinowski E.:Termodynamika, Wyd. P. Wr. 1994
2. Szargut J.: Termodynamika techniczna, Wyd. P. Śl. 1997
3. Szargut J. I inni: Zadania z termodynamiki technicznej, P. Śl. 1995
4. Wiśniewski St.: Termodynamika techniczna, WNT 1995
5. Tuliszka E. Red.: Termodynamika techniczna. Zbiór zadań, Nr 889, Wyd. P.P. 1980

Additional bibliography:

1. Tuliszka E.: Teoria maszyn cieplnych, Nr 511, Wyd. P.P. 1974
2. . M.J. Morano, H.N.Shapiro: Fundamentals of Engineering Thermodynamics, John Wiley & Sons, New York, 1998

Result of average student's workload

Activity	Time (working hours)
1. Participation in classes (according to plan)	60
2. Preparation for the exam / pass	11
3. Participation in the exam / pass	3

Student's workload

Source of workload	hours	ECTS
Total workload	74	3
Contact hours	63	2
Practical activities	18	1