

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Thermal Energetics		Code 1010632231010630317
Field of study Mechanical Engineering	Profile of study (general academic, practical) (brak)	Year /Semester 2 / 3
Elective path/specialty Thermal Engineering	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 1 Classes: - Laboratory: 1 Project/seminars: 1		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: Dr hab inż. Jarosław Bartoszewicz email: jaroslaw.bartoszewicz@ut.poznan.pl tel. 6652215 Working Machines and Transportation Piotrowo 3, 60-965 Poznań		Responsible for subject / lecturer: dr inż. Rafał Urbaniak email: rafal.urbaniak@put.poznan.pl tel. 061 665-2331 Working Machines and Transportation Piotrowo 3, 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	The Student has a basic knowledge of plant and machinery, and the relationship with other areas of knowledge. The Student knows and understands basic practical methods and tools with a range of technical thermodynamics in terms of thermal energy. The Student knows the main tasks of the energy systems in the area of thermal energy and economic development.
2	Skills	The Student knows how to use the concepts and methods in the description of the objects. The Student is able to use the acquired knowledge to the analysis of specific phenomena and processes in energy systems. The Student is able to solve the specific problems arising from thermal energy.
3	Social competencies	The Student is able to work in a group, taking in the various roles. The Student is able to prioritize important when solving posed in front of him. The Student has autonomy in solving problems, the acquisition and improvement of acquired skills and knowledge.
Assumptions and objectives of the course: Gain the skills to make a proper analysis and synthesis energy systems. Deepening the knowledge of basic energy technologies, especially in terms of minimizing their negative effects on the environment of man		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Characterize the thermal systems and thermal processes in power plants, combined heat and power and circuits which are followed by intense heat flow processes. - [[K2A_W07 K2A_W13]]		
2. Explain the need for the efficient use of resources, taking into account the temperature levels of the heat energy of the original. - [[K2A_W200]]		
3. The Student has general knowledge about the types of research and research methods of pumps using modern techniques for measurement and data acquisition. - [[K2A_W20]]		
Skills:		
1. A Student can obtain information from literature or other sources, Polish and foreign, can integrate the information obtained to interpret and draw conclusions from them, and create guest reviews. - [[K2A_U03 K2A_U04]]		
2. . The Student is able to use the acquired professional know-how knowledge of thermodynamics to simulate the processes taking place in pre-, using a specialized computer program. - [[K2A_U04]]		
3. The Student is able to perform basic measurements of the size of the mechanical and thermodynamic investigation on energy at using modern measuring systems - [[K2A_U07]]		
Social competencies:		

1. Understand the need for lifelong learning; can inspire and organize the learning of others - [[K2A_K01]]
2. The Student is able to determine the priorities for the implementation of the undertaken task - [[K2A_K04]]
3. The Student is able to think and act in an entrepreneurial, make decisions, Act for the development of the employer and society - [[K2A_K05]]

Assessment methods of study outcomes

-lectures, exercises, laboratory exercises, array in laboratories and in combined heat and power. exercise: written exam oral question, written reports of lab exercises, lectures: written and oral exam

Course description

The basic thermodynamic characteristics and economical heat power engineering machinery and equipment. Power plants, thermal power stations. Heat regeneration issues. Gas-steam power stations. The use of waste energy. For secondary recuperation physical and chemical. The issue of recovery of waste energy and low-temperature Absorption heat pump compressor. Heat transformers. Associated energetic processes. Associated production of electricity and heat from renewable resources. Issues and methods of accumulation of energy. Rational use of energy. The optimal choice of media power, its parameters, power supply devices and receivers.

Basic bibliography:

1. J. Szargut, A. Ziębik - Podstawy energetyki cieplnej, PWN, Warszawa 1998
2. A. Miller, J. Lewandowski - Układy gazowo-parowe na paliwo stałe, WNT, Warszawa 1993
3. H. Recknagel - Poradnik ? Ogrzewanie ? Klimatyzacja, EWFE, Gdańsk 1994
4. R. Domański - Magazynowanie energii cieplnej, PWN, Warszawa, 1990

Additional bibliography:

1. K. Kordesch, G. Simader - Fuel Cells and Their Applications, VCH Verlagsgesellschaft mbH, ISBN 3-527-28579-2

Result of average student's workload

Activity	Time (working hours)	
1. Participation in the lecture	15	
2. Consultation	4	
3. Lecture recording	10	
4. Preparation to exam	10	
Student's workload		
Source of workload	hours	ECTS
Total workload	100	3
Contact hours	45	2
Practical activities	55	1