STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Technical Thermodynamics		**1010622211010630911**
Field of study: **Mechanical Engineering**	Profile of study (general academic, practical): **general academic**	Year /Semester: **1 / 1**
Elective path/specialty: **Internal Combustion Engines**	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: **1** Laboratory: **-** Project/seminars: **-**		No. of credits: **2**
Status of the course in the study program (Basic, major, other): **other**	(university-wide, from another field): **university-wide**	
Education areas and fields of science and art: **technical sciences** **Technical sciences**		ECTS distribution (number and %): **2 100%** **2 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge in the field of: technical thermodynamics, heat exchange and fluid mechanics.
2	**Skills**	The student is able to apply the principles of thermodynamics to solve simple engineering problems.
3	**Social competencies**	The student is able to improve professional competencies and is ready to collaborate in team

Assumptions and objectives of the course:

The aim is to extend the student's knowledge in the field of thermodynamics. To acquaint with energy balances of thermodynamic systems and explanation of the importance of lecture topics in industrial practice. To acquaint the student with thermodynamic cycles which can be found in industry. To acquaint the student with the issues of heat transport and ecology problems.

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

Knowledge:

1. The student has knowledge on the properties of steam power plants, internal combustion engines and heat pumps. The student knows the main mechanisms and laws regarding heat transfer. He / she knows the methods of solving the problems of conductivity and convection as well as radiation transfer of thermal energy occurring in industrial devices. - [M2_W04]

Skills:

1. The student knows how to apply knowledge in the field of thermodynamic phenomena to solve technical problems. - [M2_U13]
2. The student knows how to determine the efficiency of thermal-fluid-flow devices in industrial installations. - [M2_U13]
3. The student can explain the need for effective use of primary energy resources. - [M2_U13]

Social competencies:

1. The student is able to think and act in an effective way in the field of power plants to minimize primary energy consumption and environmental protection. - [M2_K05]

Assessment methods of study outcomes

Rewarding activity in class.
Written final test

Course description

The first and second law of thermodynamics. The perfect, real gases and their polytropic transformations. Phase transitions in thermodynamic terms. Evaporation curve. Thermodynamic cycles and their optimization (recuperation). Gas power cycles, vapor and combined power cycles. Gas condensation (LNG). Thermodynamics of moist air. Methods of solving engineering problems with the conduction, convection and radiation heat transfer. Methods of intensification of heat exchange. Combustion processes.

Basic bibliography:

1. Szargut J. i inni: Zadania z termodynamiki technicznej, P. Śl. 2013
2. Szargut J.: Termodynamika techniczna, Wyd. P. Śl. 2011
3. Incropera F., DeWitt P., Bergman P., Lavine A.: Fundamentals of heat and mass transfer, Wiley & Sons, 2006
4. Wiśniewski St.: Termodynamika techniczna, WNT 1995
5. Tuliszka E. Red.: Termodynamika techniczna. Zbiór zadań, Nr 889, Wyd. P.P.
6. Gutkowski A., Kapusta T. (red) - Zbiór zadań z termodynamiki technicznej, Skrypt PŁ, 2014

Additional bibliography:

1. Furmański P., Domański R.: Wymiana ciepła. Przykłady obliczeń i zadania, Oficyna Wydawnicza Politechniki Warszawskiej, 2002

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	15
2. Consolidation of lecture material	7
3. Consultation	2
4. Preparation for classes	5
5. Participation in classes	15
6. Preparation to test	10
7. Participation in test	2

Student’s workload

Source of workload	hours	ECTS
Total workload	56	2
Contact hours	34	0
Practical activities	0	0