1.3. Module/ course form

mTeaseCourd bypletecombeTo							
	Module name : **Applied thermodynamics**					Module code:	
	Course name: **Applied thermodynamics**					Course code:	
	Faculty: **Institute of Technology**						
	Field of study: **Mechanics and Machine Technology**						
	Mode of study : stationary		Learning profile: practical			Speciality:	
	Year/ semester:		Module/ course status:			Module/ course language: **English**	
	Type of classes	lecture	lessons	lab	project	tutorial	other (please specify)
	Course load	**30**				**15**	

Module/ course coordinator	Dr inż. Krzysztof Krasowski
Lecturer	Dr inż. Krzysztof Krasowski
Module/ course objectives	Solution of simple technical problems, particularly energy balances for closed and open systems
Entry requirements	Basic knowledge of physics and mathematics

LEARNING OUTCOME		
Nr	LEARNING OUTCOME DESCRIPTION	Learning outcome reference
1	Recognizes thermodynamic systems	
2	Defines and differentiates real and ideal gases	
3	Prepares and solves energy balances for open and closed systems	
4	Calculates heat and work of thermodynamic processes	

CURRICULUM CONTENTS
Lecture
Definitions. Properties. Specific volume. Pressure. Internal energy. Enthalpy. Entropy. **Gases**. Ideal gas. Equation of state. Properties of ideal gas. **Forms o energy.** Forms of energy. Work. Heat. Heat capacity. **The first law of thermodynamics.** The first law of thermodynamics. First law for closed system. First law for open system. **Thermodynamic systems and cyclic processes.** Processes and cycles – reversible and irreversible. Polytropic process. Causes of irreversibility. The Carnot cycle. Otto cycle. Brayton cycle. Joule cycle. **The second law of thermodynamics. Physical properties of vapours**. Phases of a pure substance. Equilibrium of pure substance. Phase diagrams. Processes. The Rankine cycle.

Tutorial
Applications of equation of state. Internal energy and enthalpy of ideal and semiideal gasses. Specific heat of ideal and semiideal gasses. Energy balance for closed and open systems. Heat and work of characteristic thermodynamic processes. Efficiency of selected thermodynamic cycles. Properties of wet steam. Heat of isobaric process. Work of the reversible adiabatic process

Basic literature	1. Look D.C., Sauer H.J.: Engineering thermodynamics, SI edition Van Strand Reinhold Co. Ltd, 1988 2. Liley P.E: Mechanical engineering. Thermodynamics. McGraw-Hill Publishing Company, 1988
Additional literature	

Teaching methods	Multimedia presentation	
Assessment method		Learning outcome number
Exam		1,2,3,4,
Form and terms of an exam	Lecture and tutorial – defence of homework	

STUDENT WORKLOAD	
	Number of hours
Participation in lectures	30
Independent study of lecture topics	25
Participation in tutorials, labs, projects and seminars	15
Independent preparation for tutorials*	16
Preparation of projects/essays/etc.*	
Preparation/ independent study for exams	25
Participation during consultation hours	2
Other	
TOTAL student workload in hours	71
Number of ECTS credit per course unit	**5**
Number of ECTS credit associated with practical classes	**1,3**
Number of ECTS for classes that require direct participation of professors	**2**