Attachement no. 1 to Programme of Education

LEARNING OUTCOMES FOR THE FIELD OF STUDY

(Assumed educational effects)

Faculty: Mechanical and Power Engineering
Field of study: Mechanical Engineering and Machine Building (MBM)
Level of study: I (undergraduate)

The area of study

Field of study Mechanical Engineering and Machine Building belongs to the domain of technical studies and is related to such majors as Energy, Environmental Engineering, Electrical Engineering, Process Engineering and Aerospace Engineering.

Explanation of symbols

K – learning outcomes for the field of study
S – learning outcomes for specialization
W – category of knowledge
U – category of skill
K (after the underscore) – category of social competencies
T – the area of study in the field of technical sciences
1 – undergraduate studies,
A – general profile

Learning outcome for undergraduate studies in the field of study: MBM	**DESCRIPTION OF THE MAIN LEARNING OUTCOMES** **After completion of the undergraduate studies in the field of Mechanics and Machine Design, the graduate:**	**Reference to learning outcomes for the area of technical sciences (T)**
	KNOWLEDGE	
K1MBM_W01	has general knowledge of complex numbers, polynomials, solution of systems of linear equations using matrix algebra, analytic geometry on the plane and in space, conic sections, necessary for understanding of engineering math and sciences	T1A_W01 T1A_W07
K1MBM_W02	has basic knowledge of the properties of functions (trigonometric, exponential, exponential, logarithmic, trigonometric and inverse thereof), single variable calculus, indefinite integrals, definite integrals and improper integrals, multivariable differential calculus, double and triple integrals, number series, power series, Fourier series and the basis of probability theory necessary for understanding of engineering math and sciences	T1A_W01 T1A_W07
K1MBM_W03	has basic knowledge of classical mechanics, wave motion and phenomenological thermodynamics,	T1A_W01

	classical electrodynamics (electrostatics, electricity magnetostatics, electromagnetic induction, electromagnetic waves, optics), the special theory of relativity, selected topics of physics: quantum physics, physics of the solid, physics of the nucleus; astrophysics	
K1MBM_W04	has basic knowledge on the structure of matter, the periodic table, types of chemicals and chemical reactions	T1A_W01
K1MBM_W05	has general knowledge of engineering mechanics - statics, kinematics, dynamics – as well as knowledge of material science that allows solving basic structure stability problems	T1A_W02 T1A_W07
K1MBM_W06	has basic knowledge of construction, influence of structure and properties as well as applicability of various types of engineering materials such as steels, non-ferrous alloys, polymers, ceramics and composites	T1A_W01 T1A_W07
K1MBM_W07	has detailed knowledge on the drawing methods of plane figures and solids; knows in depth the rules of technical drawing	T1A_W04
K1MBM_W08	knows the basic techniques and tools that are useful in engineering work as well as in daily functioning in the modern world	T1A_W07
K1MBM_W09	knows and understands the laws governing fluid flow with accompanying transfer of heat; understands flow and thermodynamic processes occurring in fluids	T1A_W03
K1MBM_W10	has basic knowledge of the theory and techniques of experimental measurement, characterization of properties of measuring instruments, presentation of the results of measurement as well as the method of calculation of its uncertainty and the interpretation of its results	T1A_W02
K1MBM_W11	has basic knowledge of manufacturing techniques (casting, welding, plastic working, abrasive and erosive machining) including workshop metrology	T1A_W02 T1A_W05
K1MBM_W12	has elementary knowledge of electrical and electronic equipment construction , knows basic principles of the automation of technical objects, understands the basic control principles of the technical systems	T1A_W02
K1MBM_W13	has structured knowledge of the basic machinery and equipment used in energy conversion, regarding their function, structure and linkage	T1A_W06 T1A_W07
K1MBM_W14	has structured knowledge of the construction and operation of basic machine elements, knows the principles of design and algorithms for engineering calculations of these elements	T1A_W04 T1A_W06 T1A_W07
K1MBM_W15	has basic understanding of the physics and chemistry of combustion and impurity formation mechanisms and the knowledge of properties of gaseous fuels used in power generation and aviation	T1A_W02
K1MBM_W16	has basic knowledge of the legal protection of various categories of intellectual property, in particular,	T1A_W10 T1A_W11

	industrial intellectural property, as well as copyright and related rights associated with engineering works	
K1MBM_W17	understands ecological aspects of the environmental anthropogenic actions, is aware of the legal and economic conditions the use of the environment	T1A_W08
K1MBM_W18	has basic knowledge necessary to understand the social, philosophical, economic and legal background of engineering	T1A_W08 T1A_W09 T1A_W11
	achieves results in the category KNOWLEDGE for one of the following specializations: • Thermal Engineering (INC) - Appendix 1 • Engineering of Aviation (ILO) - Appendix 2	
SKILLS		
K1MBM_U01	is able to properly and effectively apply knowledge of linear algebra and analytic geometry for qualitative and quantitative analysis of mathematical problems related to engineering	T1A_U09 T1A_U13 T1A_U14
K1MBM_U02	is able to properly and effectively apply the knowledge of differential and integral calculus of functions of one and several variables, numerical series, power series and Fourier series and probability for qualitative and quantitative analysis of mathematical problems related to engineering	T1A_U09 T1A_U13 T1A_U14
K1MBM_U03	can properly and effectively apply principles and laws of physics to the qualitative and quantitative analysis of physical problems in engineering and is able to plan and safely perform measurements, develop measurement results and evaluate the uncertainty of measured values	T1A_U09 T1A_U11 T1A_U14
K1MBM_U04	can properly understood and effectively apply the principles and laws of chemistry for qualitative and quantitative analysis of chemical problems in engineering and is able to plan and safely perform simple chemical experiments	T1A_U09 T1A_U11
K1MBM_U05	with appropriate techniques and methods can carry out calculation in the field of statics, kinematics and dynamics of rigid bodies, taking into account the analysis of the stress and strain	T1A_U09
K1MBM_U06	is able to analyze equilibrium charts and preform macroscopic and microscopic examination of metals	T1A_U14
K1MBM_U07	knows how to draw plane figures and solids, can prepare in the form of technical drawing any component of the machine using the CAx software for 2D and 3D	T1A_U02 T1A_U07
K1MBM_U08	is able to apply basic information technologies for obtaining information and for the creation of electronic documents	T1A_U01 T1A_U07
K1MBM_U09	knows how to use knowledge of fluid mechanics and thermodynamics in engineering calculations of machinery, equipment and industrial installations	T1A_U09 T1A_U10
K1MBM_U10	is able to plan and carry out experiments to develop the results, including error analysis and drawing of	T1A_U08 T1A_U11

	conclusions	
K1MBM_U11	is able to apply engineering technology to produce metal or plastic product, as well as design technological process of the device, including design of connections and proper selection of the execution method; knows how to use instruments to evaluate quality of realization performance of the product	T1A_U09 T1A_U11 T1A_U12 T1A_U16
K1MBM_U12	can measure, analyze, and calculate the basic parameters of electrical circuits, electronic systems, control, regulation and automation systems	T1A_U08 T1A_U09 T1A_U11
K1MBM_U13	based on various sources of knowledge, can use appropriate methods for the design basic elements of machines	T1A_U01 T1A_U05 T1A_U09 T1A_U15 T1A_U16
K1MBM_U14	is able to empirically identify basic parameters of combustion process, graphically present and interpret the results of measurements	T1A_U11 T1A_U13
K1MBM_U15	has language skills in the discipline "design and operation of machines," according to the requirements for level B2 of the European Framework of Languages	T1A_U06
K1MBM_U16	has the ability to orally present specific engineering subjects	T1A_U04
K1MBM_U17	is able to prepare a coherent report, on carried out work	T1A_U03
	achieves results in the category SKILLS for one of the following specializations: • Thermal Engineering (INC) - Appendix 1 • Engineering of Aviation (ILO) - Appendix 2	
SOCIAL COMPETENCIES		
K1MBM_K01	understands the need for continuous self-development	T1A_K01
K1MBM_K02	is aware of the importance and understanding of non-technical aspects and impacts of engineering, including its impact on the environment, as well as the associated responsibility for decisions	T1A_K02
K1MBM_K03	is able to interact and work in a group, assuming different roles	T1A_K03
K1MBM_K04	can properly identify priorities for implementation of self-defined or given tasks	T1A_K04
K1MBM_K05	is able to think and act in entrepreneurial manner	T1A_K06
K1MBM_K06	is aware of the social role that technical college graduates play in a modern world	T1A_K05 T1A_K07
K1MBM_K07	is aware of needs for individual and group activities that go beyond engineering	T1A_K04 T1A_K06

Appendix 1

LEARNING OUTCOMES FOR SPECIALIZATION

Faculty: Mechanical and Power Engineering
Field of study: Mechanical Engineering and Machine Building (MBM)
Level of study: I (undergraduate)
Specialization: THERMAL ENGINEERING (INC)

Learning outcome for undergraduate studies in specialization: INC	**DESCRIPTION OF THE MAIN LEARNING OUTCOMES** **After completion of the undergraduate studies in the field of Mechanics and Machine Design and specialization Thermal Engineering, the graduate:**	**Reference to learning outcomes for the area of technical sciences (T)**
KNOWLEDGE		
S1INC_W01	has structured and theoretically founded knowledge of stress analysis of multi-rod, plate and disc systems, including the influence of environmental conditions and time	T1A_W03 T1A_W04
S1INC_W02	has organized and theoretically founded knowledge of basic processes in thermal machines	T1A_W03 T1A_W04
S1INC_W03	has structured basic knowledge of fluid mechanics used in engineering, knows calculation method of actual fluid flow in hydraulic systems, has basic knowledge of the most common components of hydraulic systems, devices and measurement methods	T1A_W01 T1A_W03 T1A_W04
S1INC_W04	has structured knowledge of the laws of heat transfer for different types of baffles, is familiar with the basic theory of recuperative heat exchangers, can identify and describe typical cases of heat transfer and thermal conductivity	T1A_W01 T1A_W03 T1A_W04
S1INC_W05	has base knowledge on how to lower the temperature, understands condensation processes of gaseous mixtures and the use of LNG	T1A_W02 T1A_W03
S1INC_W06	has structured knowledge of the theoretical framework and basic principles of construction of thermal turbomachinery	T1A_W02 T1A_W03 T1A_W04
S1INC_W07	knows classifications and physical operation principles of displacement machines (pumps, compressors, fans), can describe their construction, understands the principles of its co-operation with the installation, knows flow regulation principles of positive displacement machines, defines losses in these machines	T1A_W02 T1A_W03 T1A_W07
S1INC_W08	has basic knowledge necessary for understanding of operations in process engineering, knows apparatus used for their implementation	T1A_W02
S1INC_W09	has basic knowledge on reactor physics, nuclear energy technologies and nuclear safety	T1A_W02 T1A_W03

S1INC_W10	has base knowledge of the structure and operation of boilers and fuel preparation equipment, knows and understands combustion methods of various fuels, can identify and name risks associated with different types of fuel combustion	T1A_W02 T1A_W04 T1A_W05
S1INC_W11	has structured knowledge of the flue gas cleaning processes and operation principles of selected atmospheric protection equipment	T1A_W02 T1A_W03
S1INC_W12	has established knowledge on balancing of machinery and equipment, knows and understands methods of efficiency calculation of these devices, can identify and name major energy losses in these devices	T1A_W02 T1A_W03 T1A_W04
S1INC_W13	has basic knowledge on construction and operation of thermal power stations	T1A_W02 T1A_W03 T1A_W06
SKILLS		
S1INC_U01	can perform endurance calculations and dimension elements based on the stress and strain analysis and taking under consideration time and temperature, can perform tests of fundamental mechanical properties of structural materials, take measurements of displacements and strains, interpret the results and draw conclusions	T1A_U08 T1A_U09 T1A_U13 T1A_U14
S1INC_U02	is able to analyze the relationship between process parameters of gas or vapor flows and the performance of thermal machines	T1A_U13 T1A_U14
S1INC_U03	has the ability to use analytical and graphical methods to calculate real fluid flow in hydraulic systems; is able to experimentally determine the velocity profile in straight-axis pipe, measure transfer characteristics and hydraulic losses, plot diagram of the serial Ancona hydraulic system	T1A_U09 T1A_U13 T1A_U16
S1INC_U04	is able to analyze and calculate heat flows and temperature gradients in bodies of different geometries, can calculate heat transfer coefficient for different types of convective heat fluxes, is able to calculate heat fluxes in thermal radiation and is able to calculate and design heat exchangers	T1A_U13 T1A_U14 T1A_U16
S1INC_U05	is able to experimentally determine temperature, humidity and specific heat of gases and solids, perform tests of heat transfer through the baffle and ribs, and determine temperature distribution in the rod	T1A_U08 T1A_U09
S1INC_U06	calculates basic parameters of refrigeration and cryogenic equipment and plants, uses phase diagrams of refrigerants and cryogenic liquids	T1A_U13 T1A_U14 T1A_U15
S1INC_U07	can integrate the knowledge gained in previous courses during the design of a single step rotary thermal machine, is able to interpret the results and draw conclusions	T1A_U13 T1A_U14 T1A_U15
S1INC_U08	can design basic working elements of positive displacement devices and flow devices, is able to select proper machine for installation; is able to analyze the	T1A_U09 T1A_U13 T1A_U14

	relationship between flow parameters of gas and vapor and the performance of thermal machines	T1A_U15 T1A_U16
S1INC_U09	can model unit processes in process engineering in order to evaluate their operation and interpret the results	T1A_U07 T1A_U09 T1A_U15
S1INC_U10	using computer simulator can analyze parameters of the nuclear power plant during normal operation and under emergency conditions	T1A_U13 T1A_U14 T1A_U15
S1INC_U11	is able, in accordance with given requirements, to select a boiler and other auxiliary equipment, knows how to calculate heat transfer and can design a water heater or a steam superheater	T1A_U14 T1A_U16
S1INC_U12	is able to design a device for the removal of gaseous and particulate pollutants taking under consideration selected ecological and economic criteria	T1A_U14 T1A_U16
S1INC_U13	can perform measurements and balances of selected machines and power equipment, calculate their efficiency, draw Sankey diagrams and estimate the uncertainty of measurement	T1A_U08 T1A_U09
S1INC_U14	Is able to assess functioning of selected systems such as thermal power plants	T1A_U09 T1A_U10

Appendix 2

LEARNING OUTCOMES FOR SPECIALIZATION

Faculty: Mechanical and Power Engineering
Field of study: Mechanical Engineering and Machine Building (MBM)
Level of study: I (undergraduate)
Specialization: ENGINEERING OF AVIATION (ILO)

Learning outcome for undergraduate studies in specialization: INC	**DESCRIPTION OF THE MAIN LEARNING OUTCOMES** **After completion of the undergraduate studies in the field of Mechanics and Machine Design and specialization Engineering of Aviation, the graduate:**	**Reference to learning outcomes for the area of technical sciences (T)**
	KNOWLEDGE	
S1ILO_W01	is familiar with the methodology of stress analysis of structural elements that are typical of aircraft structures: thin rods, plates and shells	T1A_W04 T1A_W07
S1ILO_W02	describes basic thermodynamic processes occurring in aircraft engine flow channels	T1A_W04
S1ILO_W03	identifies laws and explains phenomena associated with the flow around a body at different speeds, describes the flow around airfoil and wing	T1A_W03
S1ILO_W04	knows the purpose, construction and operating principles of modern aircraft equipment and power systems	T1A_W04
S1ILO_W05	describes aircraft design procedures and explains preliminary computation algorithms for the aircraft design	T1A_W03 T1A_W04 T1A_W07
S1ILO_W06	explains the operation of aircraft piston engines with regard to specific design solutions used in aviation	T1A_W04
S1ILO_W07	knows the purpose, construction and the operating procedure of the aircraft equipment and accessories of the modern aircraft avionics	T1A_W03
S1ILO_W08	has basic knowledge of transient and steady aircraft flights, balance and stability, takeoff and landing	T1A_W03 T1A_W04 T1A_W07
S1ILO_W09	lists purposes, tasks and is able to characterize construction of systems and installations bodied on an aircraft	T1A_W03 T1A_W04 T1A_W05
S1ILO_W10	describes the construction of an aircraft, lists loads acting on the airframe and describes the procedure for the construction of aircraft components	T1A_W03 T1A_W04 T1A_W07
S1ILO_W11	explains the operation of aviation gas turbine engines and their main components	T1A_W04
S1ILO_W12	defines the main diagnostic issues of an aircraft, explains the methods of analysis and prediction of diagnostic signals of the technical condition of aviation equipment	T1A_W07
S1ILO_W13	describes a process for the production of airframe,	T1A_W05

	characterizes technological processes used in its manufacture	T1A_W06
S1ILO_W14	knows the purpose, construction and basic operation of the major components of aircrafts and helicopters	T1A_W03 T1A_W04
S1ILO_W15	lays down rules for the safe operation of aircraft, describes the operating systems and applies the basic concepts of exploitation	T1A_W04
S1ILO_W16	identifies the "human factor" limitations, at both the individual and system level, that can affect the safety and usefulness of the aircraft	T1A_W04
SKILLS		
S1ILO_U01	examines loads on aircraft components, perform calculations for different load cases on thin-walled structures	T1A_U14 T1A_U15
S1ILO_U02	is able to calculate basic parameters of flows in the flow channels of aircraft engines	T1A_U05 T1A_U09 T1A_U15
S1ILO_U03	calculates values of the gas flow around bodies, knows how to calculate relationships between parameters of gas on both sides of the shock wave	T1A_U09
S1ILO_U04	performs basic measurements of the parameters of fluid flow through the channels and the flow around bodies	T1A_U08
S1ILO_U05	performs a preliminary design of aerodynamic body of the selected purpose aircraft	T1A_U01 T1A_U09 T1A_U15
S1ILO_U06	is able to perform basic thermodynamic calculations of a piston engine, estimate loads acting on the components of the crank-piston	T1A_U05 T1A_U09 T1A_U15
S1ILO_U07	is able to perform a preliminary design of avionics equipment for the "general aviation" aircraft class	T1A_U01 T1A_U03
S1ILO_U08	is able to determine the suitability of selected pilot - navigation devices for use on board the aircraft	T1A_U05 T1A_U08
S1ILO_U09	is able to calculate the basic parameters of the various flight conditions	T1A_U05 T1A_U09 T1A_U15
S1ILO_U10	calculates aerodynamic and performance characteristics of subsonic aircraft	T1A_U14 T1A_U15
S1ILO_U11	performs basic parameter measurements aircraft systems and system components	T1A_U01 T1A_U08 T1A_U13
S1ILO_U12	calculates loads and stresses in major airframe components	T1A_U09
S1ILO_U13	designs the endurance structure of major airframe components	T1A_U09 T1A_U15
S1ILO_U14	is able to perform basic thermodynamic calculations of the main components of aircraft turbine engine, as well as its performance	T1A_U05 T1A_U09 T1A_U15
S1ILO_U15	is able to perform basic diagnostic tests of an aircraft using visual methods	T1A_U09 T1A_U13
S1ILO_U16	is able to carry out an initial verification of an airframe and perform basic disassembly and assembly on the	T1A_U11 T1A_U15

	aircraft	
S1ILO_U17	is able to carry out the basic maintenance on the aircraft	T1A_U08 T1A_U11 T1A_U13
S1ILO_U18	is able to develop a maintenance program for an aircraft	T1A_U02 T1A_U05 T1A_U16
S1ILO_U19	follows the principles of safe operation of an aircraft taking under consideration the "human factor"	T1A_U01 T1A_U04 T1A_U10

MATRIX OF CORRELATION BETWEEN EDUCATIONAL OUTCOMES/ EFFECTS IN THE FIELD OF TECHNICAL SCIENCES AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY

1st level, main field of study *Mechanical Engineering and Machine Building* (MBM), general academic profile

Legend: INC –Thermal Engineering, ILO –Engineering of Aviation

Symbol of the educational outcome in the field of technical sciences	Description of the educational outcomes/ effects in the field of technical sciences	Reference to educational outcomes for 1st level, main field of study MBM		
		Main field of study effects	Specialization effects	
			INC	ILO
KNOWLEDGE				
T1A_W01	has knowledge of mathematics, physics and chemistry and other areas related to the studied discipline necessary to formulate and solve simple tasks in the field of the studied discipline	K1MBM_W01 K1MBM_W02 K1MBM_W03 K1MBM_W04 K1MBM_W06	S1INC_W03 S1INC_W04	
T1A_W02	has fundamental knowledge in the field of study related to the studied discipline	K1MBM_W05 K1MBM_W10 K1MBM_W11 K1MBM_W12 K1MBM_W15	S1INC_W05 S1INC_W06 S1INC_W07 S1INC_W08 S1INC_W09 S1INC_W10 S1INC_W11 S1INC_W12 S1INC_W13	
T1A_W03	has organized, general knowledge and theoretical grounding including key issues related to the studied discipline	K1MBM_W09	S1INC_W01 S1INC_W02 S1INC_W03 S1INC_W04	S1ILO_W03 S1ILO_W05 S1ILO_W07 S1ILO_W08

			S1INC_W05 S1INC_W06 S1INC_W07 S1INC_W09 S1INC_W11 S1INC_W12 S1INC_W13	S1ILO_W09 S1ILO_W10 S1ILO_W14
T1A_W04	has detailed knowledge connected with the chosen issues in the field of the studied discipline	K1MBM_W07 K1MBM_W14	S1INC_W01 S1INC_W02 S1INC_W03 S1INC_W04 S1INC_W06 S1INC_W10 S1INC_W12	S1ILO_W01 S1ILO_W02 S1ILO_W04 S1ILO_W05 S1ILO_W06 S1ILO_W08 S1ILO_W09 S1ILO_W10 S1ILO_W11 S1ILO_W14 S1ILO_W15 S1ILO_W16
T1A_W05	has fundamental knowledge of trends in development in scientific disciplines and fields of study related to the studied discipline	K1MBM_W11	S1INC_W10	S1ILO_W09 S1ILO_W13
T1A_W06	has fundamental knowledge of the lifecycle of devices, objects and technical systems	K1MBM_W13 K1MBM_W14	S1INC_W13	S1ILO_W13
T1A_W07	knows fundamental methods, techniques, tools and materials used for solving simple engineering tasks in the field of the studied discipline	K1MBM_W01 K1MBM_W02 K1MBM_W05 K1MBM_W06 K1MBM_W08 K1MBM_W13 K1MBM_W14	S1INC_W07	S1ILO_W01 S1ILO_W05 S1ILO_W08 S1ILO_W10 S1ILO_W12
T1A_W08	has fundamental knowledge necessary to understand social, economical ,legal and	K1MBM_W17		

	other non-technical factors of engineering activities	K1MBM_W18		
T1A_W09	has fundamental knowledge of management, including quality management and running a business	K1MBM_W18		
T1A_W10	knows and understands basic concepts and rules related to industrial property protection and copyright laws; is able to use patent information resources	K1MBM_W16		
T1A_W11	knows general rules related to establishing and developing individual entrepreneurial activity, using knowledge of scientific disciplines and fields of study related to the studied discipline	K1MBM_W16 K1MBM_W18		
SKILLS				
1) general skills (not related to the area of engineering education)				
T1A_U01	is able to obtain information from literature, databases and other properly selected sources, either in English or another foreign language regarded as a language for international communication in the studied discipline ; is able to integrate obtained information, interpret it and draw conclusions, formulate and justify opinions	K1MBM_U08 K1MBM_U13		S1ILO_U05 S1ILO_U07 S1ILO_U11 S1ILO_U19
T1A_U02	is able to communicate in their professional environment and other environments using various techniques	K1MBM_U07		S1ILO_U18
T1A_U03	is able to prepare a well documented study of problems in the field of studied discipline both in Polish and a foreign language regarded as a basic one in the scientific disciplines and fields of study related to the studied discipline	K1MBM_U17		S1ILO_U07
T1A_U04	is able to prepare and give an oral presentation concerning detailed issues in the field of the studied discipline both in Polish and a foreign language	K1MBM_U16		S1ILO_U19
T1A_U05	has ability to self-learning	K1MBM_U13		S1ILO_U02 S1ILO_U06 S1ILO_U08 S1ILO_U09 S1ILO_U14 S1ILO_U18
T1A_U06	has language skills in scientific disciplines and fields of study related to the studied discipline according to CEFR requirements for B2 level	K1MBM_U15		
2) fundamental engineering skills				
T1A_U07	is able to use information and communication technologies necessary to perform tasks typical of engineering activities	K1MBM_U07 K1MBM_U08	S1INC_U09	
T1A_U08	is able to plan and run experiments including measurements and computer	K1MBM_U10	S1INC_U01	S1ILO_U04

	simulations, interpret results and draw conclusions	K1MBM_U12	S1INC_U05 S1INC_U13	S1ILO_U08 S1ILO_U11 S1ILO_U17
T1A_U09	is able to use analytical, simulation and experimental methods to formulate and solve engineering tasks	K1MBM_U01 K1MBM_U02 K1MBM_U03 K1MBM_U04 K1MBM_U05 K1MBM_U09 K1MBM_U11 K1MBM_U12 K1MBM_U13	S1INC_U01 S1INC_U03 S1INC_U05 S1INC_U08 S1INC_U09 S1INC_U13 S1INC_U14	S1ILO_U02 S1ILO_U03 S1ILO_U05 S1ILO_U06 S1ILO_U09 S1ILO_U12 S1ILO_U13 S1ILO_U14 S1ILO_U15
T1A_U10	is able -while formulating and solving engineering tasks-to notice their system and non technical aspects	K1MBM_U09	S1INC_U14	S1ILO_U19
T1A_U11	is prepared to work in industry environment and knows safety rules in the workplace	K1MBM_U03 K1MBM_U04 K1MBM_U10 K1MBM_U11 K1MBM_U12 K1MBM_U14		S1ILO_U16 S1ILO_U17
T1A_U12	is able to carry out primary economic analysis of undertaken engineering activities	K1MBM_U11		
3) skills directly connected with solving engineering tasks				
T1A_U13	is able to carry out critical analysis of functioning and also assess – particularly in reference to the studied discipline- existing technical solutions, in particular devices, objects, systems, processes, and services	K1MBM_U01 K1MBM_U02 K1MBM_U14	S1INC_U01 S1INC_U02 S1INC_U03 S1INC_U04 S1INC_U06 S1INC_U07 S1INC_U08 S1INC_U10	S1ILO_U11 S1ILO_U15 S1ILO_U17
T1A_U14	is able to identify and formulate specifications of simple, practical engineering tasks specific for the studied discipline	K1MBM_U01 K1MBM_U02	S1INC_U01 S1INC_U02	S1ILO_U01 S1ILO_U10

		K1MBM_U03 K1MBM_U06	S1INC_U04 S1INC_U06 S1INC_U07 S1INC_U08 S1INC_U10 S1INC_U11 S1INC_U12	
T1A_U15	is able to assess the usefulness of routine methods and tools for solving a simple, practical engineering task specific for the studied discipline and choose and apply a proper method and tools	K1MBM_U13	S1INC_U06 S1INC_U07 S1INC_U08 S1INC_U09 S1INC_U10	S1ILO_U01 S1ILO_U02 S1ILO_U05 S1ILO_U06 S1ILO_U09 S1ILO_U10 S1ILO_U13 S1ILO_U14 S1ILO_U16
T1A_U16	is able – according to a given specification- to desing and complete a simple device, object, system or process specific for the studied discipline, using appropriate methods, techniques and tools	K1MBM_U11 K1MBM_U13	S1INC_U03 S1INC_U04 S1INC_U08 S1INC_U11 S1INC_U12	S1ILO_U18
SOCIAL COMPETENCES				
T1A_K01	understands the necessity of a lifetime learning process; is able to inspire and organize the process of learning for others	K1MBM_K01		
T1A_K02	realizes the significance and understands non-technical aspects and consequences of engineering activity and especially its influence on the natural environment and the related responsibility for decisions	K1MBM_K02		
T1A_K03	is able to cooperate and work in a group, taking up different roles	K1MBM_K03		
T1A_K04	is able to set clear priorities leading to the realizatione tasks set by himself or others	K1MBM_K04 K1MBM_K07		
T1A_K05	identifies correctly and solves dilemmas connected with the profession	K1MBM_K06		

T1A_K06	is able to think and act in an entrepreneurial way	K1MBM_K05 K1MBM_K07		
T1A_K07	realizes the social role of technical university graduates and especially understands the need to formulate information and share it with society, e.g. through mass media, in relation to achievements in environmental engineering and other aspects of engineering activity; makes attempts at sharing such information and opinions in an understandable way	K1MBM_K06		