

Education/Learning Outcomes for the main field of study

(Assumed educational effects)

Faculty: Geoengineering, Mining, and Geology

Main field of study: mining and geology

Education level: 1st, inżynier studies

Profile: general academic

Description of symbols/Legend

K – education/learning outcome for the main field of study

W – category of knowledge

U – category of skills

K (after an underscore) – category of social competences

OT –education/learning outcome for the education area of technical sciences

01, 02, 03 and further – number of education/learning outcome

1 – first level studies

A – general academic profile

Education/ learning outcome for 1 st level studies in the main field of study (K)	DESCRIPTION OF THE MAIN-FIELD-OF-STUDY EDUCATION/LEARNING OTCOMES	Correlation with education/ learning outcomes for the education area in the field of technical sciences (OT)
On completion the 1st level studies in the field of mining and geology a graduate:		
KNOWLEDGE		
K_W01	has fundamental knowledge of the properties of mathematical functions (trigonometric, power, exponential, logarithmic, cyclometric and their inverses), the differential and indefinite integral calculus of the single variable functions necessary to understand mathematical problems in engineering sciences; has fundamental knowledge of the definite and improper integrals, differential calculus of multi variable functions, double and triple integrals, numerical and power series necessary to understand mathematical problems in engineering sciences	OT1A_W01 OT1A_W07
K_W02	has fundamental knowledge of complex numbers, polynomials, matrix algebra and its use to solve the systems of linear equations, analytical geometry on a plane and in space, and conic sections	OT1A_W01 OT1A_W07

K_W03	has fundamental knowledge of the mathematical basics of probabilistic models (random variables, quantiles and moments, independence) and statistical methods for the random phenomenon analysis (estimation, linear regression, testing of hypotheses) necessary to understand probabilistic and statistical issues in engineering sciences	OT1A_W01 OT1A_W07
K_W04	has fundamental knowledge of classical mechanics, wave motion and phenomenological thermodynamics; has fundamental knowledge of the classical electrodynamics (electrostatics, electric current, magnetostatics, electromagnetic induction, electromagnetic waves, optics); has fundamental knowledge of the special theory of relativity, as well as of the selected problems of physics i.e. quantum physics, physics of the solid-state, physics of the atomic nucleus, and astrophysics	OT1A_W01
K_W05	has fundamental knowledge of chemistry related to the properties of the matter, the most important chemical phenomena and processes helpful for a mining engineer to understand the surrounding world as well as natural and industrial processes	OT1A_W01
K_W06	knows basic methods of ethics; has fundamental knowledge necessary to understand the ethical factors of social functions of communication in engineering activity	OT1A_W07 OT1A_W08
K_W07	has elementary knowledge of widely comprehended mining engineering as one of the most important fields of technical and economic activity of a human being	OT1A_W02
K_W08	has fundamental knowledge of the spatial visualisation of technical objects and preparation as well as reading of technical drawings; has fundamental knowledge of visualisation of mining objects with the use of the 'cechowany' projection i.e. the orthogonal projection along with giving of the distance between the projection plane and projected point	OT1A_W01 OT1A_W07
K_W09	has well-ordered knowledge of computer architecture especially of the hardware layer; has fundamental knowledge of the principles of operational use, exploitation and safety of computer networks	OT1A_W02 OT1A_W03
K_W10	has fundamental knowledge of the free market economy mechanisms and the function of enterprises within different market structures	OT1A_W08
K_W11	has fundamental knowledge of natural environment of the Earth necessary for geoengineering activity	OT1A_W08
K_W12	knows fundamental methods and measuring techniques used to construct and revise geographic maps; knows the principles of reading and spatial interpretation of maps; knows the principles of geodetic calculations for engineering tasks	OT1A_W02 OT1A_W07
K_W13	has fundamental knowledge of the rigid body statics encompassing the equilibrium condition of coplanar and spatial force systems and the determination of the	OT1A_W01 OT1A_W03

	distribution of internal forces	
K_W14	has fundamental knowledge of the structure of the Earth as the interior planet of the Solar System; knows basic endogenetic and exogenetic processes influencing the topographic profile (relief) of the Earth surface and formation of strata and other rock bodies in the lithosphere; understands how geological processes influence the lithosphere interior structure and the formation of mineral resource deposits; knows the history of the Earth and of life on this planet from its formation to the present day and the division of this history into formal units (geological time periods); knows and understands the influence of living organisms on the structure of lithosphere external strata and the formation of organic mineral resource deposits	OT1A_W01 OT1A_W08
K_W15	has elementary knowledge of the elasticity theory and its application to strength hypotheses helpful to design basic engineering constructions	OT1A_W02
K_W16	has fundamental knowledge of the internal structure of minerals and its influence on mineral physical and chemical properties; knows the most important rock-forming and mineral-forming processes with special regard to the formation processes of useful minerals and their deposits; knows the formal structural-chemical classification of minerals and characteristics of minerals belonging to the major classes; knows basic types of rocks and knows the mineral, structural-textural, and genetic characteristics of rocks of all types the most commonly occurring within the lithosphere; understands relations between geological processes and their effects i.e. formation and alteration of rocks and their minerals considered as useful minerals	OT1A_W01 OT1A_W08
K_W17	has fundamental knowledge of the origin, occurrence and flow of groundwater	OT1A_W01 OT1A_W08
K_W18	has knowledge of the mechanical properties of soils, their structure and classification; knows the geoenineering methods for recognition of the physical and mechanical properties of soil media and also the state of stress, strain, and deformations within the natural intact soil	OT1A_W03 OT1A_W07
K_W19	has knowledge and theoretical and practical grounding related to the design and management of surface mining of loose and compact useful minerals including the efficient exploitation of machines and equipment	OT1A_W04 OT1A_W05 OT1A_W07
K_W20	has mastered the basic concepts related to deposit geology and mining geology; has systematised knowledge of the resources and production (output) of raw minerals in Poland; has fundamental knowledge related to the principles of the mineral resource classification and geological documentation of useful mineral deposits; has fundamental knowledge related to	OT1A_W01 OT1A_W08

	geophysical methods for recognition of, prospection for and exploration of mineral deposits	
K_W21	has fundamental knowledge of drilling technologies; recognises the technologies of straight and directed well drilling used for engineering tasks, exploration, and exploitation; distinguishes the drilling technologies applied to shaft and tunnel construction	OT1A_W02 OT1A_W05 OT1A_W07
K_W22	has knowledge of the physical properties of mineral resources and waste materials; knows the methods for enrichment and refinement of metal ores, glass raw materials, and other materials, including recycled materials used for further metallurgical and chemical processing, production of building and other materials	OT1A_W02 OT1A_W07
K_W23	has fundamental knowledge related to the examination of rock medium properties and the basic principles and laws of mechanics used to explain the mining-induced phenomena in the rock mass; has knowledge of the prediction methods of the rock mass failure around the mining workings being developed	OT1A_W01 OT1A_W07
K_W24	has fundamental knowledge related to the selection of the appropriate construction and exploitation characteristics of mining machines made on the basis of the material strength criteria	OT1A_W07
K_W25	has fundamental knowledge of electrotechnics related to its application to mining industry	OT1A_W01 OT1A_W07
K_W26	has fundamental knowledge of construction, operation and function of the underground mining plant	OT1A_W03 OT1A_W05 OT1A_W06 OT1A_W07
K_W27	has fundamental knowledge of the role of geoinformation tools (GIS) in the management of industrial plants (including mines) and public administration; has fundamental knowledge of the GPS and photogrammetry techniques used for acquiring the spatial data	OT1A_W02 OT1A_W07 OT1A_W09
K_W28	has knowledge related to the assessment of the water inflow into the deposits and mines, their dewatering and the environment protection against such the process	OT1A_W02 OT1A_W07
K_W29	has knowledge of the legal and administrative factors of deposit management (Deposit Management Plan) and the principles of the post-mining area planning and development	OT1A_W02 OT1A_W06
K_W30	has knowledge and scientific grounding related to the principles of underground mine ventilation and the rules of underground fire protection and suppression	OT1A_W01 OT1A_W03 OT1A_W07
K_W31	has fundamental knowledge of the cost accounting, management accounting and financial reporting of enterprises; has fundamental knowledge related to economic assessment of investment operations; has knowledge of the basic concepts of, rules of, methods and tools useful for the management of projects	OT1A_W06 OT1A_W08 OT1A_W09

K_W32	has fundamental knowledge of the machines and machinery systems used in all the branches of mining industry as well as of their construction appropriate to the mining requirements	OT1A_W03 OT1A_W06
K_W33	has knowledge of the fundamentals of occupational safety and health related to: the supervision and inspection of occupational safety and health conditions; accidents at work; occupational diseases; employee's and employer's responsibilities and duties resulting from the occupational safety and health regulations; the principles of investigation and measurements of noxious, hazardous and arduous agents; assessment of the exposure to the hazardous agents; the principles and methods of the occupational risk assessment; has knowledge of the basic occupational hazards in mining industry and the rules of their identification and limitation; knows the rules of mining rescue functioning in Poland embracing the ways of performing mine rescue works and the rescue equipment the mine rescue units have	OT1A_W02 OT1A_W08
K_W34	has knowledge of the Geological and Mining Law making it possible to perform regulated professions in the field of mining	OT1A_W08
K_W35	has synthesised knowledge of the mining enterprise as the integrated system of the production operations (the exploration and development of a deposit, mining, transport, treatment and processing of useful minerals) analysed in the context of qualitative, market, legal and environmental conditions	OT1A_W08 OT1A_W09
K_W36	has fundamental knowledge related to selected sporting activity (sports)	
SKILLS		
K_U01	is able to make use of various sources of information in a foreign language, especially professional literature; is able to integrate obtained information and apply it to deepen the specialization knowledge and to improve their own language skills; comprehends spoken and written formulations on general, scientific and technological topics connected with the scientific disciplines and fields of study related to the studied discipline; has language skills sufficient to relatively correctly express themselves (verbally and in writing), formulate and justify opinions, explain their own standpoint, present advantages and disadvantages of different technical solutions, discuss and present general and scientific as well as technical topics (e.g. prepare and give oral presentation concerning project and research tasks, realised or in progress); is able to use a foreign language to communicate within the international professional environment with regard to inter-culture knowledge and the formal and informal type of language	OT1A_U01 OT1A_U02 OT1A_U03 OT1A_U04

K_U02	is able to properly and effectively apply the knowledge of the differential and integral calculus of the single-variable functions to the qualitative and quantitative analysis of mathematical problems connected with the studied engineering discipline; is able to properly and effectively apply the knowledge of the differential and integral calculus of the multi-variable functions and numerical and power series to the qualitative and quantitative analysis of mathematical problems connected with the studied engineering discipline	OT1A_U01 OT1A_U07
K_U03	is able to properly and effectively apply the knowledge of linear algebra and analytical geometry to the qualitative and quantitative analysis of mathematical problems connected with the studied engineering discipline	OT1A_U01 OT1A_U07
K_U04	is able to analyse statistically the experimental data and interpret the analysis results; is able to properly and effectively use their knowledge of probability and statistics to analyse statistical problems in engineering sciences	OT1A_U08
K_U05	is able to make use of the Microsoft Office software environment to prepare documents with the Word application and multimedia presentations with the Power Point application as well as to work with the Excel calculation sheet	OT1A_U07
K_U06	is able to correctly and efficiently use the studied physical principles, laws and rules for quantity and quality analysis of physical problems related to engineering ones; is able to: a) plan and carry out measurements safely, b) collate and process measurement results, c) estimate the uncertainties of measured values of parameters investigated	OT1A_U08 OT1A_U09
K_U07	is able to carry out simple chemical reactions	OT1A_U08
K_U08	is able to prepare and read 3D technical drawings	OT1A_U02
K_U09	is able to make a study on the ordered problem related to the economy of mineral resource markets	OT1A_U01
K_U10	is able to make the geodetic calculations for engineering tasks; is able to carry out realisation and check measurements in engineering works; is able to evaluate the measuring accuracy and to make error calculations	OT1A_U07
K_U11	is able to make static calculations for the simple rod systems (beams, frames, arches) occurring in the underground and surface mining objects	OT1A_U09
K_U12	is able to recognise and characterise the primary fossil invertebrates crucial to stratigraphy; is able to determine the absolute and relative age of rocks coming from areas of the relatively simple geological structure; is able to read, interpret and make simple geological maps, cross-sections and lithological sections; is able to use a geological compass;	OT1A_U07
K_U13	is able to examine simple strength problems; is able to	OT1A_U07

	carry out strength calculations using NL and SG methods; is able to examine the statically indeterminate cases	OT1A_U09
K_U14	is able to identify and characterise the most important deposit-forming and rock-forming minerals on the basis of the macroscopic recognition of their basic physical characteristics; is able, mainly on the base of the macroscopic features, to recognise and characterise the basic magmatic, sedimentary and metamorphic rocks and their component minerals; is able, on the basis of mineral and structural-textural characteristics, to identify and describe the processes leading to the formation of all types of the most important rocks and characterise the genetic relations between them	OT1A_U07 OT1A_U08
K_U15	is able to apply laboratory methods for the determination of fundamental hydrogeological parameters of rocks	OT1A_U07
K_U16	is able to apply laboratory methods to the determination of the basic physical properties of soils, their compressibility, consistency limits and strength	OT1A_U08 OT1A_U10
K_U17	is able to design the work technology and select the technological system appropriate for the realisation of a large-size earthen excavation in the assumed time-limit	OT1A_U16
K_U18	is able to evaluate the mineral raw material on the base of its macroscopic features; is able, using analytical and geophysical methods, to determine the structural characteristics of deposits and the variability of deposit parameters	OT1A_U07 OT1A_U09 OT1A_U15
K_U19	is able to use laboratory methods of basic measurements in mineralurgy, the processes of mineral raw material comminution, the gravity upgrading (separation), the flotation of sulphide ores and hard coal, the magnetic upgrading (separation) and the determination of basic physical-mechanical properties of rocks	OT1A_U16
K_U20	is able to use laboratory methods for the examination of basic physical-mechanical properties of rocks including the analysis of the full stress-strain relationship characteristics (diagram, curve) and also the analysis of the diagrams obtained under the 'real' triaxial compressive stress state condition (triaxial compression test); is able to develop the method for the determination of loading of the heading working support	OT1A_U14 OT1A_U15 OT1A_U18
K_U21	is able to select the appropriate construction parameters of welded, bolted and other joints and construction characteristics of shafts	OT1A_U14
K_U22	is able to use laboratory methods of the examination of sinusoidal alternating current circuits with RLC elements, the power measurement of single-phase and three-phase current systems, and also the examination of electrical engines	OT1A_U08 OT1A_U16
K_U23	is able to design the mining district of a metal ore mine including the economic analysis; is able to develop	OT1A_U10 OT1A_U16

	blasting works in underground mining workings	
K_U24	is able to make use of the ArcGIS ESRI software in practice; is able to plan, make and develop GPS measurements and also analyse their results; is able to carry out the output surveying inspection in a surface mine; is able to carry out the vertical and horizontal orientation geodetic measurement in an underground mine	OT1A_U14 OT1A_U15
K_U25	is able to make the simplified project of the surface mine dewatering	OT1A_U14
K_U26	is able to develop the post-mining area development plan and the simplified project of the land reclamation in accordance with the given brief foredesign	OT1A_U14 OT1A_U16
K_U27	is able to use laboratory methods of the mine ventilation measurements, the development of potential schemes of mine ventilation networks and the examination of coal susceptibility to spontaneous combustion; is able to design the separate ventilation taking into account natural and induced airflow; is able to design the mine ventilation network modernisation using the Cross's method	OT1A_U14 OT1A_U16
K_U28	is able to prepare the simplified financial model of the investment and calculate its cost-effectiveness indexes; is able to develop the cost forecast of the mining project including the analysis of the cost variability, the amortisation and the analysis of the break-even point using the fundamental project objectives previously developed	OT1A_U10 OT1A_U12
K_U29	is able to use laboratory methods of the examination of the conveyor rollers and belts; is able to make calculations for the belt conveyor project; is able to indicate machines appropriate to specified exploitation tasks	OT1A_U08 OT1A_U16
K_U30	is able to use laboratory methods for measurements of the basic risk factors in workplaces; is able to analyse and assess the measurement results; is able to carry out the occupational risk assessment for selected workplaces in underground and surface mines, using the standard methods	OT1A_U08 OT1A_U11
K_U31	is able to use their knowledge of the Geological and Mining Law to analyse specified legal problems occurring during the mining plant operations	OT1A_U11
K_U32	is able to develop technologies, select proper machines, make calculations of the mining plant productivity related to the chosen mining and useful mineral processing technology with regard to the market requirements, the structure and quality of products and the costs of post-mining area reclamation	OT1A_U08 OT1A_U12
K_U33	has basic abilities related to the sports discipline they chose as the optional course; is able to lead a pro-health lifestyle along with the sports activity chosen for their	

	lifetime and form attitudes promoting the lifetime physical activity	
K_U34	has the practical experience necessary to work in industrial environment related to: the mining plant management, the technology and systems of useful mineral mining, the work technology of basic mining machines and transportation systems, the technology of excavated mineral raw material processing, the development of mining wastes and tailings, the development of post-mining workings, the reclamation works and safety rules connected with such the works	OT1A_U11
SOCIAL COMPETENCES		
K_K01	understands the necessity and knows the possibilities of the lifelong education (permanent learning) (second and third level studies, postgraduate courses, refresher courses, additional trainings) and of the professional, personal and social competence development (upgrading)	OT1A_K01
K_K02	realises the significance of and understands non-technical aspects and consequences of the mining engineer activity including its influence on the natural environment and the related responsibility for decisions; realises the value of and the need to form the safety culture in the workplace in the mining industry	OT1A_K02
K_K03	realises the significance of the professional behaviour as well as the obedience to ethical rules and the respect for various opinions and cultures	OT1A_K05
K_K04	realises the responsibility for their individual work and is disposed to obey the rules of working in a team and be responsible for tasks performed by the team	OT1A_K04 OT1A_K07
K_K05	knows general rules of the establishment and development of the individual enterprise types using the knowledge related to the studied scientific discipline	OT1A_K06
K_K06	is able to think and act in an entrepreneurial way	OT1A_K07
K_K07	realizes the social role of the university of technology graduates and especially understands the need to formulate information and opinions concerning achievements in mining engineering and other aspects of a mining engineer activity and share them with the society, among other means, through mass media; makes efforts to share the information and opinions in an understandable way	OT1A_K08
K_K08	promotes the social and cultural significance of sport and physical activities and cultivates their own interests in the field of physical culture	