SEMESTER 1

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geometria Wykreślna i Rysunek Techniczny
Name in English: Descriptive Geometry and Technical Drawing
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: MMG1103
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	15			45	
Number of hours of total student workload (CNPS)	60			150	
Form of crediting	crediting with grade			crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points	2			5	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2			3	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of Euclidean space, necessary to understand methods of representation of spatial objects in the plane.
2. Basic knowledge of geometric figures.
3. Basic skills related to pencil techniques drawing tools.

SUBJECT OBJECTIVES

C1. Acquisition of knowledge on theoretical basis of spatial objects in the plane, parallel and central projection, rules of the following methods of representation used in engineering graphics:

C1.1. Axonometric projections.
C1.2. Monge projection.
C1.3. Projection with elevations.

C2. Acquisition of knowledge on general rules related to technical drawings, dimensioning, various drawing forms.

C3. Acquisition of technical drawing skills and reading geometric forms of objects in drawings, skills related to solving spatial problems related to construction representation, terrain topography and mining objects or other earthworks design, using the newly learnt methods of representation.

C4. Development of spatial imagination necessary to solve engineering problems.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – knows the rules of determining projection space and rules of points and figures representation as well as invariants in parallel and central projection

PEK_W02 – knows the method of Monge projection and basic construction defining relations and space elements affiliation

PEK_W03 – knows the method of axonometric projections – isometry, oblique and orthogonal dimetry, knows basic geometric dependencies

PEK_W04 – knows the method of projection with elevations, knows basic constructions defining relations and affiliation of space elements and basic constructions determining parameters of topographic surfaces

PEK_W05 – has basic knowledge about technical documentation of designed or existing objects

relating to skills:

PEK_U01 – is able to make a technical drawing which makes documentation of an engineering project, in accordance with current rules of technical drawing.

PEK_U02 – can make drawings, both handmade and using tools, of the learnt representation methods and describe them.

PEK_U03 – can record and read a geometric form of objects in orthogonal projecting

PEK_U04 – can use various drawing forms – view, section, half-view half-section, broken-out section, detail.

PEK_U05 – can calibrate objects in accordance with dimensioning rules of technical drawings

PEK_U06 – can interpret notation and symbols related to dimensions tolerance and surface roughness used in drawings

PEK_U07 – can mark threads in drawings and use reductions in representations of bolted joints

PEK_U08 – can use reductions in drawings and interpret symbols related to welded joints

PEK_U09 – can use reductions related to bearings, can present shafts and gear wheel, can interpret symbols related to fit

PEK_U10 – in Monge projections can determine relations and affiliation of space elements – point straight line, plane – using characteristic planes and transformations of a reference system.

PEK_U11 – can determine a plane intersection and penetrating polyhedra in Monge projections

PEK_U12 – can determine a plane intersection and penetrating solids of revolution in Monge projections

PEK_U13 – can record and read a geometric form of polyhedra in oblique and orthogonal dimetry.

PEK_U14 – can determine an intersection of a polyhedron and a plane intersection in axonometric projection

PEK_U15 – can present spatial objects in projections with elevations

PEK_U16 – can use a projection with elevations in earthworks design related to mining exploitation and road construction

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Course organization. Central and parallel projection. Axonometric projections.	3
Lec 2	Orthogonal parallel projection. Space elements and relations between them. Affiliated elements – straight line and plane, plane and plane. Plane figures penetration. Reference system – transformation penetration.	3
Lec 3	Orthogonal parallel projection. Polyhedron-straight line intersection. Polyhedron-plane intersection. Polyhedra penetration.	3
Lec 4	Orthogonal parallel projection. Penetration of solids of revolution and penetration of solids of revolution with rigid bodies.	3
Lec 5	Projection with elevations. Space elements and relations between them. Applications of projections with elevations in terrain topography representations. Final test.	3
	Total hours	**15**

Form of classes – project		**Number of hours**
Proj 1	Course organization. General rules of technical drawing: paper sheet sizes, types of drawing lines and their uses, scales, title blocks, drawing plans, technical writing practice – Latin alphabet, figures, symbols, Greek characters. Orthogonal projection, hand drawing practice.	6
Proj 2	Axonometric projections. Polyhedron-plane intersection in axonometric projections. Orthogonal parallel projection – Space elements and relations between them, straight line-plane, plane-plane (transformation and characteristic planes).	3
Proj 3	Orthogonal parallel projection. Straight line and solid, polyhedron-plane intersection. Polyhedra penetration.	6
Proj 4	Orthogonal parallel projection. Penetration of solids of revolution and penetration of solids of revolution with rigid bodies.	9
Proj 5	Notation of a geometric form of solids using such forms as intersection, revolved section, half-section, half-view, half-section and half-view.	6
Proj 6	Dimension systems, dimensioning rules. Surface roughness.	3
Proj 7	Graphic record of threads. Record of bolted joints constructions.	3
Proj 8	Record of welded joints constructions.	3
Proj 9	Graphic record of axles, shafts, gear wheels and bearings, dimension and fit tolerance (assembly drawing).	3
Proj 10	Projection with elevations. Application of a projection with elevations in representations of mining exploitation objects. Final test.	3
	Total hours	**45**

TEACHING TOOLS USED
N1. Traditional lecture elements of an interactive lecture, using mainly handwriting techniques and computer presentations prepared in PowerPoint, AutoCAD and Data Mine. N2. Project – interactive class, using problem solving methods, students solve spatial graphic problems in representations over a plane, using hand drawing and pencil technique tools. N3. Project – reading a geometric form of 3-dimensional objects from projections – multiple choice test, graphic quizzes and puzzles. N4. Students' own work – successful preparation of about 9 thematic drawings. N5. Students' own work – individual literature studies N6. Consultations

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENTS

Evaluation F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01-PEK_W04	Crediting with grade – written tests
P = F1		
F1	PEK_U01-PEK_U16	Arithmetic average of partial grades received for thematic drawings, short written tests, oral presentations
F2	PEK_U01-PEK_U09 PEK_W05	Crediting with grade – written test
P = 0.5*F1 + 0.5*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Bogaczyk T., Romaszkiewicz-Białas T., 13 wykładów z geometrii wykreślnej, Oficyna Wydawnicza PWr, Wrocław 2011

[2] Dobrzański T., Rysunek techniczny maszynowy, Wydawnictwa Naukowo-Techniczne, Wydanie 24, Warszawa 2010

SECONDARY LITERATURE:

[1] Lewandowski Z., Geometria wykreślna, PWN , Warszawa 1984 (or any other book on the fundamentals of descriptive geometry)

[2] Dyba K., Geometria rzutów, skrypt PWr, Wrocław 1982

[3] Rydzanicz I., Rysunek techniczny jako zapis konstrukcji. Zadania, WNT, Warszawa 2004

[4] Rydzanicz I., Zapis konstrukcji, skrypt PWr, Wrocław

[5] Rydzanicz I., Zapis konstrukcji - zadania, skrypt PWr, Wrocław 1991

[6] binding standards PN, PN-EN, PN-ISO, PN EN-ISO related to technical drawings

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Descriptive Geometry and Technical Drawing
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W08	C1, C4	Lec 1	N1, N5, N6
PEK_W02	K_W08	C1.2	Lec 2-Lec 4	N1, N5, N6
PEK_W03	K_W08	C1.1	Lec 1	N1, N5, N6
PEK_W04	K_W08	C1.3	Lec 5	N1, N5, N6
PEK_W05	K_W08	C2	Proj 1	N1, N2, N6
PEK_U01-PEK_U02	K_U08	C2, C3	Proj 1-Proj 10	N2, N4, N6
PEK_U03	K_U08	C3, C4	Proj 1-Proj 4	N2, N3, N4, N6
PEK_U04-PEK_U09	K_U08	C2, C3	Proj 5-Proj 9	N2, N4, N6
PEK_U10-PEK_U12	K_U08	C3, C4	Proj 2-Proj 4	N2, N3, N4, N6
PEK_U13-PEK_U14	K_U08	C3, C4	Proj 2	N2, N4, N6
PEK_U15-PEK_U16	K_U08	C3, C4	Proj 10	N2, N3, N4, N6

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Podstawy Górnictwa
Name in English: Fundamentals of Mining
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG1102
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30				
Number of hours of total student workload (CNPS)	60				
Form of crediting	Examination				
For group of courses mark (X) final course					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has a general knowledge (corresponding to the secondary education) necessary to understand engineering features, technical issues concerning the exploitation of mineral resources.
2. The student has the necessary knowledge (corresponding to the secondary education) concerning issues of Earth's interior construction and the processes that shape it, and the types and origin of rocks and minerals.
3. The student has an elementary knowledge (corresponding to the secondary education) concerning the wider range of global economy functioning, which is necessary to understand the role and importance of mining activities, which, supplying raw materials, has always been and continues to be a technical and economic basis of human activity.

SUBJECT OBJECTIVES

C1 - Familiarizing students with the role and tasks of mining, which supplying raw materials, since the dawn of civilization is the basis of technical and economic aspects of human activity

C2 - Familiarizing students with the history of the use of mineral resources and the development of technology of mineral deposits exploitation, which was one of the most important factors stimulating the development of science and technology throughout history (including an explanation of the origin and contemporary role of customs and traditions in the mining industry).

C3 - Acquainting students with the basic knowledge of the processes of mineral deposits formation

and the form of existence and construction of mineral reserves - which determine the methods of operation and the technology used in this field.

C4 - Presenting and explaining to the students basic technical problems of mineral resources exploitation - in particular issues relating to: the exploration and sharing of mineral deposits, reservoir geology, rock mining methods, rock mechanics, housing excavations, underground construction, drainage and ventilation of mines, mining transportation (vertical and horizontal), mechanization of mining, mining industry risks and ways to combat them, mine rescue, as well as elements of geological and mining law.

C5 - Acquainting the students with the technology and systems of underground mining.

C6 - Acquainting the students with the technology and systems of open-cast mining.

C7 - Learning and understanding the specialist mining nomenclature.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has an elementary knowledge of the wider issues of mining as one of the most important areas of technical and human economic activity

PEK_W02 The student has knowledge of the role, tasks and importance of mining. The student will understand fundamental meaning of mineral exploitation as a basis for technical and economic human activity.

PEK_W03 The student has a general knowledge of the history of mineral resources exploitation and the development of mineral deposits techniques throughout history. The student knows the origins and contemporary importance of customs and traditions in mining.

PEK_W04 The student has a general knowledge concerning the processes of mineral deposits formation and the form of existence and construction of mineral reserves - which determine the methods of operation and the technology used in this field.

PEK_W05 The student has general knowledge and understands the basic technical problems of running an open-cast and underground mining of mineral resources - in terms of exploration and sharing of mineral deposits, reservoir geology, rock mining methods, rock mechanics, housing excavations, underground construction, drainage and ventilation of mines , mining transportation (vertical and horizontal), mechanization of mining, mining risks and ways to combat them, mine rescue, as well as elements of geological and mining.

PEK_W06 The student has general knowledge and understands functioning of underground mining systems.

PEK_W07 The student has general knowledge and understands functioning of open-cast deposit excavation.

PEK_W08 The student knows and can properly apply specialist mining nomenclature.

relating to skills:

PEK_K01 The student is aware of the social role of technical university graduate, especially understands the need for formulation and communication to the public - including the mass media - the information and opinions on the performance of mining and other aspects of engineer-miner, shall endeavour to provide such information and opinions in a widely understood manner;

PEK_K02 The student has knowledge which enables them to conduct polemics with those who do not understand the role and importance of mining in the development of civilization and technology and culture, from the earliest times to the present.

PROGRAMME CONTENT		
Form of classes - lectures		**Number of hours**
Lec 1	Subject's programme, conditions of crediting, literature. Tasks and the meaning of mining. The development of mineral deposits techniques throughout history. Geological and mining law. Job traditions in mining.	2
Lec 2	The mineral resources deposits - type and origin, form and fields construction. Mineral raw materials exploration. Determining resources and methods of counting, the economic viability criteria. The underground mining terminology.	2
Lec 3	Technology of rock yielding in underground exploitation. Basic issues of rock mechanics: static and dynamic manifestations of rock pressure, excavation support (basic concepts and the division of supports).	2
Lec 4	Underground mining: types of enabling excavations, basic structures of enabling in underground mining (a model of a mine).	2
Lec 5	Underground mining. Shafts - excavation, support, equipment. Lifting equipment of vertical transport. Pits and chambers.	2
Lec 6	Underground mining: preparing the bed for exploitation, maintenance technology of underground excavations	2
Lec 7	Underground mining: exploitation systems - exploitation excavations, elimination of after-exploitation voids - controlling a roof, directions of exploitation.	2
Lec 8	Underground mining: dangers in underground mining, ventilation, drainage and lighting of underground mines, mine rescue. Liquidation of mines.	2
Lec 9	Open-cast mining - deposits exploitation technology in open-cast mining, minerals sourced in open-cast mining - types of minerals, use, occurrence, characteristics of the deposits. Terminology in open-cast mining - basic definitions, basic processes, basic technological processes, types of excavations, elements of the open-cast pit mining.	2
Lec 10	Enabling deposits in open-cast mining - aim, factors influencing a place of occurrence, ways of enabling, machines. Exploitation systems and methods of moving the front line working in open-cast mining - requirements, types, characteristics of systems	2
Lec 11	Technologies of rock minerals opencast mining. Exploitation on aggregates - how basic machines work, excavator bucket, transport, basics of drilling-shooting works - methods of shooting, the basic effects of shooting, parameters of a shooting hole, schemes of shooting grid.	2
Lec 12	Technologies of rock minerals opencast mining. Exploitation of rocks concise on the blocks - features of deposits allowing the exploitation of the blocks, steps in the process of obtaining blocks from a face, methods of quarrying operations on the blocks. Characteristics of quarrying operations on the blocks, elements of rock processing.	2
Lec 13	Lignite mining technology - operating systems, types of bucket wheel excavators, bucket wheel excavators working methods, transport systems.	2
Lec 14	Removal and heaping of overload - ways of excavators and stackers working, heaping elements, heaping systems,	2
Lec 15	Technologies of rock exploitation from the water - types of excavation, exploitation systems, excavators, transport of excavated material.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem solving lecture. N2. Multimedia presentations. N3. Didactic discussion during the lecture. N4. Duty hours

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at the end of semester)	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01-PEK_W08 PEK_K01, PEK_K02	P1.Final grade of written test. (N2)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] CHUDEK M., Podstawy górnictwa, „Śląsk" Publishing.

[2] BĘBEN. A. - Maszyny i urządzenia do wybranych technologii urabiania surowców skalnych. Śląsk. Katowice 1998 r.

[3] FRANKIEWICZ W., GLAPA W.: Górnictwo i przeróbka kamienia łamanego. W: Surowce skalne. Kruszywa mineralne. Red. nauk. Roman Ney. Kraków : Wydaw. IGSMiE PAN,

[4] FRANKIEWICZ W., GLAPA W., GALOS K.: Technika i technologia eksploatacji kruszyw naturalnych i piasków przemysłowych. W: Surowce skalne.. [Red.] Roman Ney. Kraków: Wydaw. Instytutu Gospodarki Surowcami Mineralnymi i Energią PAN 2002

[5] FRANKIEWICZ W., GLAPA W., GALOS K Technika i technologia eksploatacji kamieni budowlanych i drogowych. W: Surowce skalne. Kamiemie budowlane i drogowe [Red.] Roman
Ney. Kraków: Wydaw. Instytutu Gospodarki Surowcami Mineralnymi i Energią PAN 2003

[6] FRANKIEWICZ W., GLAPA W.: Normy stosowane w dokumentowaniu, projektowaniu i w odkrywkowej eksploatacji złóż. Kopaliny Podstawowe i Pospolite Górnictwa Skalnego, 2006 rok nr 1

[7] HAWRYLAK H. i inni - Maszyny i prace pomocnicze górnictwie odkrywkowym. Śląsk. Katowice 1974.

[8] GAŁCZYŃSKI S., Podstawy budownictwa podziemnego, Oficyna Wydawnicza Pol. Wr., Wrocław 2001.

[9] KŁECZEK Z., Geomechanika górnicza, Śląskie Pub. Techn., Katowice 1994.

[10] NOWAK K., KOSTRZ J. Górnictwo. Część 1. Pub. „Śląsk", Katowice 1989.

[11] PIECHOTA S. Podstawowe zasady i technologie wybierania kopalin stałych, Pub. PAN IGSMiE, Kraków 2003.

[12] PIECHOTA S. Podstawy górnictwa kopalin stałych, Pub. AGH, Kraków 1996,

[13] PIECHOTA S. Technika podziemnej eksploatacji złóż i likwidacji kopalń. Pub. AGH, Kraków 2008.

[14] PIECHOTA S. Technika podziemnej eksploatacji złóż. Część 1. Podstawowe zasady i technologie wybierania kopalin stałych. Kraków 2004.

[15] POCHCIAŁ Z: Eksploatacja podziemna złóż, Skrypt Politechniki Wrocławskiej, Wrocław 1984

SECONDARY LITERATURE:

[1] RYNCARZ T. Zarys fizyki górotworu, Śląskie Pub. Techn., Katowice 1993.
[2] GOSZCZ A., Elementy mechaniki skał oraz tąpania w polskich kopalniach węgla i miedzi, Biblioteka Szkoły Eksploatacji Podziemnej, Pub. Inst. Gospodarki Surowcami Min. i Energią PAN, Kraków 1999.
[3] CHUDEK M., Obudowa wyrobisk górniczych, część I, Obudowa wyrobisk korytarzowych i komorowych. "Śląsk", Katowice 1986.
[4] BIENIAWSKI Z. T., Engineering Rock Mass Clasifications.Wilej et Sons,Intersc.publication.NY 1989.
[5] HOEK E.,BROWN E. T., Underground Excavations in Rock.Institution of Mining and Met.. London 1980.
[6] Praca zbiorowa: Materiały konferencyjne Szkoły Eksploatacji Podziemnej, Pub. AGH
[7] Górnictwo Odkrywkowe – czasopismo
[8] Świat Kamienia – czasopismo - www.swiat-kamienia.pl/pl/
[9] Nowy Kamieniarz – czasopismo - http://nowykamieniarz.pl/

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Fundamentals of Mining
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01-PEK_W08 PEK_K01-PEK_K02	K_W11 K_K07	C1-C7	Lec 1-Lec 15	N1-N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Podstawy Ekonomii
Name in English: Introduction to Economics
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: EKG1101
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15				15
Number of hours of total student workload (CNPS)	30				30
Form of crediting	Examination				crediting with grade
For group of courses mark (X) final course					
Number of ECTS points	1				1
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1				1

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

C1 Familiarizing students with the mechanisms of free market economy, enterprise operation in various market structures and various microeconomic issues such as: supply and demand and their elasticity, optimal pricing policy, the analysis of production costs, perfect competition, monopoly and oligopoly, monopolistic competition, the structure of markets, fiscal policy, money circulation, factors production, material welfare vs. economic freedom.

C2 Familiarizing students with the current issues concerning the operation of mining and energy industry in Poland and in the world including privatization and restructuring of certain departments and the influence of the environmental regulations on their operation in Poland and international markets.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Possesses basic knowledge concerning the rules and the operational principles of the free market economy including supply and demand.

PEK_W02 Possesses knowledge concerning various market structures and their operational principles.

PEK_W03 Knows domestic and international problems of mining and energy industry.

PEK_W04 Understands the consequences of dishonest operations for the economy.

relating to skills:

PEK_U01 Is able to notice economic mechanisms and explain the observed economic phenomena and regularity.

PEK_U02 Can explain the strategic operations of companies in various markets.

PEK_U03 Can appreciate the importance of honesty in economy.

PEK_U04 Using a search engine, an online directory and a traditional library (professional magazines and books) the student can find necessary information concerning the current economic aspects of the operation of mining and energy industry.

PEK_U05 Can identify, analyse and present in a synthetic and interesting form the chosen information concerning the current economic aspects of the operation of mining and energy industry.

relating to social competences:

PEK_K01 Can appreciate the importance of the ability to understand the business and economic reasons of political decisions.

PEK_K02 Appreciate the importance of the advantages resulting from his knowledge about the economic situation in a country and the industrial branch.

PEK_K03 Is able to take part in a discussion about economic issues and can stand for his opinion.

PEK_K04 Is aware of the negative consequences that may result from the dishonest operation, e.g.: business entities. The student appreciates the significance of their ethic and clear operation.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	The principles of free market economy.	1
Lec 2	The limits of the production capacity.	1
Lec 3	Economic growth.	1
Lec 4	Trade (D. Ricardo model)	1
Lec 5	The model of money circulation.	1
Lec 6	Supply and demand.	1
Lec 7	The examples and consequences of price regulation.	1
Lec 8	Production costs.	1
Lec 9	The elasticity of supply and demand.	1
Lec 10	Perfect competition.	1
Lec 11	Pure monopoly.	1
Lec 12	Oligopoly.	1
Lec 13	Monopolistic competition.	1
Lec 14	Market structures.	1
Lec 15	Material welfare vs. economic freedom	1
	Total hours	**15**

Form of classes - seminar		**Number of hours**
Sem 1	The introduction to seminar, distribution of topics for presentations. Students are obliged to make a presentation on two individually selected topics concerning the economic issues of mineral resources market, energy and environment protection in Poland and in the world.	1
Sem 2	15-20 min. presentations followed by a group discussion about the content and the form. Each student gives two presentations.	14
	Total hours	**15**

TEACHING TOOLS USED
N1. Traditional lectures with multimedia presentations using audio-visual equipment. N2. Discussion about students' presentations. N3. The evaluation of a presentation draft, plan, main information, and educational resources. N4. Individual work – expanding knowledge acquired during the lectures. N5. Office hours. N6. Individual work – searching the data necessary to make a presentation. N7. The analysis of presentations and a discussion. N8. Exam - test, negative points and the zero expected value for a "blank shot".

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01	Questionnaire on the principles of free market economy (the evaluation of students' knowledge) – discussing the results and referring to them during the first lecture.
F2	PEK_W01-PEK_W04	Free discussion during the lecture – encouraging students to present their personal opinion. Giving "a plus" to the most active students.
P1	PEK_W01-PEK_W02 PEK_W04 PEK_U01- PEK_U03	Written exam in a form of a test with negative points. The tests require simple calculations in order to obtain correct answers to some questions.
P2	PEK_U02	Encouraging students to analyse the strategy of choosing the questions to answer taking into account a pass mark and negative points that guarantee the zero expected value for a "blank shot".
P3	PEK_ W03-PEK_W04 PEK_U03-PEK_U05	Grade from students' presentations: the content, the form, the quality, the number of educational resources used.
F3	PEK_ K01-PEK_K03	Students' attendance and class activity may affect the final seminar grade.
P4	PEK_K04	Penalty for cheating during the exam (student who cheats will not be credited).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Kamerschen D.R., McKenzie R.B., Nardinelli C.: Ekonomia, Fundacja Gospodarcza NSZZ „Solidarność", Wyd. III, Gdańsk 1993.
[2] Begg D., Fisher S., Dornbusch R.: Ekonomia T1 i T2, PWE, Warszawa 1993.
[3] Samuelson W.F., Marks S.G. : Ekonomia menedżerska, PWE, Warszawa 1998.

SECONDARY LITERATURE:

[1] Rabushka A.: Od Adama Smitha do bogactwa Ameryki, Centrum im. Adama Smitha, Warszawa 1996.
[2] Samuelson P.A., Nordhaus W.D.: Ekonomia T1 i T2, Wydawnictwa Naukowe PWN, Warszawa 1996.
[3] Varian H.R.: Mikroekonomia, kurs średni ujęcie nowoczesne, Wydawnictwo Naukowe PWN, Warszawa 1995.
[4] Hall R.E., Taylor J.B.: Makroekonomia - teoria, funkcjonowanie i polityka, Wydawnictwo Naukowe PWN 1995.
[5] Błaszczyński A.: Słownik pojęć ekonomicznych, Szkoła Zarządzania Uniwersytetu Jagiellońskiego, Towarzystwo Handlowe „Atlant", Kraków 1995.
[6] Chiang A.C.: Podstawy ekonomii matematycznej, PWE, Warszawa 1994.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Introduction to Economics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01 PEK_W02	K_W21	C1	Lec 1-Lec 15	N1, N4, N5, N8
PEK_W03 PEK_W04	K_W21	C2	Sem 1-Sem 7	N2, N3, N6-N7
PEK_U01 PEK_U02 PEK_U03	K_U42	C1	Lec 1-Lec 15	N1, N4, N5, N8
PEK_U03 PEK_U04 PEK_U05	K_U42	C2	Sem 1-Sem 7	N2, N3, N6-N7
PEK_K01 PEK_K02 PEK_K03	K_K01-K_K07	C1, C2	Lec 1-Lec 15 Sem 1-Sem 7	N1, N4, N5 N2, N3, N6-N7
PEK_K04	K_K01-K_K07	C1	Lec 1	

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Podstawy Ekologii i Ochrony Środowiska
Name in English: Introduction to Ecology and Environment Protection
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: OSG1101
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	30				
Number of hours of total student workload (CNPS)	60				
Form of crediting	crediting with grade				
For group of courses mark (X) final course					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge in the field of natural sciences at the level defined by secondary school curriculum

SUBJECT OBJECTIVES

C1. Familiarising students with the natural environment of the Earth as a planet influenced by forces and phenomena of the Universe.
C2. Presenting a synthetic image of how the most important natural environments of the Earth, determining the scope of geoengineering activity, function.
C3. Teaching students about threats to the natural environment of the planet and its condition with particular emphasis on Poland.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Has knowledge of the Earth as a planet which was created and evolves in the surrounding cosmic environment, understands the forces and phenomena shaping the Earth, is aware of external opportunities and threats

PEK_W02 Has synthetic knowledge of natural processes in the atmosphere, hydrosphere and lithosphere, which have substantial influence on the use natural resources of the Earth

PEK_W03 Knows the most important threats to the natural environment, ways of monitoring them, methods of protecting the natural environment from devastation and restoring the values of the natural environment transformed by human activity

relating to social competences:

PEK_K01 Understands the significance of natural conditions of engineering activity and its influence on the condition of the natural environment

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Ecology – definition, division, history	2
Lec 2	Cosmic environment of the inhabitants of planet Earth	6
Lec 3	The Earth's atmosphere	4
Lec 4	Earth's climate – changes, its role in human development	2
Lec 5	Earth's hydrosphere – resources and water cleanliness	4
Lec 6	Natural diversity of land environment	4
Lec 7	Knowledge of the environment as the basis for using Earth's resources	4
Lec 8	Condition and protection of the natural environment of the Earth with particular emphasis on the natural environment of Poland	4
	Total hours	**30**

TEACHING TOOLS USED
N1. Traditional lecture with multimedia presentations (with the use audiovisual equipment)

EVALUATION OF SUBJECT EDUCATIONAL EFFECT ACHIEVEMENTS

Evaluation F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01-PEK_W03	Crediting with grade on the basis of a written test covering the scope of issues discussed at the lecture.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Textbooks "Fizyka z Astronomią" for secondary schools.
[2] Makowski J.: Geografia fizyczna świata. Wyd. Nauk. PWN, Warszawa 2008
[3] Graniczny M.: Katastrofy przyrodnicze. Wyd. Nauk. PWN, Warszawa 2009
[4] Weiner J.: Życie i ewolucja biosfery. Wyd. Nauk. Warszawa 2012
[5] Archer D.: Globalne ocieplenie. Zrozumieć prognozę. Wyd. Nauk. PWN, Warszawa 2010
[6] Kożuchowski K., Wibig J., Degirmendžić J.: Meteorologia i klimatologia. Wyd. Nauk. PWN, Warszawa 2009
[7] Van Andel T.H.: Nowe spojrzenie na starą planetę. Wyd. Nauk. PWN, Warszawa 2010

SECONDARY LITERATURE:

[1] "Wiedza i Życie" (monthly)
[2] "Świat Nauki" (monthly)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Introduction to Ecology and Environment Protection
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W11	C1	Lec 1-Lec 2	N1
PEK_W02	K_W11	C2	Lec 3-Lec 7	N1
PEK_W03	K_W11	C3	Lec 8	N1
PEK_K01	K_K02	C2, C3	Lec 1-Lec 8	N1

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Technologie Informacyjne
Name in English: Information Technologies
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: INZ0535
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30				
Number of hours of total student workload (CNPS)	60				
Form of crediting	crediting with grade				
For group of courses mark (X) final course					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Required knowledge from computer science and mathematics at the level of high school.

SUBJECT OBJECTIVES

C1 familiarizing students with the basics of information technology in the field:
- C1.1 organization and computer functioning
- C1.2 software and hardware
- C1.3 particular applications,
- C1.4 computer networks and the Internet
- C1.5 security

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has knowledge of basic computers functions and architecture

PEK_W02 The student has knowledge how to use a computer and ways of using it

PEK_W03 The student has a right knowledge concerning professional usage of particular applications

PEK_W04 The student knows the rules of computer networks and the Internet functioning achieving information and communication in the net.

PEK_W05 The student has knowledge concerning threads and ways of safe work using computer and in the net.

relating to social competences:

PEK_K01 The student has is aware of norms, ethics and rules which are in force in the informatics society.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Introduction, basic notions on informatics technology	2
Lec 2	Representing, coding and data processing on a computer	2
Lec 3	Basics of computer's architecture	2
Lec 4	External devices and memories	2
Lec 5	Algorithms, data structure, programming	2
Lec 6	Software, operational systems	2
Lec 7	Professional use of word processors	2
Lec 8	Spreadsheets	2
Lec 9	Data presentation and manager's graphic	2
Lec 10	Elements of data bases	2
Lec 11	Computer networks and the Internet; introduction	2
Lec 12	Computer networks and the Internet; services and net applications	2
Lec 13	Computer security, data coding, digital signature	4
Lec 14	Particular tools and programmes	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Traditional lecture illustrated by multimedia presentations.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at the end of semester)	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01-PEK_W05	Crediting on the basis of a written test.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Dec Z., Konieczny R., ABC komputera 2012, Edition 2000, Kraków 2011
[2] Żarowska-Mazur A., Węglarz W., ECDL na skróty, PWN Publishing
[3] Sikorski W., ECDL. Podstawy technik informatycznych i komunikacyjnych, PWN 2009
[4] Wojciechowski A. Usługi w sieciach informatycznych. PWN Publishing 2007

SECONDARY LITERATURE:

[1] Żarowska-Mazur A., Węglarz W., ECDL advanced na skróty, Wyd. PWN, 2011
[2] Morley D., Parker C., Understanding computers today and tomorrow, Thomson – Course Technology, 12th Edition, 2009
[3] Wojtuszkiewicz K., Jak działa computer? PWN Publishing, 2011

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Information Technologies
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W09	C1.1	Lec 1-Lec 4	N1
PEK_W02	K_W09	C1.2	Lec 5-Lec 6	N1
PEK_W03	K_W09	C1.3	Lec 7-Lec 10	N1
PEK_W04	K_W09	C1.4	Lec 11-Lec 12	N1
PEK_W05	K_W09	C1.5	Lec 13	N1
PEK_K01	K_K03	C1	Lec 1-Lec 14	N1

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Analiza Matematyczna I
Name in English: Mathematical Analysis I
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: optional / university-wide
Subject code: MAP1142
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	30			
Number of hours of total student workload (CNPS)	150	90			
Form of crediting	Examination	crediting with grade			
For group of courses mark (X) final course					
Number of ECTS points	5	3			
including number of ECTS points for practical (P) classes	0	3			
including number of ECTS points for direct teacher-student contact (BK) classes	3	2			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. It is recommended to possess knowledge of mathematics equivalent to matura advanced level standards

SUBJECT OBJECTIVES

C1. The student should obtain basic knowledge of the general properties of the function, in particular, elementary functions and solving equations and inequalities with these functions.
C2. The student should acquire knowledge of basic concepts of calculus of functions of one variable using test functions and solving optimization tasks.
C3. The student should obtain basic knowledge about indefinite integral.
C4. The student should use of the acquired knowledge to create and analyse mathematical models to solve theoretical and practical problems in various fields of science and technology.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student possesses basic knowledge of logic and set theory, known properties of power functions, exponential, trigonometric and inverse to them.

PEK_W02 The student knows the basics of calculus of functions of one variable using for solving optimization problems.

PEK_W03 The student possesses basic knowledge of the indefinite integral.

relating to skills:

PEK_U01 The student is able to solve equations and inequalities such as: exponential, polynomial, exponential, logarithmic and trigonometric.

PEK_U02 The student is able to calculate the limits of sequences and functions, determine the asymptotic function theorem and apply L'Hospital's rule to the unmarked symbols.

PEK_U03 The student is able to calculate the derivatives of the function and interpret the values, is able to estimate the differential, as well as, solve optimization of functions of one variable, and examine the property and conduct of functions of one variable

PEK_U04 The student is able designate an indefinite integral of elementary functions and rational functions using properties and methods of integration learned during the lecture

relating to social competences:

PEK_K01 The student is able find and use the recommended literature and independently acquire knowledge

PEK_K02 The student understands the need for systematic and independent work on mastery of course material

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Elements of mathematical logic and set theory. Quantifiers. Sets on the line.	2
Lec 2	Composition of functions. The injective function. The inverse function and its graph. Power and exponential functions, and opposite to them.	2
Lec 3	Trigonometric functions. Reduction formulas and trigonometric identities. Inverse trigonometric functions and their graphs.	2
Lec 4	Limit of a sequence. Claims of finite limits. Limit the number of invalid e string. Incorrect delineation strings. Indeterminate expressions.	3
Lec 5	Limit of a function at the point (right and wrong). Sided limits of functions. The technique for calculating limits. The boundaries of basic unmarked expressions. Function asymptotes.	4
Lec 6	Continuity of a function at a point and on the interval. Continuity of sided functions. Points of discontinuity and their types. Theorems on continuous functions on a closed interval and their applications. Approximate solution of equations.	3
Lec 7	The derivative of the function at the point. Sided and Wrong derivatives. Derivatives of basic elementary functions. Differentiation. Derivatives of higher orders.	2
Lec 8	Geometric interpretation of the derivative. Tangent. Differentials and their applications to approximate calculations. The value of the smallest and the largest function in a closed interval. Applications to geometry, physics and technology leading to the determination of global extremes.	3
Lec 9	Mean value theorems (Rollethe and Lagrange). Examples of the application of Langrange's theory. Taylor and Maclaurin formulas and their applications. The rule de L'Hospital.	2
Lec 10	Intervals of monotonicity of functions. Local extremes functions. Necessary and sufficient conditions of existence of local extremes. Convex functions and points	3

	of inflection in the graph of a function. Examination of a function.	
Lec 11	Indefinite integrals and their basic properties. Integration by parts. Integration by substitution. Integration of rational functions. Integration of trigonometric functions.	4
	Total hours	**30**

Form of classes - class		**Number of hours**
Cl 1	Application of the laws of logic and set theory.	2
Cl 2	The study of general properties of functions (monotonicity, injectives, domain, folding function, inverse function). The study of functions and graphs and drawing power function, exponential, trigonometric and inverse to them and their assemblies. Solving equations and inequalities with the use of above functions.	4
Cl 3	Calculating the limits of appropriate and inappropriate number sequences and functions (at a point) and unmarked expressions. Determining function asymptotes.	5
Cl 4	Continuity and function at a point on the interval. The use of theorems concerning continuous function on a closed interval to the problems of extreme and approximate equations.	2
Cl 5	Calculating the function derivatives using the theorems of differentiation with the interpretation of the derivative. Determining tangent to the sequence. Usage of differentials to approximate calculations (error estimation).	4
Cl 6	Determining the rules of Taylor / Maclaurin to estimate accuracy. Usage of L'Hospital's rule to calculate limits.	3
Cl 7	Investigation of the function - monotonicity, convexity, local extremes Determining the formulas of Taylor / Maclaurin with the estimation of accuracy. Usage of L'Hospital's rule to calculate the limits. Determining global extremes.	4
Cl 8	The calculation of integrals - integration by parts and by substitution. Integration of rational functions. Integration of trigonometric functions.	4
Cl 9	Final test.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Lecture N2. Laboratories N3. Consultations N4. Homework assignments

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01-PEK_U04 PEK_K01-PEK_K02	Oral and written form of crediting the student
F2	PEK_W01-PEK_W3 PEK_K02	Final examination

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] G. Decewicz, W. Żakowski, Matematyka, Cz. 1, WNT, Warszawa 2007.

[2] M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2011.

[3] W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, Cz. I, PWN, Warszawa 2006.

SECONDARY LITERATURE:

[1] G. M. Fichtenholz, Rachunek różniczkowy i całkowy, T. I-II, PWN, Warszawa 2007.

[2] M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2011.

[3] R. Leitner, Zarys matematyki wyższej dla studiów technicznych, Cz. 1-2 WNT, Warszawa 2006.

[4] F. Leja, Rachunek różniczkowy i całkowy ze wstępem do równań różniczkowych, PWN, Warszawa 2008.

[5] H. i J. Musielakowie, Analiza matematyczna, T. I, cz. 1 i 2, Wydawnictwo Naukowe UAM, Poznań 1993.

[6] W. Stankiewicz, Zadania z matematyki dla wyższych uczelni technicznych, Cz. B, PWN, Warszawa 2003.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mathematical Analysis I MAP1142
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W36	C1, C4	Lec 1-Lec 3	N1, N3, N4
PEK_W02	K_W36	C2, C4	Lec 4-Lec 10	N1, N3, N4
PEK_W03	K_W36	C3, C4	Lec 11	N1, N3, N4
PEK_U01	K_U39	C1, C4	Cl 1, Cl 2	N2, N3, N4
PEK_U02	K_U39	C2, C4	Cl 3, Cl 4	N2, N3, N4
PEK_U03	K_U39	C2, C4	Cl 5-Cl 7	N2, N3, N4
PEK_U04	K_U39	C3, C4	Cl 8	N2, N3, N4
PEK_K01-PEK_K02	K_K01	C1-C4	Lec 1-Lec 14 Lec 1-Le c9	N1-N4

SEMESTER 2

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Chemia
Name in English: Chemistry
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: CHG2101
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	90		30		
Form of crediting	Examination		crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	3		1		
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	3		0.5		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge necessary to understand chemical and physical-chemical processes.

SUBJECT OBJECTIVES

C1 Acquisition of basic knowledge of chemistry related to matter properties and the most important chemical processes and phenomena, which help a mining engineer to understand the surrounding world, natural and industrial processes.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 has knowledge allowing to define and explain chemical processes and phenomena

PEK_W02 has basic knowledge of chemistry allowing for describing and characterising processes in nature, technology and environment protection.

relating to skills:

PEK_ U01 is able to conduct simple chemical reactions from various branches of chemistry.

relating to social competences:

PEK_K01 is able to formulate and pass knowledge related to basic chemical processes and their influence on the environment and social conditions.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Introduction, goal and scope of lectures, crediting. Structure of matter.	2
Lec 2	The periodic system	2
Lec 3	Chemical bond	2
Lec 4	States of aggregation of matter	2
Lec 5	Solutions	2
Lec 6	Chemistry of geological processes	2
Lec 7	Phase borders	2
Lec8	Chemical reactions	2
Lec 9	Electro-chemistry	2
Lec 10	Thermodynamics	2
Lec 11-Lec 12	Elements of organic chemistry	4
Lec 13	Environmental chemistry	2
Lec 14	Iron and its properties	2
Lec 15	Chemistry of explosive materials	2
	Total hours	**30**

Form of classes - laboratory		**Number of hours**
Lab 1	Introduction. Scope and type of laboratory research during laboratory classes. Crediting conditions. Presentation of binding safety regulations at laboratory classes and during experiments. Experiment equipment and devices. Calculation rules. Report writing rules.	2
Lab 2	Water	2
Lab 3	Interphase phenomena	2
Lab 4	Analysis of report writing correctness	2
Lab 5	Colloids	2
Lab 6	Electrolytes	2
Lab 7	Metals corrosion	2
Lab 8	Non-metals corrosion	2
Lab 9	Combustion	2
Lab 10	Polymers	2
Lab 11	Coal	2

Lab 12	Leaching	2
Lab 13-Lab 14	Supplementary exercises	4
Lab 15	Assessment of reports and laboratory tests. Test of basic chemical processes. Crediting.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Traditional lecture with multimedia presentations and discussions N2. Preparation of a report on conducted laboratory tests N3. Consultations

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENTS

Evaluation F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01-PEK_W03 PEK_K01	Written exam
F, P	PEK_U01-PEK_U02	F1- assessment of substantial adequacy of laboratory research and the way it was conducted F2- assessment of the report of laboratory research P- final result of laboratory class (arithmetic average of F1 and F2)

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Barycka I., Skudlarski K., Podstawy chemii, różne wydania, Oficyna Wydawnicza PWr, Wrocław [2] Młochowski, J., Podstawy chemii, różne wydania, Oficyna Wydawnicza PWr, Wrocław **SECONDARY LITERATURE:** [1] Materials for lectures: http://www.minproc.pwr.wroc.pl/zpkio/dlastudmat.html
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Chemistry
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01 PEK_W02	K_W05	C1	Lec 1-Lec 15	N1, N3
PEK_U01	K_U07	C1	Lab 1-Lab 15	N2, N3
PEK_K01	K_K07	C1		

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geodezja Inżynierska
Name in English: Engineering Surveys
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG2102
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	30		60		
Form of crediting	crediting with grade		crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	1		2		
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1		1		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1.Basic knowledge of mathematics and physics required at the level of secondary education.

SUBJECT OBJECTIVES

C1 Acquisition of knowledge on basic functions and role of geodesy at all stages of mining engineering work, in inventory measurements, completion survey and control measurements
C2 Acquisition of knowledge on rules of linear, angle and topographic measurements, for mapping purposes as well as processing and visualisation of measurement results
C3 Learning and understanding elements of the calculus of coordinates, ways of area and cubature calculation as well as measurements and calculations precision assessment.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 has basic knowledge of structures and role of geodesy in engineering work at design, completion and control stages

PEK_W02 has general knowledge related to basic types of geodetic measurements, processing them and graphic presentation on maps, can define linear, angle and area measurements units

PEK_W03 is able to define notions of the coordinate system and describe all most important notions related to the calculus of coordinates, has knowledge of area and cubature calculation methods

PEK_W04 knows and understands the essence of measurements and calculations precision, can define the notion of deviation and correction as well as initial measurement results adjustment

relating to skills:

PEK_U01 is able to take field mapping and topographic measurements, make basic geodetic calculations and prepare an analogue map

PEK_U02 is able to calculate rectangular coordinates pursuant to the binding state system of spatial references, on the basis of geodetic measurements results and determine area and cubature

PEK_U03 is able to adjust results of mapping and topographic measurements as well as make an analysis of measurements and determinations' precision

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Role of geodesy in mining, analysis of the main branches of geodesy	2
Lec 2	Types of geodetic measurements, elements of spatial references systems	2
Lec 3	Measurement units: length, area and angles, recalculation of angle measurements	2
Lec 4	Types of maps: content of maps, geometric interpretation, scales	2
Lec 5	Direct and indirect measurements of distance, straight lines and angles determination	2
Lec 6	Measurements of terrain details: methods, technical instructions, introductory results analysis	2
Lec 7	Theodolite, measurement of horizontal and vertical directions, calculation of angles	2
Lec 8	Calculus of coordinates in the plane: calculation of the coordinates of a polygonal traverse, deviation and correction	2
Lec 9	Area and cubature calculation methods	2
Lec 10	Elements of the calculus of errors: types of errors, identically and non-identically accurate observations, mean error, observation function error	2
Lec 11	Topographic measurements: geometric levelling, level circuits adjustment, checking and rectification of levelling instruments	2
Lec 12	Geometric surface levelling, trigonometric levelling	2
Lec 13	Completion and control measurements: data determination for setting out objects, setting out slopes, level and rectilinearity testing in construction elements of buildings	2
Lec 14	Basics of analytical and digital photogrammetry, applications in mining	2
Lec 15	Elements of SIP/GIS used in management support in mining	2
	Total hours	**30**

Form of classes - laboratory		Number of hours
Lab 1	Regulations related to classes, safety regulations training, basic equipment for linear measurements	2
Lab 2	Measurements of terrain details using the orthogonal method, a field sketch,	2
Lab 3	Measurements of terrain details using the polar method	2
Lab 4	Charting an analogue map	2
Lab 5	Geometric interpretation of economic maps: interpolation of contour lines, structure sections of mining areas	2
Lab 6	Area and cubature calculation	2
Lab 7	Angle measurements: theodolite, optical and digital tacheometer, measurements of horizontal and vertical directions	2
Lab 8	Topographic measurements – geometric levelling: optical and digital levelling instruments, construction, operation, rectification	2
Lab 9	Topographic measurements, geometric levelling of a level circuit,	2
Lab 10	Surface levelling	2
Lab 11	Coordinates calculus: calculation of coordinates of a polygonal traverse	2
Lab 12	Intersection, measurements of geometric elements	2
Lab 13	Testing horizontality and verticality in building structures	2
Lab 14	Analytical and digital photogrammetry: presentation of stereophotogrammetric models, determination of coordinates	2
Lab 15	Initial assessment of accuracy of measurements and determinations – function error	2
	Total hours	**30**

TEACHING TOOLS USED
N1 Traditional lecture with multimedia presentations.
N2 Laboratory classes – Preparing reports in the form of surveys with calculation results and visualisations
N3 Student's own work – continuation of laboratory work
N4 Student's own work – individual studies and preparation for the exam
N5 Consultations

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENTS

Evaluation F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01-PEK_U03	Verbal responses and written tests
F2	PEK_U01-PEK_U03	Tests results
P1		Arithmetic average of F1 and F2
P2	PEK_W01-PEK_W04	Oral and written tests

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Beluch J., Ćwiczenia z geodezji I, Wyd. AGH, Kraków 2007
[2] Beluch J., Ćwiczenia z geodezji II, Wyd. AGH, Kraków 2008
[3] Kurczyński Z., Preuss R.: Podstawy Fotogrametrii. Oficyna Wydawnicza PW, Warszawa 2004
[4] Łyszkowicz S., „Podstawy Geodezji", Wyd. Politechniki Warszawskiej, Warszawa 2008
[5] Jagielski A. Geodezja I. P.W.STABILL, wyd. II, Kraków 2005.
[6] Jagielski A. Przewodnik do ćwiczeń z geodezji. I. P.W.STABILL, Kraków 2004.
[7] Osada E. Wykłady z geodezji i geoinformatyki. Niwelacja. Wydawnictwo Naukowe Dolnośląskiej Szkoły Wyższej. Wrocław 2009.
[8] Przewłocki St., Geodezja dla Inżynierii Środowiska, PWN, 2000

SECONDARY LITERATURE:

[1] Instrukcje i wytyczne techniczne Głównego Urzędu Geodezji i Kartografii 2011 r.
[2] Geodeta - Miesięcznik geoinformacyjny. Wydawnictwo Geodeta Sp. z o.o., Warszawa
[3] Przegląd Geodezyjny – Miesięcznik Stowarzyszenia Geodetów Polskich. Wydawnictwo Sigma NOT

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Engineering Surveys
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W12	C1	Lec 1-Lec-2 Lec 14, Lec 15	N1, N4, N5
PEK_W02	K_W12	C2	Lec 3-Lec 7 Lec 11, Lec 12	N1, N4, N5
PEK_W03	K_W12	C3	Lec 8-Lec 9	N1, N4, N5
PEK_W04	K_W12	C3	Lec 4, Lec 13	N1, N4, N5
PEK_U01	K_U10	C1, C2	Lab 1-Lab 4 Lab 7-Lab 10	N2, N3, N5
PEK_U02	K_U10	C3	Lab 5, Lab 6 Lab 11-Lab 14	N2, N3, N5
PEK_U03	K_U10	C3	Lab 15	N2, N3, N5

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Mechanika Techniczna
Name in English: Technical Mechanics
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: MMG2101
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	30	30			
Number of hours of total student workload (CNPS)	60	90			
Form of crediting	Examination	crediting with grade			
For group of courses mark (X) final course					
Number of ECTS points	2	3			
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2	2			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

Basic knowledge of mathematical analysis, algebra and physics, necessary to understand engineering mathematical problems.

SUBJECT OBJECTIVES

C1 Acquisition of theoretical knowledge on plane and spatial static structures on flat and spatial static structures.

C2 Acquisition of skills related to modelling and solving plane static structures.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Acquisition of basic knowledge related to plane and spatial force systems.

PEK_W02 Acquisition of detailed knowledge related to active forces and calculation of passive forces and cross-cutting forces.

relating to skills:

PEK_U01 Ability to recognise types of plane and spatial structures.

PEK_U02 Ability to solve plane and spatial structures with reference to reactions and cross-cutting forces.

PEK_U03 Ability to check the correctness of solutions to plane and spatial structures.

relating to social competences:

PEK_K01 Understanding the significance of static solutions for the correct operation of constructions.

PEK_K02 Understanding threats related to lack of control over static solutions.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	The subject of Technical Mechanics. Vector and scalar. Vector algebra. Analytical presentation of a free vector in the space and in the plane. Multiplication and division of vectors by a number. Addition and subtraction of vectors. Polygon of forces and force planning. Scalar and vector product of vectors.	2
Lec 2	Statics axioms. Equivalence of two vectors. Force projection onto a plane. A resultant and a component. Graphic determination of a resultant of a coplanar concurrent force system. Graphic presentation of the equilibrium of such a system. Projection sum of vectors sum theorem. Analytical determination of a resultant of a coplanar concurrent force system. System equilibrium from analytical perspective.	2
Lec 3	Moment of force to point. General moment a system of forces. Couple of forces. Analytical determination of a plane resultant force of any system of forces. Equilibrium of such a system.	2
Lec 4	Reduction of a spatial concurrent and optional system of forces. Central and torsion vector.	2
Lec 5	Moment of forces to a straight line. Analytical conditions of the equilibrium of a spatial concurrent and optional system of forces.	2
Lec 6	Equilibrium of three and four forces in a plane. The Culmann question. Elements of graph statistics. Funicular polygon. Graphic determination of a resultant force of a plane optional system of forces. Graphic determination of a moment of forces to point.	2
Lec 7	Elements of kinematics of a rigid body. Freedom degrees. Instantaneous permanent centre. Kinematics of systems of discs. Geometric invariability and static determinability. Statics of a rigid body. Constraints. Reactions. Supports. Division of loading forces.	2
Lec 8	Statics of statically determined beams and frames. Reactions and internal forces: longitudinal force, shearing force, bending moment and torque moment. Definitions, marking agreements. Rules related to internal forces graphs. Differential connections between internal forces.	2
Lec 9	Statics of statistically determinable tables and frames (continuation).	2
Lec 10	Statics of statistically determinable tables and frames (continuation).	2
Lec 11	Continuous and joint beams. Reactions and internal forces. Analytical and	2

	descriptive methods.	
Lec 12	Plane trusses: definitions, static determinability and geometric invariability. Methods: knots equilibrium and Cremona.	2
Lec 13	Plane trusses. Methods: Ritter, Culmann.	2
Lec 14	Statics of arches. Reactions and internal forces: bending moment, shearing and longitudinal forces. Graphs of internal forces.	2
Lec 15	Statics of hinged arches.	2
	Total hours	**30**

Form of classes – class		**Number of hours**
Cl 1 – Cl 15	Detailed presentation of questions discussed during lectures in tasks.	30
	Total hours	**30**

TEACHING TOOLS USED
N1. Lecture: presentation and discussing theories and examples using audio-video equipment. N2. Classes: solving tasks at the blackboard individually or in cooperation with other students.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENTS

Evaluation F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01, PEK_W02, PEK_U02	Exam composed of a written and oral part.
P2	PEK_U01, PEK_U02, PEK_U03	Written tests during classes.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Siuta Wł., Mechanika techniczna;
[2] Misiak J., Mechanika techniczna. Statyka i wytrzymałość materiałów;
[3] Chrobok R., Zbiór zadań z podstaw statyki;
[4] Leyko J.: Mechanika ogólna. Tom I. Statyka i kinematyka.

SECONDARY LITERATURE:

[1] Klasztorny M., Mechanika: statyka, kinematyka, dynamika'
[2] Jokiel M., Statyka i wytrzymałość materiałów. Część I. Statyka. Geometria mas.
[3] Cywiński Z., Mechanika budowli w zadaniach.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Technical Mechanics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W13	C1, C2	Lec 1-Lec 15	N1
PEK_W02	K_W13	C1, C2	Cl 1-Cl 15	N2
PEK_U01	K_U11	C1, C2	Lec 1-Lec 5, Cl 1-Cl 5	N1, N2
PEK_U02	K_U11	C1, C2	Lec 5-Lec 10, Cl 5-Cl 10	N1, N2
PEK_U03	K_U11	C1, C2	Lec 10-Lec 15, Cl 10-Cl 15	N1, N2
PEK_K01	K_K07	C1, C2	Lec 10-Lec 15	N1, N2
PEK_K02	K_K07	C1, C2	Lec 10-Lec 15	N1, N2

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Podstawy Geologii
Name in English: Fundamentals of Geology
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GEG2101
Group of courses: YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15			30	
Number of hours of total student workload (CNPS)	60			60	
Form of crediting	Examination			crediting with grade	
For group of courses mark (X) final course	X				
Number of ECTS points	2			2	
including number of ECTS points for practical (P) classes				1	
including number of ECTS points for direct teacher-student contact (BK) classes	2			1	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The knowledge of geography at matura level.
2. The knowledge of Polish language at matura level.

SUBJECT OBJECTIVES

C1 Familiarizing students with the Earth's structure and its evolution starting from its formation in the young Solar System to the present day.
C2 Familiarizing students with the processes that play an important role in the development of the lithosphere and their various mineral deposits.
C3 Teaching students how to present the geological structures on maps, stratigraphic sections and geological profiles.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01The student knows and understands the processes leading to the creation of the Solar System and the Earth.

PEK_W02 The student knows the structure of the Earth.

PEK_W03 The student knows the most important events from the history of the Earth starting from its formation in the young Solar System to the present day and understands the chronological order of this process.

PEK_W04 The student knows the most important geological processes forming the lithosphere and its mineral deposits and understands their interrelationship. The student is also aware of the consequences of these processes and knows their causes.

relating to skills:

PEK_U01 Learning how to make simple maps, profiles and stratigraphic sections.

PEK_U02 Learning how to use a geological compass and how to take advantage of basic stratigraphic principles and various methods of determining relative and non-relative age of rocks.

PEK_U03 Learning how to characterise the processes and the effects of the deformations of rocks in the lithosphere.

relating to social competences:

PEK_K01 The student is able to present to a 12 year old person the structure and the history of the Earth starting from its formation in the young Solar System to the present day.

PEK_K02 The student is able to logically characterise to a 12 year old person the most important geological processes forming the lithosphere and their interrelationships, causes and consequences.

PEK_K03 The student is able read and explain data included on maps, stratigraphic sections, and geological profiles. The student is also able to present a geological structure in a form of ketches and drawings understandable to a 12 year old person.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	The Earth’s formation.	1
Lec 2	The Precambrian Era.	1
Lec 3	The Paleozoic Era.	2
Lec 4	The Mesozoic Era.	2
Lec 5	The Cenozoic Era.	1
Lec 6	The Earth’s structure.	2
Lec 7	The egzogenic geological processes.	3
Lec 8	The endogenic geological processes.	3
	Total hours	**15**

Form of classes - project		Number of hours
Proj 1	Basic issues concerning stratigraphy, tectonics, geological cartography, making measurements using a geological compass.	8
Proj 2	Making a geological map on the basis of a stratigraphic section.	2
Proj 3	Making a stratigraphic section on the basis of a geological map.	4
Proj 4	Making a stratigraphic section on the basis of a borehole profile.	4
Proj 5	Making a geological map sheet with a proper lithological profile, a proper stratigraphic section and a proper legend.	12
	Total hours	**30**

TEACHING TOOLS USED
N1. Traditional lecture with multimedia presentations. N2. Project-oriented classes covering basic issues from the following areas: stratigraphy, tectonics, geological cartography, making measurements using a geological compass as well as making maps, profiles and stratigraphic sections. N3. Identifying teaching materials and resources for self-study.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W03, PEK_W04, PEK_U02, PEK_U03, PEK_K01-PEK_K03	Test on the basic issues concerning stratigraphy, tectonics, and geological cartography.
F2 – F5	PEK_W03, PEK_W04, PEK_U01-PEK_U03, PEK_K01-PEK_K03	Students will be graded on the basis of the individual completion of 4 projects and the ability to use a geological compass.
P	PEK_W01-PEK_W04, PEK_U01-PEK_ U03, PEK_K01-PEK_K03	Exam covering the whole material that the students came across during the self-study, the project-oriented classes and the lectures. The project grade will be also taken into consideration while giving the final grade. The project grade is an average grade of all grades F1-F5.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] CZUBLA P., MIZERSKI W., ŚWIERCZEWSKA-GŁADYSZ E., 2005, Przewodnik do ćwiczeń z geologii. Wydawnictwo Naukowe PWN, Warszawa.
[2] DZIK J., 2003, Dzieje życia na Ziemi. Wydawnictwo Naukowe PWN, Warszawa.
[3] JAROSZEWSKI W. (red.), 1986, Przewodnik do ćwiczeń z geologii dynamicznej. Wydawnictwa Geologiczne, Warszawa.
[4] KŁAPCIŃSKI J., NIEDŹWIEDZKI R., 1995, Zarys geologii historycznej. Wydawnictwo Uniwersytetu Wrocławskiego, Wrocław.
[5] KSIĄŻKIEWICZ M., 1968, Geologia dynamiczna. Wydawnictwa Geologiczne, Warszawa.
[6] LEHMANN U., HILLMER G., 1991, Bezkręgowce kopalne. Wydawnictwa Geologiczne, Warszawa.
[7] McCONNELL D., STEER D., KNIGHT C., OWENS K., 2010, The Good Earth. Introduction to Earth Science. McGRAW-HILL, New York, USA.
[8] MIZERSKI W., 1999, Geologia dynamiczna dla geografów. Wydawnictwo Naukowe PWN, Warszawa.
[9] MIZERSKI W., 2006, Geologia dynamiczna. Wydawnictwo Naukowe PWN, Warszawa.
[10] MIZERSKI W., ORŁOWSKI S., 2001, Geologia historyczna dla geografów. Wydawnictwo Naukowe PWN, Warszawa.
[11] ORŁOWSKI S. (red.), 1987, Przewodnik do ćwiczeń z geologii historycznej. Wydawnictwa Geologiczne, Warszawa.
[12] ORŁOWSKI S., SZULCZEWSKI M., 1990, Geologia historyczna, część pierwsza. Wydawnictwa Geologiczne, Warszawa.
[13] PLUMMER C. C., CARLSON D. H., HAMMERSLEY L., 2010, Physical geology. McGRAW-HILL, New York, USA.
[14] PROTHERO D. R., DOTT R. H., Jr., 2010, Evolution of the Earth. McGRAW-HILL, New York, USA.
[15] STANLEY S. M., 2002 – Historia Ziemi. Wydawnictwo Naukowe PWN, Warszawa.

SECONDARY LITERATURE:

[1] ADAMS F., LAUGHLIN G., 2000, Ewolucja Wszechświata. Wydawnictwo Naukowe PWN, Warszawa.
[2] ALLEN P. A., 2000, Procesy kształtujące powierzchnię Ziemi. Wydawnictwo Naukowe PWN, Warszawa.
[3] ALVAREZ W., 1999, Dinozaury i krater śmierci. Prószyński i S-ka, Warszawa.
[4] van ANDEL T. H., 1991, Historia Ziemi i dryf kontynentów. Wydawnictwo Naukowe PWN, Warszawa.
[5] van ANDEL T. H., 1997, Nowe spojrzenie na starą planetę. Zmienne oblicze Ziemi. Wydawnictwo Naukowe PWN, Warszawa.
[6] ARTYMOWICZ P., 1995, Astrofizyka układów planetarnych. Wydawnictwo Naukowe PWN, Warszawa.
[7] CRICK F., 1992, Istota i pochodzenie życia. Państwowy Instytut Wydawniczy, Warszawa.
[8] CZECHOWSKI L., 1994, Tektonika płyt i konwekcja w płaszczu Ziemi. Wydawnictwo Naukowe PWN, Warszawa.
[9] DADLEZ R., JAROSZEWSKI W., 1994, Tektonika. Wydawnictwo Naukowe PWN, Warszawa.
[10] DYSON F., 1993, Początki życia. Państwowy Instytut Wydawniczy, Warszawa.
[11] JAROSZEWSKI W., MARKS L., RADOMSKI A., 1985, Słownik geologii dynamicznej. Wydawnictwa Geologiczne, Warszawa.
[12] LEWIN R., 2002, Wprowadzenie do ewolucji człowieka. Prószyński i S-ka, Warszawa.
[13] LOVELOCK J., 2003, Gaja. Nowe spojrzenie na życie na Ziemi. Prószyński i S-ka, Warszawa.
[14] MACDOUGALL J. D., 1998, Krótka historia Ziemi. Prószyński i S-ka, Warszawa.

[15] McSWEEN H. Y., Jr., 1996, Od gwiezdnego pyłu do planet. Prószyński i S-ka, Warszawa.
[16] SCHOPF J. W., 2002, Kolebka życia. O narodzinach i najstarszych śladach życia na Ziemi. Wydawnictwo Naukowe PWN, Warszawa.
[17] SIMPSON G. G., 1999, Kopalny zapis historii życia. Prószyński i S-ka, Warszawa.
[18] STRINGER Ch., McKIE R., 1999, Afrykański exodus. Pochodzenie człowieka współczesnego. Prószyński i S-ka, Warszawa.
[19] SZARSKI H., 1990, Historia zwierząt kręgowych. Państwowe Wydawnictwo Naukowe, Warszawa.
[20] TOLLMANNOWIE A. i E., 1999, A jednak był potop. Od mitu do historycznej prawdy. Prószyński i S-ka, Warszawa.
[21] WARD P., 1995, Kres ewolucji. Dinozaury, wielkie wymierania i bioróżnorodność. Prószyński i S-ka, Warszawa.
[22] WARD P. D., 2002, Tajemnica epoki lodowcowej. Dlaczego wymarły mamuty i inne wielkie ssaki przeszłości. Prószyński i S-ka, Warszawa.
[23] WEINER J., 1999, Życie i ewolucja biosfery. Wydawnictwo Naukowe PWN, Warszawa.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Fundamentals of Geology
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W14, K_W11	C1, C2	Lec 1	N1, N3
PEK_W02	K_W14, K_W11	C1	Lec 1, Lec 6	N1, N3
PEK_W03	K_W14, K_W11	C1, C2	Lec 2-Lec 5	N1, N3
PEK_W04	K_W14, K_W11	C2	Lec 7-Lec 8	N1-N3
PEK_U01	K_U12	C3	Proj 1-Proj 5	N2, N3
PEK_U02	K_U12	C3	Proj 1	N2, N3
PEK_U03	K_U12	C2, C3	Lec 7-Lec 8, Proj 1-Proj 5	N1-N3
PEK_K01	K_K01-K_K07	C1, C2	Lec 1-Lec 6	N1-N3
PEK_K02	K_K01-K_K07	C2	Lec 7-Lec 8, Proj 1	N1-N3
PEK_K03	K_K01-K_K07	C2, C3	Proj 1-Proj 5	N1-N3

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Analiza Matematyczna II
Name in English: Mathematical Analysis II
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: optional / university-wide
Subject code: MAP1144
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	45	30			
Number of hours of total student workload (CNPS)	150	90			
Form of crediting	Examination	crediting with grade			
For group of courses mark (X) final course					
Number of ECTS points	5	3			
including number of ECTS points for practical (P) classes	0	3			
including number of ECTS points for direct teacher-student contact (BK) classes	3	2			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student is able to examine convergence of sequences and calculate limits of functions of one variable.
2. The student is familiar with calculus of functions of one variable and its applications.
3. The student is familiar with and knows how to use the indefinite integral of a function of one variable.
4. The student is familiar with the basic concepts of linear algebra.

SUBJECT OBJECTIVES

C1. Understanding of the structure and properties of the definite integral. Acquiring the ability to use the definite integral (including improper) for engineering calculations.
C2. Understanding of the basic concepts of differential and integral calculus of multivariable functions.
C3. Obtaining basic knowledge of numerical series and power series.
C4. Using newly acquired knowledge to create and analyse mathematical models to solve theoretical and practical problems in various fields of science and technology.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student knows the structure of the definite integral and its properties, has the concept of improper integrals

PEK_W02 The student knows the basics of differential and integral calculus of multivariable functions

PEK_W03 The student has a basic knowledge of the theory of numerical series and power series, knows the convergence criteria

relating to skills:

PEK_U01 The student is able to calculate and interpret the definite integral, and solve engineering problems with the use of integrals

PEK_U02 Student is able to calculate the partial derivatives, directional and gradient of multivariable functions and interpret the size, and solve the optimization problem for multivariable functions

PEK_U03 The student is able to develop functions in a power series, knows how to use obtained data to develop a rough calculations

PEK_U04 The student is able to calculate and interpret the double integral, and solve engineering problems with the use of double integral

relating to social competences:

PEK_K01 The student is able to find and use the recommended literature course and independently acquire knowledge

PEK_K02 The student understands the need for systematic and autonomous work to meet the course requirements

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Definite integral. Definition. Geometric and physical interpretation. Theorem Newton - Leibniz. Integration by parts and by substitution.	2
Lec 2	Properties of definite integral. The average value of the range of functions. Applications integrals in geometry (box, arc length, the volume of a solid of revolution, the surface area of the side of the solid of revolution) and engineering.	3
Lec 3	Improper integral of the first kind. Definition. The comparative criterion and quotient convergence. Examples of the use of improper integrals of the first kind in geometry and technology.	2
Lec 4	Functions of two and three variables. Stock on the plane and in space. Examples of graphs of functions of two variables. The surfaces of the second degree.	2
Lec 5	The partial derivatives of the first order. Definition. Geometric interpretation. Higher order partial derivatives. Schwarz's theorem.	2
Lec 6	The plane tangent to the graph of a function of two variables. Differentials and their applications. Partial derivatives of composite functions. Directional derivatives. Gradient function.	3
Lec 7	Local extremes of functions of two variables. Sufficient conditions for the existence of extreme. Extremes conditional function of two variables. The smallest and the largest value of the function on the set. Examples of extreme problems in geometry and technology.	3
Lec 8	Double integrals. The definition of the double integral. Geometric and physical interpretation. Calculation of double integrals normal regions.	2
Lec 9	Properties of double integrals. Double integral in polar coordinates.	2
Lec 10	Applications of double integrals in geometry (field area, the volume of the solid, field lobe) and technology.	2

Lec 11	Series of numbers. The definition of numerical series. Sub-total, the rest of the series. A geometric series. A prerequisite for convergence of the series. The criteria for convergence of series of words nonnegative (integral, comparative quotient). Cauchy's and d'Alembert criteria. Leibniz criterion. Approximate total ranks.	4
Lec 12	Power series. The definition of a power series. The radius and interval of convergence. Cauchy and Hadamard theorem. Taylor and Maclaurin power series. The development of features in a power series. Differentiation and integration of power series. Approximate calculation of integrals.	4
Lec 13	Topics to choose from 14 - 18	15
Lec 14	Given algebraic structures - groups, rings, fields.	6
Lec 15	Implicit functions.	3
Lec 16	Integral triple. Definition. Physical interpretation. Replacement of the iterated triple integrals. Change of variables in cylindrical and spherical coordinates. (for L2, L7, L12)	5
Lec 17	Elements of vector analysis. An oriented curvilinear integral. Oriented surface integral. Nabla and Laplacian operators. Rotation and divergence. Stokes and Gauss-Ostrogradskiy's theorem (5-6 hrs.). (For L12)	6
Lec 18	Sequences and series of functions. The convergence: point and uniform. (for L9)	2
Lec 19	Fourier series (for L3, L9, L12).	2
Lec 20	Ordinary differential equations. The differential equation with separated variables. Linear differential equation first row. Linear differential equation of second raw with constant coefficients. (for L2, L3, L7, L9 and L12)	6
Lec 21	Introduction to probability: Probability space, probability, random variable, distribution function and density distribution, the basic schedule of the continuous random variables. (for L9)	5
	Total hours	**45**

Form of classes - class		**Number of hours**
Cl 1	Calculation of integrals using methods obtained during the lecture. Study of convergence of improper integrals. The use of the definite integral for engineering calculations.	4
Cl 2	Calculation of partial derivatives. Determination of the tangent plane. Estimating with the use of differential. Calculation of the directional derivative and the gradient.	2
Cl 3	Calculation of partial derivatives. Determination of the tangent plane. Estimating with the use of differential. Calculation of the directional derivative and the gradient.	2
Cl 4	Determination of the extremes of functions of two and three variables. Determination of conditional extremes.	3
Cl 5	Calculation of double integrals normal regions. Reversal iterated integrals. The calculation of integrals of replacing variables in polar coordinates. The use of double integral for engineering calculations.	3
Cl 6	Calculating the sum of numerical series. The study of conditional and unconditional convergence using methods obtained during the lecture. Study of convergence of power series. Determination of the Maclaurin series. The approximate calculation of the series and integrals.	6
Cl 7	In connection with L16: Calculation of triple integrals - change into iterated integral. The calculation of integrals of the change of variables in spherical coordinates. The use of for triple integral calculation in geometry and technique.	2

Cl 8	In connection with L17 Calculation of curvilinear and surface integrals. Determination of operators – nablan and laplacian. Calculation of rotation and divergence.	4
Cl 9	In connection with L17 and L18: Designation of convergence of functional series. The development of functions and Fourier series and expansions of the obtained convergence	2
Cl 10	In connection with L20: Determination of the general integrals and solving initial value problems of ordinary differential equations with separated variables, first row and second raw with constant coefficients.	4
Cl 11	In connection with L14: Verifying properties of algebraic structures. The study whether the structure is a group ring body.	4
Cl 12	In connection with L21: The calculation of the probabilities of events, determining distribution and density distributions of random variables	3
Cl 13	The final test	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Lecture N2. Exercises N3. Consultations N4. Homework assignments

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01-PEK_U04 PEK_K01-PEK_K02	Oral and written form of crediting the student
F2	PEK_W01-PEK_W3 PEK_K02	Final exam

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] W. Żakowski, W. Kołodziej, Matematyka, Cz. II, WNT, Warszawa 2003.
[2] W. Żakowski, W. Leksiński, Matematyka, Cz. IV, WNT, Warszawa 2002.
[3] M. Gewert, Z. Skoczylas, Analiza matematyczna 2. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2012.
[4] M. Gewert, Z. Skoczylas, Równania różniczkowe zwyczajne. Teoria, przykłady, zadania, Oficyna Wydawnicza GiS, Wrocław 2011.
[5] W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, Cz. I-II, PWN, Warszawa 2006.

SECONDARY LITERATURE:

[1] G. M. Fichtenholz, Rachunek różniczkowy i całkowy, T. I-II, PWN, Warszawa 2007.
[2] M. Gewert, Z. Skoczylas, Analiza matematyczna 2, Definicje, twierdzenia, wzory. Oficyna Wydawnicza GiS, Wrocław 2012.
[3] F. Leja, Rachunek różniczkowy i całkowy ze wstępem do równań różniczkowych, PWN, Warszawa 2008.

[4] R. Leitner, Zarys matematyki wyższej dla studiów technicznych, Cz. 1-2, WNT, Warszawa 2006.
[5] H. i J. Musielakowie, Analiza matematyczna, T. I, Cz. 1-2 oraz T. II, Cz. 1, Wydawnictwo Naukowe UAM, Poznań 1993 oraz 2000.
[6] J. Pietraszko, Matematyka. Teoria, przykłady, zadania, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2000.
[7] W. Stankiewicz, Zadania z matematyki dla wyższych uczelni technicznych, Cz. B, PWN, Warszawa 2003.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

dr inż. Jolanta Sulkowska, jolanta.sulkowska@pwr.wroc.pl
Komisja programowa Instytutu Matematyki i Informatyki

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mathematical Analysis II MAP1144
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W01	C1, C4	Lec 1-Lec 3	N1, N3, N4
PEK_W02	K_W01	C2, C4	Lec 4-Lec 10, Lec 15, Lec 16, Lec 18	N1, N3, N4
PEK_W03	K_W01	C3, C4	Lec 11, Lec 12, Lec 17	N1, N3, N4
PEK_U01	K_U02	C1, C4	Cl 1	N2, N3, N4
PEK_U02	K_U02	C2, C4	Cl 2-Cl 4	N2, N3, N4
PEK_U03	K_U02	C3, C4	Cl 6, Cl 8	N2, N3, N4
PEK_U04	K_U02	C2, C4	Cl 5, Cl 7	
PEK_K01-PEK_K02	K_K07, K_K01	C1-C4	Lec 1-Lec 14 Cl 1-Cl 8	N1-N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Fizyka I
Name in English: Physics I
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: optional / university-wide
Subject code: FZP1058
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	30	30			
Number of hours of total student workload (CNPS)	120	60			
Form of crediting	Examination	crediting with grade			
For a group of courses mark (X) for the final course					
Number of ECTS points	4	2			
including number of ECTS points for practical (P) classes	0	2			
including number of ECTS points for direct teacher-student contact (BK) classes	4	2			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

Competence in the field of principles of mathematics and physics supported by the positive secondary school grades

SUBJECT OBJECTIVES

C1 Acquisition of basic knowledge of the following classical physics sections:
C1.1. Classical mechanics.
C1.2. Oscillatory and wave motion.
C1.3. Thermodynamics.
C2. Acquisition of qualitative understanding skills, skills of interpretation and the quantitative analysis - based on the laws of physics – the selected phenomena and physical processes in the field:
C2.1. Classical mechanics.
C2.2. Oscillatory motion and wave motion.
C2.3. Thermodynamics.
C3. Acquisition and consolidation of social skills including emotional intelligence involving the ability to work in a group of students with the aim of effective problem solving. Responsibility, honesty and reliability in the proceedings; campus and society obeying rules

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – is aware of the importance of discoveries and achievements of physics for engineering sciences and the progress of civilisation

PEK_W02 – possesses basic knowledge of dimensional analysis and principles of estimating values of physical quantities

PEK_W03 – possesses fundamental knowledge of vector calculus in the rectangular coordinate system

PEK_W04 - possesses knowledge in the field of kinematics description of rectilinear and curvilinear motion (views: vertical, horizontal, diagonal, circular motion; angular kinematic components with the linear kinematic quantities)

PEK_W05 - possesses knowledge of fundamentals and applications of dynamics, and the detailed knowledge of: a) the reference systems (inertial and non-inertial), b) comprehension of the importance of the dynamics of physical quantities mass and force c) types of basic interactions and types of forces observed in nature (conservative, non-conservative, central, friction, inertial), d) Newton's laws of dynamics and the extent of their applicability, e) the correct formulation of the equations of motion, f) knowledge and comprehension of the physical meaning of the Galilean transformation, g) the dynamics of particles/body in a curvilinear motion in the inertial reference system, h) the dynamics of particles/bodies in non-inertial frames of reference, and) the physical meaning of inertial forces, including their symptoms and consequences

PEK_W06 - possesses knowledge of conservative and non-conservative forces and those observed in nature and everyday life, possess knowledge of the concepts: a) conservative force, b) the force field including the field of conservative force, c) labour and mechanical force, d) the kinetic and potential energy; knows the content of the work and kinetic energy theorem, and possesses knowledge that allows to explain the relationship of conservative forces and potential energy, following the mathematical reasoning, knows the principle of conservation of mechanical energy particles/bodies in the field of conservative force

PEK_W07 – possesses knowledge and comprehends the concepts of: a) impulse b) mechanical momentum of a particle and a system of material points, knows the formulation of the second law of dynamics with the use of the concept of momentum and has knowledge of: a) the principle of momentum conservation of a particle and the system of material points and conditions of its applicability b) elastic and inelastic collisions, knows and understands the concept of a system of material points and the centre of mass, and possesses knowledge of dynamics of the centre of mass of the material points

PEK_W08 – possesses knowledge of the terms: a) the torque as related to the point/rotation axis, b) the momentum of a particle, the system of material points and a rigid body in reference to the point/ rotation axis, c) the moment of inertia: of a particle, the system of material points and a rigid body with respect to the axis of rotation; knows the formula of the second law of dynamics for the rotation of a rigid body around the fixed axis of rotation, and possesses knowledge of the rotational kinetic energy, impulse and power in the rotational motion; knows the correct qualitative and quantitative description of the phenomenon of the precession and reciprocating-rigid body motion, and possesses knowledge of : a) the principles of conservation of momentum of a particle, distribution of particles and rigid bodies with respect to a fixed rotation axis, b) the applicability conditions of the principle of the momentum conservation

PEK_W09 – possesses knowledge of the vector form of the law of universal gravitation; possesses knowledge of terms: a) the strength and potential of the gravitational field, b) gravitational potential energy of the body and the distribution of bodies, and possesses knowledge of: a) the principle of conservation of mechanical energy of the body/bodies in the gravitational field, b) the relationship of the potential, the field strength and the gravitational force with the gravitational potential energy, b) Kepler's laws and the justification of the laws based on the universal gravitation and the principle of conservation of momentum on the planet; knows the concepts of the I, II and III space velocity

PEK_W10 - possesses knowledge of fundamentals of statics of solids and the elastic properties of liquids and solids

PEK_W11 - possesses knowledge of fundamentals of hydrostatics and hydrodynamics of fluids and possesses a detailed knowledge of: hydrostatic pressure, Pascal's laws and Archimedes' principles, surface tension and effects it generates, types of ideal and non-ideal fluid flow, continuity and Bernoulli's equations, viscosity and effects it generates, the dynamics of body motion in a viscous medium, Stokes law

PEK_W12 - possesses knowledge of the fundamentals of kinematics and dynamics and applications of the vibratory motion, and possesses the detailed knowledge of: a) simple harmonic motion of oscillating pendulums: mathematical, physical, torsion and particles subjected to a potential force and performing small oscillations around the point at which the potential energy takes the the minimum value, b) damped oscillatory motion, c) forced vibration sinusoidal external force, and possesses knowledge of the physics of the mechanical resonance

PEK_W13 - possesses knowledge of the basics of wave motion and its applications, and the detailed knowledge of: a) generating and basic properties of mechanical waves, b) types of waves, c) the monochromatic plane wave equation, d) basic physical quantities of the wave motion (length and frequency of a wave, the vector wave and circular frequency) and the units of their measurement, e) the velocity of wave motion (phase, particle centre, group), f) dependencies of the velocity of longitudinal and transverse waves on the elastic properties of the centre (modules: Young's modulus, shear and bulk modulus) , g) transport of the mechanical energy by means of waves (energy and the average power, the intensity, the average energy density of the wave in the medium) h) dependencies of the intensity of a wave on the distance from the source

PEK_W14 - possesses the detailed knowledge regarding: a) generating, types and properties of acoustic waves (velocity of sound in the air, the volume/intensity of the wave, energy transport), b) the law of refraction and reflection, c) pressure and force values exerted by a wave incident on a surface, d) the Doppler effect, e) ultrasound applications, f) wave interference (the superposition principle), g) standing waves and sound sources, h) beats, i) the selected applications of sound and ultrasound

PEK_W15 - possesses knowledge regarding the zero and the first law of thermodynamics; knows the basic concepts (macroscopic system, equilibrium, thermodynamic parameters, the functions of the state, thermodynamic processes, ideal gas, the ideal and actual gas equation) and possesses detailed knowledge of: a) the temperature, thermodynamic temperature scale and the units of measurement used by a variety of scales, b) the definition of the kelvin units, c) the concept of the internal energy of a system, d) the value of basic work on ideal gas, e) the work conducted on/by and exchanged with the environment heat in the thermodynamic processes of ideal gas

PEK_W16 - possesses fundamental knowledge of the second and third laws of thermodynamics, and possesses detailed knowledge of: a) reversible and irreversible processes, b) the entropy of a macroscopic system, the content of the second law and the elementary value of the entropy distribution change, c) methods for the quantitative determination of the ideal gas entropy change d) thermodynamics of machine/heat engines and their efficiency in simple and reverse cycles, e) the third law of thermodynamics

PEK_W17 - possesses knowledge of the fundamentals of statistical thermodynamics and the detailed knowledge of: a) objectives and mathematical formalism (probability equations and mathematical statistics) statistical thermodynamics, b) the macroscopic thermodynamic parameter as a random variable, c) micro and macro-state, and statistical weight, d) statistical interpretation of the Boltzmann-Planck entropy e) Boltzmann distribution function (altimeter formula), f) the Maxwell distribution function of ideal gas molecules velocity, g) the most probable square velocity and the average velocity of the ideal gas molecules, h) the relationship between the average energy of the particles and the number of degrees of freedom i) microscopic interpretation of temperature and pressure of ideal gas, j) the theorem of heat equipartition

relating to skills:

PEK_U01 - is able to: a) identify and justify discoveries and achievements in physics that have contributed to the progress of civilisation, b) explain the basis of the physical devices for the common use

PEK_U02 - is able to: a) apply the basic principles of the dimensional analysis and qualitative analysis, b) estimate the values of simple and complex physical quantities

PEK_U03 - is able to: a) distinguish between the scalar and vector quantities, b) present the largest vector in the Cartesian coordinate system, c) operate the known elements of vector calculus, in particular knows how to set: vectors, angles between the vectors, products: scalar, vector, mixed, and triple

PEK_U04 – is able to set – with the application of the Galilean transformation - the values of kinematic quantities of the moving, relative to each other inertial frames of reference

PEK_U05 - is able to identify and determine the kinematic quantities (vectors: position, velocity, overall acceleration, the tangential acceleration, normal acceleration) in the rotational and advance motion and quantitative relationships between the linear and angular kinematic quantities

PEK_U06 - is able to identify correctly forces acting on the given particle/body and in the inertial and non-inertial system and assign the resultant force

PEK_U07 – is able to apply the principles of dynamics to describe the movement of a body in the inertial frame of reference, in particular, is able to: a) properly formulate a vector equation of motion and its scalar figure in the selected coordinate system, b) solve the scalar equations of motion, taking into account the initial conditions

PEK_U08 – is able to apply the principles of dynamics to describe the movement of a body in the non-inertial frame of reference, in particular possesses knowledge to: a) identify the forces acting on the given particle/body and formulate the equation of motion in the non-inertial system properly, b) explain the observed effects related to the rotation of the Earth

PEK_U09 – is able to use use properly the concept of work and energy in order to describe physical phenomena, in particular is able to apply the principle of energy conservation to solve problems of kinematics and dynamics of motion of the particle/the given body/bodies; is able to determine the value of: a) mechanical work and constant and alternating force of kinetic and potential energy, b) changes in the kinetic energy of the particle/body with the use of work theorem and kinetic energy, c) the conservative force based on the analytical form of the potential energy

PEK_U10 – is able to apply the laws of motion to describe material points, in particular, in order to determine the values: of the impulse acting on the body, the momentum of the particle/material system and the position of the centre of mass of a system of points and quantitatively analyse the motion of the centre of mass of the material points under the influence of external resultant forces

PEK_U11 – is able to apply properly the principle of conservation of momentum for quantitative and qualitative analysis of the dynamic properties of material points distribution, in particular for the quantitative analysis of elastic and inelastic collisions

PEK_U12 - is able to apply the concepts of torque and momentum to analyse simple problems of kinematics and dynamics of rigid body rotation around a fixed axis, in particular, knows how to set the value of: a) the moment of the force related to the point /axis, b) the momentum of the particle, the distribution of material particles and a rigid body as related to the point /axis of rotation, c) formulate and solve the equation of rotating motion of a rigid body that rotates around a fixed axis d) qualitatively characterise the phenomenon of precession, e) formulate and solve the equation of motion of the reciprocating-rotating rigid bodies

PEK_U13 – is able to apply the concept of conservation of momentum to solve the selected physical and technical problems

PEK_U14 – is able to apply the concept of work and kinetic energy of a rigid body to solve problems related to the rotation of a rigid body, in particular, is able to determine the value of a) the rotational kinetic energy, work and force during rotation, b) changes in the kinetic energy of rotation of the particle/body using the theorem of work and kinetic energy of rotation

PEK_U15 - is able to: a) justify the conservative nature of the gravitational field, b) explain the physical meaning of Kepler's laws, c) apply correctly the principle of conservation of mechanical energy of the body / bodies in the gravitational field, knows how to set values: a) the intensity and potential of the gravitational field, b) gravitational potential energy of the body and of the body distribution, c) I, II and III space velocity

PEK_U16 – is able to analyse and solve simple tasks regarding hydrostatics and hydrodynamics of fluids in particular, is able to determine the values of the surface tension, velocity and efficiency of fluid flow: is able to solve simple problems related to the dynamics of bodies in fluids, including resistive force

PEK_U17 – is able to describe properly the properties of the periodic motion, in particular, formulate and solve the differential equations of vibrational motion for simple cases (pendulum: mathematical, physical, torsion and particles performing small oscillations around the position of equilibrium) is able to analyse the kinematic and dynamic properties of harmonic motion for braking forces and periodic, excited forces; is able to determine the periods of vibration and qualitatively and quantitatively characterise mechanical resonance

PEK_U18 – is able to: a) explain the relationship of the wave motion of the elastic properties of the centre, b) quantitatively characterise the mechanical energy transport thorough the travelling waves, c) describe quantitatively and correctly the phenomenon of diffraction, interference, polarisation, and the pressure exerted by the wave incident on the surface

PEK_U19 – is able to explain, on the basis of knowledge of the standing waves, the physical principles of generating acoustic waves by the sound sources, is able to explain and determine: a) the frequency of the received waves depending on the motion source and the receiver (the Doppler effect), b) the frequency of the beat

PEK_U20 – is able to apply the first law of thermodynamics for the quantitative and qualitative description of an ideal gas changes and determine the values: of that heat exchanged with the environment, the work on the gas and the ideal gas, the internal energy changes in these alternations; is able to graphically represent the transformation of the ideal gas, can justify/derive Mayer formula and put the adiabatic equation

PEK_U21 – is able to set the values with the use of the first and second laws of thermodynamics: a) the entropy change of a thermodynamic system, in particular, the ideal gas subjected to a specific thermodynamic transition, b) the efficiency of machines / heat engines working in simple or reverse cycle, c) describe quantitatively thermal conductivity

PEK_U22 – is able to: a) calculate the dependence of pressure on height using the Boltzmann distribution function, b) provide the statistical interpretation of entropy, c) derive, with the application of the Maxwell distribution function, value dependencies of the most probable velocity and the average square velocity of gas molecules on the ideal temperature, d) apply the principle of equipartition of thermal energy, e) determine the microscopic interpretation of temperature and pressure of the ideal gas.

SUBJECT EDUCATIONAL EFFECTS of the person who completed the course

I. The scope of knowledge: possesses fundamental knowledge of classical mechanics, wave motion and phenomological thermodynamics

PEK_W01 – is aware of the importance of discoveries and achievements of physics for engineering sciences and the progress of civilisation

PEK_W02 – possesses basic knowledge of dimensional analysis and principles of estimating values of physical quantities

PEK_W03 – possesses fundamental knowledge of vector calculus in the rectangular coordinate system

PEK_W04 - possesses knowledge in the field of kinematics description of rectilinear and curvilinear motion (views: vertical, horizontal, diagonal, circular motion; angular kinematic components with the linear kinematic quantities)

PEK_W05 - possesses knowledge of fundamentals and applications of dynamics, and the detailed knowledge of: a) the reference systems (inertial and non-inertial), b) comprehension of the importance of the dynamics of physical quantities mass and force c) types of basic interactions and types of forces observed in nature (conservative, non-conservative, central, friction, inertial), d) Newton's laws of dynamics and the extent of their applicability, e) the correct formulation of the equations of motion, f) knowledge and comprehension of the physical meaning of the Galilean transformation, g) the dynamics of particles/body in a curvilinear motion in the inertial reference system, h) the dynamics of particles/bodies in non-inertial frames of reference, and) the physical meaning of inertial forces, including their symptoms

and consequences

PEK_W06 - possesses knowledge of conservative and non-conservative forces and those observed in nature and everyday life, possess knowledge of the concepts: a) conservative force, b) the force field including the field of conservative force, c) labour and mechanical force, d) the kinetic and potential energy; knows the content of the work and kinetic energy theorem, and possesses knowledge that allows to explain the relationship of conservative forces and potential energy, following the mathematical reasoning, knows the principle of conservation of mechanical energy particles/bodies in the field of conservative force

PEK_W07 – possesses knowledge and comprehends the concepts of: a) impulse b) mechanical momentum of a particle and a system of material points, knows the formulation of the second law of dynamics with the use of the concept of momentum and has knowledge of: a) the principle of momentum conservation of a particle and the system of material points and conditions of its applicability b) elastic and inelastic collisions, knows and understands the concept of a system of material points and the centre of mass, and possesses knowledge of dynamics of the centre of mass of the material points

PEK_W08 – possesses knowledge of the terms: a) the torque as related to the point/rotation axis, b) the momentum of a particle, the system of material points and a rigid body in reference to the point/ rotation axis, c) the moment of inertia: of a particle, the system of material points and a rigid body with respect to the axis of rotation; knows the formula of the second law of dynamics for the rotation of a rigid body around the fixed axis of rotation, and possesses knowledge of the rotational kinetic energy, impulse and power in the rotational motion; knows the correct qualitative and quantitative description of the phenomenon of the precession and reciprocating-rigid body motion, and possesses knowledge of : a) the principles of conservation of momentum of a particle, distribution of particles and rigid bodies with respect to a fixed rotation axis, b) the applicability conditions of the principle of the momentum conservation

PEK_W09 – possesses knowledge of the vector form of the law of universal gravitation; possesses knowledge of terms: a) the strength and potential of the gravitational field, b) gravitational potential energy of the body and the distribution of bodies, and possesses knowledge of: a) the principle of conservation of mechanical energy of the body/bodies in the gravitational field, b) the relationship of the potential, the field strength and the gravitational force with the gravitational potential energy, b) Kepler's laws and the justification of the laws based on the universal gravitation and the principle of conservation of momentum on the planet; knows the concepts of the I, II and III space velocity

PEK_W10 - possesses knowledge of fundamentals of statics of solids and the elastic properties of liquids and solids

PEK_W11 - possesses knowledge of fundamentals of hydrostatics and hydrodynamics of fluids and possesses a detailed knowledge of: hydrostatic pressure, Pascal's laws and Archimedes' principles, surface tension and effects it generates, types of ideal and non-ideal fluid flow, continuity and Bernoulli's equations, viscosity and effects it generates, the dynamics of body motion in a viscous medium, Stokes law

PEK_W12 - possesses knowledge of the fundamentals of kinematics and dynamics and applications of the vibratory motion, and possesses the detailed knowledge of: a) simple harmonic motion of oscillating pendulums: mathematical, physical, torsion and particles subjected to a potential force and performing small oscillations around the point at which the potential energy takes the minimum value, b) damped oscillatory motion, c) forced vibration sinusoidal external force, and possesses knowledge of the physics of the mechanical resonance

PEK_W13 - possesses knowledge of the basics of wave motion and its applications, and the detailed knowledge of: a) generating and basic properties of mechanical waves, b) types of waves, c) the monochromatic plane wave equation, d) basic physical quantities of the wave motion (length and frequency of a wave, the vector wave and circular frequency) and the units of their measurement, e) the velocity of wave motion (phase, particle centre, group), f) dependencies of the velocity of longitudinal and transverse waves on the elastic properties of the centre (modules: Young's modulus, shear and bulk modulus) , g) transport of the mechanical energy by means of waves (energy and the average power, the intensity, the average energy density of

the wave in the medium) h) dependencies of the intensity of a wave on the distance from the source

PEK_W14 - possesses the detailed knowledge regarding: a) generating, types and properties of acoustic waves (velocity of sound in the air, the volume/intensity of the wave, energy transport), b) the law of refraction and reflection, c) pressure and force values exerted by a wave incident on a surface, d) the Doppler effect, e) ultrasound applications, f) wave interference (the superposition principle), g) standing waves and sound sources, h) beats, i) the selected applications of sound and ultrasound

PEK_W15 - possesses knowledge regarding the zero and the first law of thermodynamics; knows the basic concepts (macroscopic system, equilibrium, thermodynamic parameters, the functions of the state, thermodynamic processes, ideal gas, the ideal and actual gas equation) and possesses detailed knowledge of: a) the temperature, thermodynamic temperature scale and the units of measurement used by a variety of scales, b) the definition of the kelvin units, c) the concept of the internal energy of a system, d) the value of basic work on ideal gas, e) the work conducted on/by and exchanged with the environment heat in the thermodynamic processes of ideal gas

PEK_W16 - possesses fundamental knowledge of the second and third laws of thermodynamics, and possesses detailed knowledge of: a) reversible and irreversible processes, b) the entropy of a macroscopic system, the content of the second law and the elementary value of the entropy distribution change, c) methods for the quantitative determination of the ideal gas entropy change d) thermodynamics of machine/heat engines and their efficiency in simple and reverse cycles, e) the third law of thermodynamics

PEK_W17 - possesses knowledge of the fundamentals of statistical thermodynamics and the detailed knowledge of: a) objectives and mathematical formalism (probability equations and mathematical statistics) statistical thermodynamics, b) the macroscopic thermodynamic parameter as a random variable, c) micro and macro-state, and statistical weight, d) statistical interpretation of the Boltzmann-Planck entropy e) Boltzmann distribution function (altimeter formula), f) the Maxwell distribution function of ideal gas molecules velocity, g) the most probable square velocity and the average velocity of the ideal gas molecules, h) the relationship between the average energy of the particles and the number of degrees of freedom i) microscopic interpretation of temperature and pressure of ideal gas, j) the theorem of heat equipartition

II. The scope of knowledge: is able to apply correctly and effectively the principles and laws of physics for the quantitative and qualitative analysis of the selected physical, engineering problems

PEK_U01 - is able to: a) identify and justify discoveries and achievements in physics that have contributed to the progress of civilisation, b) explain the basis of the physical devices for the common use

PEK_U02 - is able to: a) apply the basic principles of the dimensional analysis and qualitative analysis, b) estimate the values of simple and complex physical quantities

PEK_U03 - is able to: a) distinguish between the scalar and vector quantities, b) present the largest vector in the Cartesian coordinate system, c) operate the known elements of vector calculus, in particular knows how to set: vectors, angles between the vectors, products: scalar, vector, mixed, and triple

PEK_U04 – is able to set – with the application of the Galilean transformation - the values of kinematic quantities of the moving, relative to each other inertial frames of reference

PEK_U05 - is able to identify and determine the kinematic quantities (vectors: position, velocity, overall acceleration, the tangential acceleration, normal acceleration) in the rotational and advance motion and quantitative relationships between the linear and angular kinematic quantities

PEK_U06 - is able to identify correctly forces acting on the given particle/body and in the inertial and non-inertial system and assign the resultant force

PEK_U07 – is able to apply the principles of dynamics to describe the movement of a body in the inertial frame of reference, in particular, is able to: a) properly formulate a vector equation of motion and its scalar figure in the selected coordinate system, b) solve the scalar equations of

motion, taking into account the initial conditions

PEK_U08 – is able to apply the principles of dynamics to describe the movement of a body in the non-inertial frame of reference, in particular possesses knowledge to: a) identify the forces acting on the given particle/body and formulate the equation of motion in the non-inertial system properly, b) explain the observed effects related to the rotation of the Earth

PEK_U09 – is able to use properly the concept of work and energy in order to describe physical phenomena, in particular is able to apply the principle of energy conservation to solve problems of kinematics and dynamics of motion of the particle/the given body/bodies; is able to determine the value of: a) mechanical work and constant and alternating force of kinetic and potential energy, b) changes in the kinetic energy of the particle/body with the use of work theorem and kinetic energy, c) the conservative force based on the analytical form of the potential energy

PEK_U10 – is able to apply the laws of motion to describe material points, in particular, in order to determine the values: of the impulse acting on the body, the momentum of the particle/material system and the position of the centre of mass of a system of points and quantitatively analyse the motion of the centre of mass of the material points under the influence of external resultant forces

PEK_U11 – is able to apply properly the principle of conservation of momentum for quantitative and qualitative analysis of the dynamic properties of material points distribution, in particular for the quantitative analysis of elastic and inelastic collisions

PEK_U12 - is able to apply the concepts of torque and momentum to analyse simple problems of kinematics and dynamics of rigid body rotation around a fixed axis, in particular, knows how to set the value of: a) the moment of the force related to the point /axis, b) the momentum of the particle, the distribution of material particles and a rigid body as related to the point /axis of rotation, c) formulate and solve the equation of rotating motion of a rigid body that rotates around a fixed axis d) qualitatively characterise the phenomenon of precession, e) formulate and solve the equation of motion of the reciprocating-rotating rigid bodies

PEK_U13 – is able to apply the concept of conservation of momentum to solve the selected physical and technical problems

PEK_U14 – is able to apply the concept of work and kinetic energy of a rigid body to solve problems related to the rotation of a rigid body, in particular, is able to determine the value of a) the rotational kinetic energy, work and force during rotation, b) changes in the kinetic energy of rotation of the particle/body using the theorem of work and kinetic energy of rotation

PEK_U15 - is able to: a) justify the conservative nature of the gravitational field, b) explain the physical meaning of Kepler's laws, c) apply correctly the principle of conservation of mechanical energy of the body / bodies in the gravitational field, knows how to set values: a) the intensity and potential of the gravitational field, b) gravitational potential energy of the body and of the body distribution, c) I, II and III space velocity

PEK_U16 – is able to analyse and solve simple tasks regarding hydrostatics and hydrodynamics of fluids in particular, is able to determine the values of the surface tension, velocity and efficiency of fluid flow: is able to solve simple problems related to the dynamics of bodies in fluids, including resistive force

PEK_U17 – is able to describe properly the properties of the periodic motion, in particular, formulate and solve the differential equations of vibrational motion for simple cases (pendulum: mathematical, physical, torsion and particles performing small oscillations around the position of equilibrium) is able to analyse the kinematic and dynamic properties of harmonic motion for braking forces and periodic, excited forces; is able to determine the periods of vibration and qualitatively and quantitatively characterise mechanical resonance

PEK_U18 – is able to: a) explain the relationship of the wave motion of the elastic properties of the centre, b) quantitatively characterise the mechanical energy transport thorough the travelling waves, c) describe quantitatively and correctly the phenomenon of diffraction, interference, polarisation, and the pressure exerted by the wave incident on the surface

PEK_U19 – is able to explain, on the basis of knowledge of the standing waves, the physical principles of generating acoustic waves by the sound sources, is able to explain and determine: a) the frequency of the received waves depending on the motion source and the receiver (the

Doppler effect), b) the frequency of the beat

PEK_U20 – is able to apply the first law of thermodynamics for the quantitative and qualitative description of an ideal gas changes and determine the values: of that heat exchanged with the environment, the work on the gas and the ideal gas, the internal energy changes in these alternations; is able to graphically represent the transformation of the ideal gas, can justify/derive Mayer formula and put the adiabatic equation

PEK_U21 – is able to set the values with the use of the first and second laws of thermodynamics: a) the entropy change of a thermodynamic system, in particular, the ideal gas subjected to a specific thermodynamic transition, b) the efficiency of machines / heat engines working in simple or reverse cycle, c) describe quantitatively thermal conductivity

PEK_U22 – is able to: a) calculate the dependence of pressure on height using the Boltzmann distribution function, b) provide the statistical interpretation of entropy, c) derive, with the application of the Maxwell distribution function, value dependencies of the most probable velocity and the average square velocity of gas molecules on the ideal temperature, d) apply the principle of equipartition of thermal energy, e) determine the microscopic interpretation of temperature and pressure of the ideal gas.

relating to social competences: Acquisition and consolidation of competencies in the following areas:

PEK_K01 - search for information and its critical analysis,

PEK_K02 - team cooperation assigned to a group on improving the methods for the strategy selection for the optimal problems solving solutions,

PEK_K03 – comprehension of the need for self-study, including the ability to improve concentration and focus on the important issues and development of the ability to apply knowledge and skills independently,

PEK_K04 – development of self-esteem and self-control capacity and responsibility for the results of the taken actions,

PEK_K05 - compliance with the customs and rules of the academic environment,

PEK_K06 - independent and creative thinking,

PEK_K07 – comprehension of the impact of discoveries and achievements of physics on technical progress, society and the environment be means of possessing knowledge of and curiosity relating to scientific and high-tech achievements

PEK_K08 - an objective evaluation of arguments, rational clarification and justification of one's own point of view, be means of applying the knowledge of physics.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Organizational matters. The methodology of physics	2
Lec 2	Kinematics. Newton 's laws	2
Lec 3,4	Work and mechanical energy. The principle of conservation of mechanical energy	4
Lec 5,6	Dynamics of material particles distribution and rigid bodies. The principles of momentum and momentum conservation	4
Lec 7	Gravity	2
Lec 8	Oscillatory motion	2
Lec 9,11	Mechanical waves	4
Lec 12	Liquids	6
Lec 13	Phenomenological thermodynamics	2
Lec 14,15	Thermodynamics with elements of classical statistical physics	2
	Total hours	**30**

Form of classes - laboratory		Number of hours
Lab 1	Organisational matters. Task solving within the range of: the dimensional analysis, estimation of physical quantities, vector and differential-integral calculus	2
Lab 2	Application of Newton's laws for solving equations of motion; setting dependencies of the basic kinematic and dynamic quantities on time values in moving and non-moving ,relative to each other inertial and non-inertial frames of reference	2
Lab 3,4	Solving the selected aspects of the dynamic of motion with the use of concepts of mechanical work, kinetic and potential energy, principle of work and energy and the principle of conservation of mechanical energy	4
Lab 5	Quantitative and qualitative task analysis based on the concept of the centre of mass, the law of conservation of momentum as applied to a system of points, elastic and inelastic collisions	2
Lab 5	Performing measurements of the selected electromagnetic quantities, preparing a report	2
Lab 6, 7	Solving kinematics and dynamics tasks of rigid body rotation around a fixed axis and the principle of conservation of momentum	4
Lab 8	The quantitative and qualitative analysis of the selected issues regarding physics of the gravitational field: a) determining the value of the gravitational force, intensity, potential, potential energy, b) the motion of bodies in a gravitational field with the application of the principles of conservation (energy, orbital momentum) and Kepler's laws	2
Lab 9, 10	The analysis and task solving in the field of dynamic range of oscillatory motion: simple, harmonic (different pendulums; particles performing minor oscillations around the position of equilibrium), damped, forced and mechanical resonances	4
Lab 11	Task solving in the field of physics of mechanical and acoustic waves. Calculating the basic values of wave motion size, energy transport by waves and wave interference	2
Lab 12	Task solving in the field of physics of acoustic waves relating to: the velocity of sound in solids and fluids, pressure and force exerted by the acoustic wave, standing waves, the Doppler effect, beats and sources of acoustic waves	2
Lab 13, 14	Task solving with the application of the principles of thermodynamics related to: a) determination of the values of that heat exchanged with the environment, the work on the gas and the ideal gas, the internal energy changes in the metabolism of the ideal gas, b) graphical representation of an ideal gas changes, c) the efficiency of thermal machines, d) determination of the ideal gas entropy transformations in the selected thermodynamic transition e) thermal conductivity.	6
	Total hours	**30**

Form of classes - seminar		Number of hours
Sem 1	Introduction, assignment of seminar topics to individual students (subject matter is comprehensive and expands the range of knowledge presented in the lecture)	1
Sem 2	Speeches of individual students (20-25-minute presentations) and discussion	14
	Total hours	**15**

TEACHING TOOLS USED
N1 Standard lecture N2 Calculation tutorials– discussion on tasks' solutions N3 Calculation tutorials – brief, 10 min. written tests N4 Consultation classes N5 Self-study - preparation for tasks N6 Self-study - self-study and exam preparation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENTS

Evaluation F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01-PEK_U22, PEK_K01-PEK_K08	Answering questions discussions, written tests, e-tests
F2	PEK_W01-PEK_W17, PEK_U01-PEK_U22, PEK_K03-PEK_K07	Oral and written exam
P = F2		

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[8] Witryna dydaktyczna Instytutu Fizyki PWr; http://www.if.pwr.wroc.pl/index.php?menu=studia zawiera duży zbiór materiałów dydaktycznych

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

dr inż. Marta Gładysiewicz-Kudrawiec, marta.gladysiewicz-kudrawiec@pwr.wroc.pl

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Physics I FZP1058
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01, PEK_W02 PEK_W03	K_W04	C1.1	Lec 1, Lec 2	N1, N5
PEK_W04, PEK_W05, PEK_W06	K_W04	C1.1	Lec 2, Lec 3	N1, N5
PEK_W07	K_W04	C1.1	Lec 4, Lec 5	N1, N5
PEK_W08	K_W04	C1.1	Lec5-Lec 8	N1, N5
PEK_W09	K_W04	C1.1	Lec 8-Lec 9	N1, N5
PEK_W10, PEK_W11	K_W04	C1.1	self-study	N6
PEK_W12, PEK_W13, PEK_W14	K_W04	C1.2	Lec 10-Lec12	N1, N5, N6
PEK_W15, PEK_W16, PEK_W17	K_W04	C1.3	Lec 13-Lec 15	N1, N5, N6
PEK_U01, PEK_U02, PEK_U03	K_U06	C2.1	Lab 1	N2, N3, N4, N5, N6
PEK_U04, PEK_U05, PEK_U06, PEK_U07, PEK_U08	K_U06	C2.1	Lab 2, Lab 3	N2, N3, N4, N5, N6
PEK_U07, PEK_U08, PEK_U09	K_U06	C2.1	Lab 4, Lab 5	N2, N3, N4, N5, N6
PEK_U10, PEK_U11	K_U06	C2.1	Lab 6	N2, N3, N4, N5, N6
PEK_U12, PEK_U13, PEK_U14	K_U06	C2.1	Lab 7, Lab 8	N2, N3, N4, N5, N6
PEK_U15	K_U06	C2.1	Lab 9	N2, N3, N4, N5, N6
PEK_U16	K_U06	C2.1	self-study	N6
PEK_U17	K_U06	C2.2	Lab 10	N2, N3, N4, N5, N6
PEK_U18	K_U06	C2.2	Lab 11	N2, N3, N4, N5, N6
PEK_U19	K_U06	C2.2	Lab 12	N2, N3, N4, N5, N6
PEK_U20, PEK_U21, PEK_U22	K_U06	C2.3	Lab 13, Lab 14, Lab 15	N2, N3, N4, N5, N6
PEK_K01-PEK_K08	K_K01-K_K07	C3	Lec 1-Lec 15 Lab 1-Lab 15	N1-N6

SEMESTER 3

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Mineralogia i Petrologia
Name in English: Mineralogy and Petrology
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GEG3104
Group of courses: YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		30		
Number of hours of total student workload (CNPS)	90		30		
Form of crediting	Examination		crediting with grade		
For group of courses mark (X) final course	X				
Number of ECTS points	3		1		
including number of ECTS points for practical (P) classes	1				
including number of ECTS points for direct teacher-student contact (BK) classes	3		0,5		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has credits in the subject Basics of Geology (group of courses).
2. The student is acquainted with basics of physics and chemistry at least at secondary school final examinations (Matura) level.

SUBJECT OBJECTIVES

C1. Acquainting students with minerals-forming and rock-forming processes, with special consideration of mineral resources forming process.
C2. Raising students awareness of the connection between geological processes and their effects i.e. formation and transformation of rocks and minerals which are becoming mineral resources.
C3. Teaching students how to recognise and describe the most important deposit-forming and rock-forming minerals as well as the most significant igneous, sedimentary and metamorphic rocks.
C4. Getting student acquainted with minerals and rocks that can be found in extra-terrestrial bodies in Solar System as well as with the occurrence of selected rocks and minerals on Polish territory.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Knows basic rock-forming and deposit-forming minerals and origins of their development.

PEK_W02 – Knows basic igneous, sedimentary and metamorphic rocks and their forming processes.

PEK_W03 – Possesses basic knowledge about the occurrence of particular types of rocks and most important deposit-forming minerals in Poland.

PEK_W04 – Possesses basic knowledge about mineralogy and petrology of extra-terrestrial bodies in Solar System.

relating to skills:

PEK_U01 – On the basis of independent defining their physical features, the student is able to recognise and describe the most important deposit-forming and rock-forming minerals.

PEK_U02 – With consideration of their structure and texture, mineral and chemical composition and their origins, the student is capable of independent recognition and description of most significant igneous, sedimentary and metamorphic rocks.

PEK_U03 – Is able to describe geological processes that have led to the development of the given/specified mineral resources.

relating to social competences:

PEK_K01 – Is able to pass on the knowledge about mineral-forming and rock forming processes and most significant minerals and rock to a twelve-year old.

PEK_K02 – Is capable of independent description of most significant deposit-forming and rock-forming minerals and of most significant rocks in all types.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Principles of crystallography.	1
Lec 2	Principles of mineralogy, including: Forming of minerals in nature. Classification of minerals Description of the selected native element minerals, sulphide/sulphide and sulphosalt/sulfosalt. Description of the selected halide, oxide and hydroxide. Description of the selected carbonate, nitrate, borane, sulphate, phosphate and organic compounds. Description of the selected silicate and aluminosilicate.	6, including: 1 1 1 1 2
Lec 3	Principles of petrology, including: Petrology of igneous rocks. Petrology of sedimentary rocks. Petrology of metamorphic rocks.	6, including 2 2 2
Lec 4	Poland's geological structure. Rocks and minerals occurring in Poland.	1
Lec 5	The selected issues concerning mineralogy and petrology of extra-terrestrial bodies in solar System	1
	Total hours	**15**

Form of classes - laboratory		Number of hours
Lab 1	Recognition and description of the selected deposit-forming minerals on the basic of their physical features.	**8**
Lab 2	Recognition and mineral, structural, textural and genetic characteristics of most significant igneous rocks.	**7**
Lab 3	Recognition and mineral, structural, textural and genetic characteristics of most significant sedimentary rocks.	**8**
Lab 4	Recognition and mineral, structural, textural and genetic characteristics of most significant metamorphic rocks.	**7**
	Total hours	**30**

TEACHING TOOLS USED
N1. Traditional form of lectures with multimedia presentations. N2. Laboratory classes dealing with recognition and description of the selected deposit-forming and rock-forming minerals, as well as with igneous, sedimentary and metamorphic rocks. N3. Indicating sources of knowledge on the subject for self-work

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1-F4	PEK_W01, PEK_W02, PEK_U01, PEK_U02, PEK_K02	Four tests during laboratory classes, comprising knowledge gained during laboratory classes and as the result of individual study on: 1. Deposit-forming minerals. 2. Rock-forming minerals and igneous rocks. 3. Rock-forming minerals and sedimentary rocks. 4. Rock-forming minerals and metamorphic rocks.
P	PEK_W01- PEK_W04, PEK_U01-PEK_U03, PEK_K01-PEK_K02	Exam comprising knowledge on the subject gained during individual study, laboratory classes and lectures as well. The concluding grade includes also the grade for laboratory work, which is an arithmetic mean derived from forming grades F1-F4.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] BEREŚ B., 1990 – Ćwiczenia z mineralogii i petrografii. Skrypt Politechniki Wrocławskiej, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław.
[2] BEREŚ B., 1992 – Zarys mineralogii i petrografii. Skrypt Politechniki Wrocławskiej, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław.
[3] BOLEWSKI A., MANECKI A., 1987 – Rozpoznawanie minerałów. Wydawnictwa Geologiczne, Warszawa.
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[2] CZUBLA P., MIZERSKI W., ŚWIERCZEWSKA-GŁADYSZ E., 2005 – Przewodnik do ćwiczeń z geologii. Wydawnictwo Naukowe PWN, Warszawa.
[3] DWORAK T. Z., RUDNICKI K., 1983 – Świat planet. PWN, Warszawa.
[4] GREELEY R., BATSON R., 1999 – Atlas Układu Słonecznego NASA. Prószyński i S-ka, Warszawa.
[5] HANDKE M., 2005 – Krystalochemia krzemianów. Uczelniane Wydawnictwa Naukowo-Dydaktyczne AGH, Kraków.
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[8] WOOD J. A., 1983 – Układ Słoneczny. PWN, Warszawa.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mineralogy and Petrology
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W16, K_W22, K_W05	C1 – C3	Lec 1-Lec 3, Lab 1-Lab 4	N1 – N3
PEK_W02	K_W16, K_W22, K_W05	C1 – C3	Lec 3, Lab 2-Lab 4	N1 – N3
PEK_W03	K_W16, K_W22, K_W05	C4	Lec 4	N1, N3
PEK_W04	K_W16, K_W22, K_W05	C4	Lec 5	N1, N3
PEK_U01	K_U14, K_U18	C1-C3	Lec 1, Lec 2, Lab 1-Lab 4	N1 – N3
PEK_U02	K_U14, K_U18	C1-C3	Lec 2, Lec 3, Lab 2-Lab 4	N1 – N3
PEK_U03	K_U14, K_U18	C1-C3	Lec 1-Lec 3, Lab 1-Lab 4	N1 – N3
PEK_K01	K_K01-K_K07	C1-C3	Lec 1-Lec 3, Lab 1-Lab 4	N1 – N3
PEK_K02	K_K01-K_K07	C1-C3	Lec 1-Lec 3, Lab 1-Lab 4	N1 – N3

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Hydrogeologia
Name in English: Hydrogeology
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GEG3102
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	60		30		
Form of crediting	Examination		crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	2		1		
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2		0,5		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has basic knowledge concerning mathematical analysis necessary to understand mathematical issues of engineering character.
2. The student knows basic notions of general geology and petrography, can show and characterise lithological profile.
3. The student can use Microsoft Office to prepare documents in Word and can also work with Excel programme.

SUBJECT OBJECTIVES

C1 - Acquainting students with the role and tasks of hydrogeology as a science dealing with the study of properties, movement and groundwater resources.
C2 - Understanding the basic properties of groundwater and the ability to assess their quality.
C3 - Understanding the research methods and evaluation of rocks properties characterized by their ability to gather, conduct and delivery of water.
C4 - Knowledge and understanding of groundwater flow models and the ability to predict flows for simple cases.
C5 - Understanding of principles for the evaluation of groundwater resources.
C6 - Understanding the mechanisms posing risks associated with the groundwater flow (suffusion, ground liquefaction).

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has knowledge concerning basic groundwater properties. On the basis of the properties the student can assess water qualities. The student has a recognition which of water should be particularly protected, which fulfil the criteria of medicinal water.

PEK_W02 The student has knowledge concerning basic properties of hydrogeological rocks and methods of their determining. It concerns their abilities to gather, conduct and deliver water by rocks.

PEK_W03 The student has knowledge concerning law and equations describing groundwater flow.

PEK_W04 The student has a general knowledge concerning groundwater resources, their protection and contamination.

relating to skills:

PEK_U01 On the basis of groundwater properties the student can determine their quality.

PEK_U02 The student can mark basic hydrogeological rocks properties and to evaluate their accuracy.

PEK_U03 On the basis of hydrogeological rocks properties the student can evaluate their abilities to gather, conduct and deliver water by a rock.

PEK_U04 The student can, using analytical methods, predict flows to a well and flows for simple waterside conditions.

relating to social competences:

PEK-K01 The student can work in team and together prepare and conduct a task of hydrogeological rocks properties and to prepare the achieved results and to present the effects of the conducted research as a team paper report.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Subject's programme, conditions of crediting, literature Groundwater as part of the hydrosphere.	2
Lec 2	Water properties. Waters in aeration and saturation area. Genesis and age of groundwater.	4
Lec 3	Hydrogeological rocks properties.	2
Lec 4	Dependence of water appearance on geological structure. Groundwater division. Fluctuations and measurement of groundwater level. Springs.	2
Lec 5	Basic law of groundwater movement. Flow theories.	4
Lec 6	Groundwater flow equations.	2
Lec 7	Analytical solutions for the chosen flow tasks.	2
Lec 8	The study of underground water deposits. Water intakes.	2
Lec 9	New and traditional geophysics methods in hydrogeological research. Groundwater and mining.	2
Lec 10	Physical and chemical properties of groundwater. Medicinal water.	4
Lec 11	Groundwater resources and their protection. Water contamination and protection of their quality.	2
Lec 12	Hydrogeological documentation. Water in law system.	2
	Total hours	**30**

Form of classes - laboratory		Number of hours
Lab 1	Scope and type of laboratory research to perform on classes, conditions of crediting, literature. Presentation of teaching laboratory from hydrogeology and getting known the research positions. Students division on research teams and giving them tasks to prepare in teams and to conduct it. Apparatus and devices for research. Health and safety regulations.	2
Lab 2	Conducting the capillary and passive research and also the word coefficient.	2
Lab 3	Conducting research of particle size analysis and on this basis determining rocks hydrogeological properties (granulation curve, reliable grain diameter, reliable tubule diameter, specific surface, filtration coefficient).	2
Lab 4	Conducting research of filtration coefficient by means of steady flow method.	2
Lab 5	Conducting research of filtration coefficient by means of unsteady flow method.	2
Lab 6	Conducting research of unsteady flow parameters.	2
Lab 7	Conducting research of critical hydraulic gradient causing soil liquefaction. Conducting research and solving a flat plate flow and contamination transport for a piston model.	2
Lab 8	Grade from reports. Additional test for students with backlogs. Crediting.	1
	Total hours	**15**

TEACHING TOOLS USED
N1.Traditional lecture illustrated by multimedia presentations. N2. Laboratory works at a research place. N3. Test - knowledge of laboratory research methods and apparatus. N4. Report on conducted laboratory research. N5. Duty hours

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at the end of semester)	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01-PEK_W04	P1.Final grade of written test.
F, P	PEK_U01-PEK_U04 PEK_K01	F1- written exam grade and performing laboratory research F2 - Grade from a written report. P2 - Final grade from a laboratory weighted average of F1 - 70% and F2 - 30%

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Z. Pazdro, B. Kozerski, Hydrogeology ogólna - Warszawa, Pub. Geol., 1990.
[2] M. Rogoż, Dynamika wód podziemnych, Katowice, GIG 2007.
A. Macioszczyk, Podstawy hydrogeologii stosowanej, Pub. Nauk. PWN Warszawa 2006.
[3] Artur Wieczysty, Hydrogeologia inżynierska, PWN Warszawa 1982.

SECONDARY LITERATURE:

[1] T. Strzelecki, W. Kostecki, S. Żak Modelowanie przepływów przez ośrodki porowate, Dolnośl. Pub. Eduk. 2007.
[2] H. P. Jordan, A. S. Kleczkowski, J. Silar, W. M. Szestakow, S. Witczak, Ochrona wód podziemnych , Pub. Geol., Warszawa 1984,
[3] Ryszard Kulma, Podstawy obliczeń filtracji wód podziemnych, Pub. AGH Kraków 1995,
[4] Aleksandra Macioszczyk, Hydrogeochemia, Pub. Geol., Warszawa 1987,
[5] Mieczysław Wacławski, Geologia inżynierska i hydrogeologia, część II – Hydrogeologia, Pub. Zakł. Graficzne Politechniki Krakowskiej 1995.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Hydrogeology
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Number of educational effect
PEK_W01	K_W17	C1, C2	Lec 1, Lec 2, Lec 10, Lec 11	N1
PEK_W02	K_W17	C3	Lec 3, Lec 7, Lab 1-Lab 8	N1 – N5
PEK_W03	K_W17	C4	Lec 5, Lec 6	N1
PEK_W04	K_W17	C5, C6	Lec 4, Lec 11, Lec 12	N1
PEK_U01	K_U15	C2	Lec 2, Lec 4, Lec 10, Lec 11	N1
PEK_U02	K_U15	C3	Lec 3 Lab 2-Lab 7	N1 – N5
PEK_U03	K_U15	C3, C6	Lec 2, Lec 3, Lec 9, Lec 12	N1
PEK_U04	K_U15	C4	Lec 6, Lec 7, Lab 7	N1 – N5
PEK_K01	K_K04		Lab 2-Lab 7	N2 – N5

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Mechanika Gruntów
Name in English: Soil Mechanics
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG3101
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	90		60		
Form of crediting	Examination		crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	3		2		
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	3		1		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of mathematical analysis necessary to understand engineering mathematical problems.
2. Elementary knowledge of widely understood mining as one of the most important branches of technical and economic areas of human activity.
3. Knowledge of basic notions, pertaining to deposits and mining geology, ability to present and characterise a lithological profile in the main mining regions.
4. Knowledge of elasticity theory elements and its use in research mechanical parameters of soil and its interpretation.
5. Ability to make calculations related to statics (vector calculus, equilibrium of forces)
6. Ability to work in Microsoft Office environment, i.e. Word documents, Power Point multimedia presentations and Excel spreadsheets,

SUBJECT OBJECTIVES

C1 - Acquisition of knowledge on the role and perspectives of soil mechanics from the perspective of its applications in geoengineering, construction engineering and surface mining for forecasting and preventing a natural threat which is loss of stability of the orogenic belt after completing mining excavation.

C2 - Presentation and explanation of issues related to soil as a three phase structure with emphasis on the role of water movements in soil and a number of other related and important phenomena, including physicochemical phenomena, effective stresses and pore pressure.

C3 - Acquisition of knowledge on the binding soil classification through learning about soil structure as a three-phase structure and using laboratory research results conducted for the purpose of determining soil grain-size, basic physical characteristics of soils, physical state of matter with particular emphasis on the role of water.

C4 - Acquisition of knowledge on rules of laboratory determination and interpretation of mechanical properties of soils such as compressibility and shear strength, including the Coulomb – Mohr hypothesis.

C5 - Presentation and explanation of issues related to determination of stress distribution in soil and soil relocation in subsoil, earth pressure on resistance constructions, water flow in soil and boundary bearing capacity of subsoil as well as slope and embankment stability.

C6 - Acquisition of knowledge on forecasting methods of stability loss.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – is able to clearly formulate definitions and the main goals of soil mechanics in the context of its numerous applications in many branches of engineering, including mainly surface mining and geoengineering.

PEK_W02 –has knowledge of the structure of soil as a three-phase structure soil structure with particular emphasis on water flow in soil and related phenomena including physicochemical phenomena resulting from interaction of soil phases with, and also pore pressure and effective stresses.

PEK_W03 – is able to indicate and characterise physical and mechanical properties of soil and define their engineering significance.

PEK_W04 - has knowledge of the binding soil classification in the EU (including Poland) based on grain-size analysis, physical and mechanical characteristics determined in a macroscopic way.

PEK_W05 - has knowledge of elasticity theory elements and is able to use it in a mathematical description of the phenomena which take place in subsoil under the influence of external forces, is able to conduct an analysis of stress distribution in subsoil from concentrated vertical force (the Boussinesq assumption) and from continuous load, and can understand the essence of these phenomena, is able to understand and present connections and dependencies between stresses and relocations in soil.

PEK_W06 – has basic knowledge of forecasting methods of slope and embankment stability loss.

relating to skills:

PEK_U01 - is able to use the knowledge related to soil classification and conduct appropriate laboratory research allowing for determining physical and mechanical properties of soil, identifying subsoil and establishing values of soil geotechnical characteristics and the resulting assessment of soil as foundation for buildings.

PEK_U02 - is able to solve elementary engineering tasks related to recalculation of physical values and graphic interpretation of mechanical parameters of soil and make graphs of stress distribution in soil.

PEK_U03 - is able to use the knowledge of slope and embankment stability to determine the safety coefficient in geotechnical constructions design.

PEK_U04 - is able to analyse and interpret results of laboratory work in a form of computer report.

relating to social competences:

PEK_K01 - Knowledge gained during soil mechanics classes is a necessary element in competences of a mining and geo-mining engineer. The knowledge and skills acquired during the course allow a graduate to solve simple professional problems in design work and also make him/her realize a large number of issues in a given field indicating opportunities and needs for further development and improvement of professional competences.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Course introduction. Theoretical and experimental basis for soil mechanics, euro-codes, subsoil categories, technical subsoil tests. The place of soil mechanics in mining.	2
Lec 2	Basic notions, rocks and soils, soil formation processes, classifications – scope of research.	2
Lec 3	Soil as a three-phase structure. Types of particles and minerals. Soil texture and structure, mineral particle-water system.	2
Lec 4	Physicochemical interaction between soil particles and water: ion exchange capacity, electro-kinetic phenomena, thixotropy phenomenon.	2

Lec 5	Physical properties, compacting and consistence states.	2
Lec 6	Groundwater movement, types of waters, processes mechanisms and their consequences, phenomenon of capillarity, shrinkage and expansiveness as well as frost phenomena in soil.	2
Lec 7	Representative elementary area. Notion of stress condition in orogenic belt. Effective stresses rule.	2
Lec 8	Soil shrinkage – compaction law. Pre-consolidation pressure.	2
Lec 9	Soil strength, strength types, research methods and results interpretation.	2
Lec 10	Dependence of stress condition in orogenic belt on deadweight and external loads. The Boussinesqu and Flammant task.	2
Lec 11	Stresses in subsoil, practical methods of stress determination in orogenic belt.	2
Lec 12	Subsoil deformation, consolidation basis.	2
Lec 13	Subsoil boundary states, calculation methods basis, earth pressure and resistance.	2
Lec 14	Stability of embankments and soil massifs for various strength conditions. Practical methods of design and stability tests.	2
Lec 15	Prevention and stabilisation methods in landslide areas.	2
	Total hours	**30**

Form of classes - laboratory		**Number of hours**
Lab 1	Scope and type of laboratory research during laboratory classes, crediting conditions, literature. Presentation of a didactic laboratory in soil mechanics and presentation of test stands. Division of students into research teams and task allocation to teams.	1
Lab 2	Macroscopic analysis of soils. Individual macroscopic tests in accordance with binding standards to recognize and prepare an introductory description of soil.	2
Lab 3	Determination of basic physical properties of soil using laboratory methods and determination of derivative characteristics of soils.	2
Lab 4	Research on boundaries of soil consistence, determination of soil states.	2
Lab 5	Examination of soil compressive strength in oedometer, determination of strength parameters, interpretation of obtained results.	2
Lab 6	Examination of soil shearing strength in a direct shearing apparatus – determination of strength parameters, interpretation of obtained results.	2
Lab 7	Examination of soil shearing strength in a three-axial compression apparatus. Discussing various variants of ATS tests, comparison of methods, interpretation of results.	2
Lab 8	Assessment of reports on laboratory research and crediting.	2
	Total hours	**15**

TEACHING TOOLS USED
N1. Informative lecture with elements of problem lecture. N2. Multimedia presentations. N3. Internet website with didactic materials and necessary information related to the lecture and laboratory. N4. Didactic discussion as part of lectures and laboratory classes. N5. Preparation for classes and reports on conducted laboratory research. N6. Test of the knowledge of laboratory research methods and laboratory apparatus. N7. Consultations.

EVALUATION OF SUBJECT EDUCATIONAL EFFECT ACHIEVEMENTS

Evaluation F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01-PEK_W06	P1 Final result of a written exam encompassing the indicated scope of material.
F P	PEK_U01-PEK_U05, PEK_K01	F1- Grade from a written test of preparation for laboratory research (laboratory methods, research apparatus) and knowledge related to laboratory. F2- Grade from a written report on research results, determination of examined soil, results interpretation P2- Final laboratory grade (weighted average of F1 – 40% and F2 - 60%).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Z. Wiłun, Zarys geotechniki, WKŁ, Warszawa, 2004
[2] S. Pisarczyk, Mechanika gruntów, Wyd. Politechniki Warszawskiej, Warszawa 1999
[3] S. Dmitruk, R. Izbicki, H. Suchnicka, Mechanika ośrodków rozdrobnionych, Politechnika Wrocławska, Wrocław 1992
[4] R. Racinowski, R. Coufal, Geologia Inżynierska dla studentów kierunku budownictwo, Politechnika Szczecińska, Szczecin 1999

SECONDARY LITERATURE:

[1] J. Waluk, Laboratorium z mechaniki gruntów Po1itechnika Wrocławska, Wrocław 1989
[2] E. Myślińska, Laboratoryjne badania gruntów, PWN, Warszawa 2010
[3] H. Konderla, A. Kwaśnik, B. Szymałowska, Przewodnik do ćwiczeń rachunkowych z geotechniki, Politechnika Wrocławska, Wrocław 1975
[4] A. Szymański, Mechanika Gruntów, wydawnictwo SGGW, Warszawa 2007
[5] NORMY:

PN-EN ISO 14688-1 Badania geotechniczne. Oznaczania i klasyfikacja gruntów. Oznaczanie i opis.
PN-EN ISO 14688-2 Badania geotechniczne. Oznaczania i klasyfikacja gruntów. Zasady Klasyfikowania.
PKN-CN ISO/TS 17892-1 Badania geotechniczne. Badania laboratoryjne gruntów. Oznaczanie wilgotności
PKN-CN ISO/TS 17892-2 Badania geotechniczne. Badania laboratoryjne gruntów. Oznaczanie gęstości gruntów drobnoziarnistych.
PKN-CN ISO/TS 17892-3 Badania geotechniczne. Badania laboratoryjne gruntów. Oznaczanie gęstości właściwej, metoda piknometru.
PKN-CN ISO/TS 17892-4 Badania geotechniczne. Badania laboratoryjne gruntów. Oznaczanie składu granulometrycznego.
PKN-CN ISO/TS 17892-5 Badania geotechniczne. Badania laboratoryjne gruntów. Badanie edometryczne gruntów.
PKN-CN ISO/TS 17892-6 Badania geotechniczne. Badania laboratoryjne gruntów. Badanie penetrometrem stożkowym.
PKN-CN ISO/TS 17892-7 Badania geotechniczne. Badania laboratoryjne gruntów. Badanie na ściskanie gruntów drobnoziarnistych w jednoosiowym stanie naprężenia.
PKN-CN ISO/TS 17892-8 Badania geotechniczne. Badania laboratoryjne gruntów. Badanie gruntów nieskonsolidowanych w aparacie trójosiowego ściskania bez odpływu wody.
PKN-CN ISO/TS 17892-9 Badania geotechniczne. Badania laboratoryjne gruntów. Badanie gruntów

w aparacie trójosiowego ściskania po nasyceniu wodą.
PKN-CN ISO/TS 17892-10 Badania geotechniczne. Badania laboratoryjne gruntów. Badanie w aparacie bezpośredniego ścinania.
PKN-CN ISO/TS 17892-11 Badania geotechniczne. Badania laboratoryjne gruntów. Badanie filtracji przy stałym i zmiennym gradiencie hydraulicznym.
PKN-CN ISO/TS 17892-12 Badania geotechniczne. Badania laboratoryjne gruntów. Oznaczenie granic Atterberga.
PN–81/B–03020. Grunty budowlane. Posadowienie bezpośrednie budowli. Obliczenia statyczne i projektowanie.
PN–74/B–02480. Grunty budowlane. Badania polowe.
PN–88/B–04481. Grunty budowlane. Badania próbek gruntu.
PN–86/B–02480. Grunty budowlane. Określenia, symbole, podział i opis gruntów.
PN–B–02479. Geotechnika. Dokumentowanie geotechniczne. Zasady ogólne.
PN–B–02481.Geotechnika. Terminologia podstawowa. Symbole literowe i jednostki miar.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Soil Mechanics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01, PEK_W02,	K_W18	C1, C2,	Lec 1, Lec 2, Lec 3, Lec 4, Lec 6,	N1-N4, N7
PEK_W03, PEK_W04,	K_W18	C3, C4	Lec 5, Lec 8, Lec 9	N1-N4, N7
PEK_W05,	K_W18	C5	Lec 7, Lec 10, Lec 11, Lec 12, Lec 13,	N1-N4, N7
PEK_W06	K_W18	C5, C6	Lec 14, Lec 15,	N1-N4, N7
PEK_U01	K_U16	C3, C4	Lab 1-Lab 7	N3-N7
PEK_U02	K_U16	C3,C4	Lab 3-Lab 7	N3-N7
PEK_U03	K_U16	C5, C6,	Lab 5-Lab 7 Lec 13, Lec 14, Lec 15	N1-N4, N7
PEK_U04	K_U16	C2, C3, C4	Lab 1-Lab 8	N5
PEK_K01	K_K01	C1-C6	Lab 1-Lab 7 Lec 7-Lec 15	N1-N7

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Informatyka
Name in English: Computer Science
Main field of study: Mining and Geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code : ING3101
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)			30		
Number of hours of total student workload (CNPS)			60		
Form of crediting			crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points			2		
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes			1		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student is able to use the office suite to collect, and process and share the data.

SUBJECT OBJECTIVES

C1. The objective of the course is to prepare students for independent work on engineering tasks with the use of information tools from office suite, and to use embedded VBA platform to automatize calculations and to create simple own procedures.

SUBJECT EDUCATIONAL EFFECTS

relating to skills:

PEK_U01 – Is able to create a spread sheet for engineering calculations, is able to present and interpret the results of calculations.

PEK_U02 – Is able to design and create an application in programming environment.

relating to social competences:

PEK_K01 – Understands the need to facilitate engineering work with the use of accessible office tools and tools for automation of work.

PROGRAMME CONTENT

Form of classes - laboratory		**Number of hours**
Lab 1	Subject contents, conditions of crediting, Health and Safety, the rules of classes participation, didactic materials and literature, consulting, access to the resources of the department intranet	2
Lab 2	Text editors – writing and formation, inserting images, charts, footnotes, table of contents, form of printing. Detailed instructions in accordance to the appendix provided by the teacher	2
Lab 3	Presentations – preparing a presentation, formatting, displaying. Detailed instructions in accordance to the appendix provided by the teacher	2
Lab 4	Spread sheets – introduction: data entry, editing, formatting, addressing cells, basic calculations, generating charts, concept of function and procedure	2
Lab 5	Conditionals in Excel. Adapting Excel nested functions to solve conditional calculation tasks on different types of data. If functions, logical functions, statistical functions, data base functions. Sample tasks for individual work	2
Lab 6	Real life sample task for individual completion (flower shop). Requirements: developing formulas, 5 sample charts, data and table formatting	2
Lab 7	Excel as data base (form, sorting, filtering, advanced filtering) Data Base Functions in Excel. Pivot table	2
Lab 8	Search for Result and SOLVER – examples of optimization tasks	2
Lab 9	Stages of programming process	2
Lab 10	Conditionals (MS Excel vs. VBA). Flowcharts, subroutines, concept of function and procedure, Boole's algebra	2
Lab 11	Automation of Excel tasks. Introduction to Macro, Excel vs. VBA. Registration, edition, macro code analysis. VBA editor in Excel – description of a user's interface. System HELP	2
Lab 12	I/O instructions, including communicating with Excel, data exchange, simple calculations. Data Structures, Operators, Predefined Constants, objects (methods, incidents, properties)	2
Lab 13	Functions and procedures, repeat functions – structure, use, examples. Operating on one and two-dimension tables. Searching, sorting, arithmetic operations	2
Lab 14	Communication with a user, creating interface, objects (forms, worksheet, chart). Creating an application	2
Lab 15	Assessing the reports of performed laboratory research	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Multimedia presentations with the use of audio-visual equipment. N2. Laboratory guidelines with examples. N3. Preparing and performing laboratory tasks reports with the use of office suite tools.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F, P	PEK_U01 PEK_U02 PEK_K01	F1 – Grade from the document preparation, presentation and completion of partial tasks concerning spread sheet F2 – Grade from the written programme in accordance to pre-given assumptions P – Final grade from laboratory work (weighted arithmetic mean from F1 – 40%, F2 – 60%)

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] John Walkenbach Excel 2010 PL. Biblia 2011 s840, Zawiera CD-ROM [2] Bill Jelen, Tracy Syrstad, Microsoft Excel 2010 PL. Język VBA i makra. Akademia Excela, Helion, 2011 [3] Charles E. Brown, Access. Programowanie w VBA, Helion, 2005 [4] John Walkenbach, Excel 2010 PL. Programowanie w VBA. Vademecum Walkenbacha, Helion, 2011 **SECONDARY LITERATURE:** Any books concerning MS Office, programme Help files
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Computer Science
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_U01	K_U05	C1	Lab 3-Lab 8	N1-N3
PEK_U02	K_U05	C1	Lab 9-Lab 14	N1-N3
PEK_K01	K_K01	C1	Lab 6-Lab 8, Lab 13-Lab 15	N3

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Fizyka II
Name in English: Physics II
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: optional / university-wide
Subject code: FZP2072
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	120		30		
Form of crediting	Examination		crediting with grade		
For a group of courses mark (X) for the final course					
Number of ECTS points	4		1		
including number of ECTS points for practical (P) classes	0		1		
including number of ECTS points for direct teacher-student contact (BK) classes	4		1		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

Competence in the field of principles of mathematical analysis, algebra and physics in the course Physics I

SUBJECT OBJECTIVES

C1 Acquisition of basic knowledge regarding aspects of application of the following classical electrodynamics sections:
- C1.1. Electrostatics
- C1.2. Electrical current
- C1.3. Magnetostatics
- C1.4. Electromagnetic induction
- C1.5. Electromagnetic waves
- C1.6. Wave optics

C2. Acquisition of basic knowledge regarding aspects of applications, of the following modern physics sections:
- C2.1. Special relativity theory
- C2.2. Quantum physics
- C2.3. Fundamentals of solid state physics
- C2.4. Nuclear Physics
- C2.5. Particle physics and astrophysics

C3. Acquisition of basic techniques and methods of measurement of the selected physical quantity
C4. Acquisition of skills:
C4.1. Planning and conducting experiments in the Laboratory of Physics (LPF) consisting of an experimental verification of the selected laws/principles of physics and measurement of physical quantities
C4.2. Preparing reports on the experiment results
C4.3. Estimating of measurement uncertainty
C4.4. Preparing a written report on the conducted measurements with the use of application software.
C5. Acquisition and consolidation of social skills including emotional intelligence involving the ability to work in a group of students with the aim of effective problem solving. Responsibility, honesty and reliability in proceedings; obeying campus and social rules.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – possesses knowledge and comprehends the importance of discoveries and achievements of classical electrodynamics and modern physics for engineering sciences and the progress of civilisation,

PEK_W02 - possesses knowledge of methods regarding the analysis of vector fields,

PEK_W03 - possesses knowledge of electrostatics and its applications; knows and comprehends: α) basic physical quantities, vector and scalar associated with the electrostatic field (current and field potential, the principle of superposition, charge quantisation, the law of conservation of the electric charge) point charge, the discrete charges distribution, β) Gauss's law, and possesses detailed knowledge concerning: a) the flux of vector field intensity and the conservative nature of the field, b) the electrostatic potential energy of the charge and charge distribution, c) the electric dipole fields, the potential energy of the dipole and the moment of the force acting on a dipole placed in the outer field, d) a conductor located in the field (the phenomenon of field screening), e) dielectric polarisation, f) electrical capacitance and capacitor applications, g) energy density of the field, i) rules of the operation of photocopiers and electrostatic filters and the determination of the field intensity of the selected continuous electrostatic charge distributions with the use of the integral form of Gauss law.

PEK_W04 – possesses knowledge of physics of direct current and its applications, and in particular knows and comprehends a) the concept of intensity and electric current density vector, resistance/ conductivity electric/correct, SEM, work, electric power and Joule heating, b) the physical mechanisms of electrical conductivity, c) Ohm's law (in the form of differential and integral) and Kirchhoff's law, e) principles for the quantitative analysis of simple electrical circuits.

PEK_W05 – possesses knowledge of magnetostatics and its applications, knows and comprehends: a) the concept of the magnetic field, the magnetic induction vector and the field intensity, b) the concept of Lorentz force and its impact on the movement of electric charges in a magnetic field, c) Gauss's law for the magnetic field, d) the physical principles of the operation of: cyclotron, particle velocity selector, a mass spectrometer and the method for determining e/m, e) the classical Hall effect, f) the concept of the magnetic moment of the circuit with the flow, g) the effect of the magnetic field on the conductor and the frame with current; possesses the detailed knowledge of: a) potential energy and the moment of force acting on the magnetic moment placed in an external field, b) the source of the magnetic field, c) the law of Biot-Savart and Ampere, d) the impact of two parallel conductors of electricity, e) the definition of unit of the electrical current, f) the designation of the selected sources of magnetic fields (linear and circular current-carrying conductor, coil, toroid).

PEK_W06 – possesses knowledge of the phenomenon of the electromagnetic induction and its applications; knows and comprehends: a) the concept of magnetic flux, b) Faraday's law and Lenz's law, c) inductance, self-inductance, d) the concepts of energy and energy density of the magnetic field; possesses knowledge on applications of eddy currents.

PEK_W07 – possesses knowledge and comprehends the concept of displacement, current and the physical meaning of Maxwell's equations (in the form of integral and differential) and equations.

PEK_W08 – possesses fundamental knowledge of electromagnetic waves and their applications, and in particular knowledge of wave spectrum, knows and comprehends: a) the concepts of sinusoidal, plane wave, the refractive index and its relation to the relative permeability coefficients of electric and magnetic medium, b) the law of geometrical optics, c) the phenomenon of dispersion of electromagnetic waves, d) the phenomenon of total internal reflection and its application meaning, e) the phenomenon of polarization of light, the methods of polarization of light and Malus law, e) transport of energy and momentum by electromagnetic wave, f) the concept of Poynting vector, g) phenomenon exerting pressure by an electromagnetic wave incident on a surface, h) rules for creating images using mirrors and thin lenses; possesses fundamental knowledge of: i) the physics of electromagnetic metamaterials exhibiting negative refractive index, ii) the use of metamaterials.

PEK_W09 – possesses fundamental knowledge of wave optics and its applications, in particular, knowledge of: a) diffraction and interference of light, b) Young's experiment, c) interference of light in thin layers, d) diffraction on the circular holes, e) the resolving power of optical systems (Rayleigh criterion), f) aberration of optic systems and an eye and methods of their correction.

PEK_W10 – possesses fundamental knowledge of the special theory of relativity and its applications, in particular knowledge and understanding of: a) Einstein's postulates, b) the Lorentz transformations and the resulting consequences (time dilation, length contraction, time diversity of events, the integrity of a cause-effect relationship in the sense of changing the inertial reference system), c) transformation patterns of speed, and possesses knowledge of the elements of relativistic dynamics, in particular, knows the concepts of the relativistic momentum of the particle/body, relativistic kinetic energy, relativistic, total energy of particles/body, knows the relativistic equation of motion and the relativistic momentum and energy relationship and has knowledge of the Doppler effect, the equivalence of mass and energy and the necessity to apply the results of the special theory of relativity in the global positioning systems.

PEK_W11 – possesses knowledge of the fundamentals of quantum physics and the selected applications, and has detailed knowledge of: a) the laws of black body radiation, thermal radiation of bodies and its applications, b) the Bohr model of the hydrogen atom (quantization of energy and momentum of the electron) and the quantum energy levels (Franck-Hertz experiment) of electrons in atoms, c) the photoelectric and Compton phenomena, d) X-ray and the creation and annihilation of particle-antiparticle pairs, e) the interaction of light with matter and physical principles of laser action, f) the corpuscular-wave duality of light and elementary particles (the hypothesis of de Broglie, waves of the matter), g) Heisenberg uncertainty principle, h) the wave function and its interpretation, i) the Schrödinger equation (temporal and timeless), j) timeless Schrödinger equation for a particle in an infinite potential well, k) the phenomenon of quantum tunnelling and its applications, l) configuration of electron elements, m) quantum numbers of the wave functions of electrons and the construction of the periodic table, n) Pauli prohibition, o) spatial quantization of orbital momentum and the magnetic moment of electrons in an atom.

PEK_W12 – possesses knowledge of fundamentals of solid state physics and its selected applications, in particular, possesses knowledge of: a) the types of chemical bonds and their influence on the physical properties of solids, b) the spatial structure of crystals, the methods of testing using X-ray diffraction and the application of this method for computer tomography, c) band model of solids, d) spontaneous and doped semiconductors, e) dependence of the specific heat of dielectrics and metals on the temperature, f) electrical conductivity of metals and semiconductors, g) Wiedemann - Franz law and its limited range of applicability, h) physics of the selected of semiconductor devices (p-n junction, diode, LED, transistor, MOSFET).

PEK_W13 - possesses knowledge of the foundations of nuclear physics and its applications, in particular, is the characteristics of the nucleus, its isotopes and nuclear forces, possesses knowledge of: a) the energy of binding nucleons and its relevance to nuclear energy (fission of heavy nuclei/isotopes), the synthesis of light nuclei, the stability of heavy nuclei, b)

natural radioactivity/artificial, c) the types of radioactive decay, d) the law of radioactive decay, e) methods of attributing dates to radioisotopes, f) nuclear reactions, g) nuclear energy, h) biological effects of radiation, i) physical fundamentals of medical imaging methods using the nuclear magnetic resonance.

PEK_W14 - possesses knowledge of fundamentals of physics of particles and astrophysics, in particular, knows: a) the types of fundamental interaction, b) the distribution of elementary particles to fermions and bosons, c) the standard model of elementary particles (leptons, quarks, intermediary particles, hadrons) possesses knowledge of: d) spin and spin magnetic moment of the electron, e) the spatial quantization of spin and spin magnetic moment of electrons, f) experimental confirmation of the existence and spatial spin quantization in experiments of Stern-Gerlach type, g) the construction and type of matter in the universe, and the standard model of the expanding universe (Big Bang, the Hubble law, background radiation).

PEK_W15 - knows the obligatory safety rules for the Laboratory of Physics.

PEK_W16 - knows methods to perform simple and complex measurements of physical quantities.

PEK_W17 - knows method of processing the results of measurements and uncertainty estimation of simple and complex measurements.

relating to skills:

PEK_U01 - be able to: a) identify and justify the findings and achievements of classical electrodynamics and modern physics, which have contributed to the progress of civilisation, b) explain the basis of the physical devices for everyday use.

PEK_U02 - is able to apply correctly and effectively the methods of analysis of vector fields to solve simple problems in the field of electromagnetism

PEK_U03 - is able to apply the knowledge of the field of electrostatics for α) qualitative and quantitative characteristics of the electrostatic field, which source are loads and systems of point loads, in particular, possesses skills to determine, on the basis of Gauss's law, the electrostatic field intensity of the selected distribution loads; β) conducting measurements in the Laboratory of Physics (LPF) and preparing descriptions of measurement results in the form of a written report. In particular, is able to define: a) the electrostatic potential energy of the load and the load distribution, b) the value of energy of the potential dipole moment of the force acting on the dipole placed in an external field, c) the electric capacitance of capacitors and their batteries, can also derive Coulomb's law from Gauss law and explain the physical mechanisms of the dielectric polarization.

PEK_U04 - is able to apply knowledge of physics of the direct current: a) the quantitative characteristics of the flow of current (electric intensity, vector of electrical current density) in simple electric circuits, b) the designation of work , power, electricity and Joule heating, c) determination of the resistance of resistors' battery, d) measuring the LPF and the development of measurement results in the form of a written report; is able to explain the physical mechanisms of electrical conductivity and justify the nature of the electric utility, which is to transport electricity.

PEK_U05 – is able to identify the source of the magnetic field and apply the knowledge of magnetostatics for: a) the qualitative and quantitative characteristics of the magnetic field (the determination of magnetic induction vectors and intensity) originating from different sources (linear and circular current-carrying conductor, coil, toroid), b) electric loadmotion in the magnetic field and determining the force acting on the conductor placed in the magnetic field, c) determination of the potential energy and the torque acting on the magnetic moment placed in an external magnetic field, d) defining the intensity of the electric current, e) the measurements conducted in the LPF and the describing the measurement results in the form of a written report. In addition, is able to explain: a) the physical principle of action: of cyclotron, particle velocity selector, a mass spectrometer , b) the importance of the Earth's magnetic field for the environment and life forms on the planet.

PEK_U06 - possesses skills to apply the knowledge in the field of electromagnetic induction: a) the qualitative and quantitative characteristics of performance of generators of AC and DC, including the determination of the value generated by SEM, b) explain the phenomenon of self-induction, c) determine the density of magnetic energy field in a coil d) measurements performed in the LPF and the prepare of measurement results in a written report; is also able

to : a) justify that the magnetic field induced by the alternating electric current field is a conservative field (potential), b) explain the meaning of Lenz rule and characterise the phenomenon of electromagnetic induction as the physical phenomenon involving the conversion of various forms of energy into electricity.

PEK_U07 – is able explain concisely and correctly the physical meaning of Maxwell's equations (in integral form) and the material equations. In addition, is able to define correctly the equations used to determine the physical parameters and measurement units.

PEK_U08 - is able to apply knowledge of the physics of electromagnetic waves and optics (geometrical optics law) to explain the optical phenomena (total internal reflection, polarisation, dispersion, dependencies of the refractive index on the relative permeability coefficients of electric and magnetic centre) and quantitative characteristics: a) of a field of electromagnetic wave and energy transport by electromagnetic waves using the Poynting vector, b) images obtained using simple optical systems, c) measurements of the selected parameters of optical systems performed in the LPF and the preparation of measurement results in a written report.

PEK_U09 – is able to apply the knowledge of wave optics to explain optical phenomena (diffraction and interference of light, Young's experiment, the interference of light in thin layers, diffraction through circular holes) and measurements of the selected parameters in the LPF and the preparation of measurements' results in the form of a written report and, in particular is able to: a) identify practical applications of interference, b) explain the meaning of the resolution capability of optical instruments, c) explain the relationship between diffraction and interference (Rayleigh criterion) with the resolution capability of optical instruments.

PEK_U10 - is able to apply the knowledge of the special relativity theory for the interpretation of time dilation, length shortening, asynchronicity of events and to determine - using the Lorentz transformation - the relationship between kinematic quantities in the two moving, relative to each other, inertial frames of reference, in particular, is able to: a) determine the frequency of electromagnetic waves emitted by a mobile / resting antenna and recorded by a moving / resting receiver (e.g. Doppler effect), b) explain the physical meaning of the model $E = mc^2$, c) quantitatively analyse the kinematics and dynamics of linear motion of particles / objects moving at speed, which is close to the speed of light, d) justify the four-dimensional nature of the space-time, e) justify the need for the results of the special relativity theory in the global positioning satellite systems and to interpret the observed phenomena and effects in the case of particles / objects moving at speed, which is close to the speed of light.

PEK_U11 – is able to apply the knowledge of the basic quantum physics for the quantitative interpretation of the selected phenomena and physical effects of microcosm, i.e., the phenomena and effects that occur over the distances of nanometers and smaller, and in particular is able to: a) demonstrate, by means of appropriate calculations, energy quantisation following the Bohr model of the hydrogen atom, b) explain the importance of the Franck-Hertz experiment for quantum physics, c) justify based on the experimental data, the corpuscular nature of light, d) justify the inadequacy of the classical physics application to describe the phenomena of the microworld and explain the probabilistic nature of quantum phenomena, e) explain the physical meaning of the corpuscular-wave duality of light and subatomic particles, f) explain the concepts of the quantum state, the wave function (followed by its interpretation) and quantisation of physical quantities, g) solve the dimensional, timeless Schrödinger equation for a particle in an infinite potential well and justify the quantisation of energy, h) indicate the use of tunnelling phenomena, and) explain the meaning of the quantum numbers of the wave function of electrons in an atom, taking into account the Pauli prohibition and the relationship with the electron configurations of atoms in the periodic table, j) describe the basic phenomena related to the light interaction with matter in the context of physics of the laser activity and the properties of the laser light, k) apply the knowledge of the basic quantum physics to measurements of the selected physical quantities, which are performed in the LPF, and for preparation of measurement results in the form of a written report.

PEK_U12 – is able to apply the knowledge of the basics of solid state physics for the qualitative and quantitative interpretation of the selected phenomena and effects. In particular, is able to: a) explain the influence of the given type of chemical bonding on physical properties of solids,

b) justify the batch-dimensional atomic crystal structure on the basis of the results of appropriate experimental methods, c) explain the concept of anisotropy of the physical properties of crystals, d) justify the experimentally observed dependencies on the temperature of the electrical conductivity of solids (dielectrics, metals, semiconductors, superconductors) in the band model and the model of free electrons, e) justify the experimentally observed dependencies on the temperature specific heat of metals and dielectrics, f) explain the physical meaning of the Wiedemann-Franz law and characterise its limited range of applicability, g) explain the performance of the selected electronic components / semiconductor devices, h) apply the knowledge of the basic quantum physics to measurements of the selected size of quantum systems, which are performed in the LPF, and prepare measurement results in the form of a written report.

PEK_U13 – is able to: a) explain on the basis of the binding nucleons' energy concept, the physical principles of energy in nuclear reactors and tokamaks - devices to carry out a controlled thermonuclear fusion, b) identify and describe the positive and negative aspects of nuclear energy, c) describe the types of radioactive decay d) describe the use of radioactivity and biological effects of radiation, e) characterise the fusion of reactions with light nuclei occurring inside the Sun, d) estimate the age of materials on the basis of the law of radioactive decay, e) explain the physical aspects of tissue and organ imaging by means of magnetic resonance.

PEK_U14 – is able to characterise properly: a) types of fundamental interactions, b) the standard model of elementary particles, c) the concept of the spin and spin magnetic moment of an electron, d) the effect of spatial quantisation of the spin and spin magnetic moment of an electron, e) the importance of the experiments of the Stern-Gerlach type for the acquisition of the properties of atoms and electrons, f) the construction and types of matter in the Universe, d) a standard model of the expanding universe.

PEK_U15 – is able to use simple measuring devices to measure physical quantities.

PEK_U16 - is able to perform simple and complex measurements of physical quantities using the manual test bench.

PEK_U17 – is able to prepare measurement results, conduct the measurement uncertainty analysis and prepare a report of measurements in the LPF using computer tools (word processing, office software, computing environments).

relating to social competences:

PEK_K01 - search for information and its critical analysis,

PEK_K02 - team cooperation assigned to a group on improving the methods for the strategy selection for the optimal problems solving solutions,

PEK_K03 – comprehension of the need for self-study, including the ability to improve concentration and focus on the important issues and development of the ability to apply knowledge and skills independently,

PEK_K04 – development of self-esteem and self-control capacity and responsibility for the results of the taken actions,

PEK_K05 - compliance with the customs and rules of the academic environment,

PEK_K06 - independent and creative thinking,

PEK_K07 – comprehension of the impact of discoveries and achievements of physics on technical progress, society and the environment be means of possessing knowledge of and curiosity relating to scientific and high-tech achievements

PEK_K08 - an objective evaluation of arguments, rational clarification and justification of one's own point of view, be means of applying the knowledge of physics.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec.1,2	Organisational issues. Mathematical analysis of vector fields Electrostatics	4
Lec.3	Electric current	2
Lec.4,5	Magnetostatics	4
Lec.6	Electrostatic induction. Maxwell's equations	2
Lec.7	Electromagnetic waves	2
Lec.8	Basics of wave optics	2
Lec.9	Elements of the special relativity theory	2
Lec.10–12	Quantum Physics	6
Lec.13	Fundamentals of solid state physics	2
Lec.14	Elements of nuclear physics	2
Lec.15	Selected aspects of particle physics and astrophysics	2
	Total hours	**30**

Form of classes - laboratory		**Number of hours**
Lab 1	Introduction to the LPF: organisational issues and conduct of laboratories, familiarising students with: a) the principles of safe measurements (brief safety training), b) the principles of writing reports, c) the basics of the measurement uncertainty analysis. Carrying out simple measurements.	2
Lab 2	Performing measurements of the electrical system with the use of the analog and digital gauges. Statistical processing of the simple and complex measurements' results, estimation of measurement uncertainty for both simple and complex measurements, graphical presentation of the measurements' results and measurement uncertainties, preparation of the report.	2
Lab 3	Performing measurements of the selected mechanical quantities, preparing a report	2
Lab 4	Performing measurements of the selected thermodynamic quantities, preparing a report	2
Lab 5	Performing measurements of the selected electromagnetic quantities, preparing a report	2
Lab 6	Performing measurements of the selected optical or quantum quantities, preparing a report	2
Lab 7	Supplementary classes	3
Lab 8	Assessment	1
	Total hours	**15**

TEACHING TOOLS USED
N1 Standard lecture with the use of transparency, slides, demonstrations and presentations of laws / physical phenomena N2 Self-study - preparation for laboratory N3 Laboratory tasks – discussion on performing measurements, analysis of results and estimating measurement uncertainty, reports' evaluation N4 Laboratory tasks - a few minutes written tests prior to the measurements N5 Self-study - self-measurements N6 Self-study - self-study and exam preparation N7 Consultation classes N8 Self-study- preparation for tasks N9 Calculation tutorials – brief, 10 min. written tests N10 Calculation tutorials – discussion on tasks' solutions

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENTS

Evaluation F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U03-PEK_U17, PEK_K01-PEK_K06, PEK_K08	Answering questions discussions, written tests, evaluation of each report
F2	PEK_W01-PEK_W14, PEK_W17 PEK_U01-PEK_U14, PEK_U17, PEK_K01, PEK_K03-PEK_K06, PEK_K08	Oral and written exam
P = F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] D. Halliday, R. Resnick, J. Walker, Podstawy fizyki, tomy 1-5., Wydawnictwo Naukowe PWN, Warszawa 2003; J. Walker, Podstawy fizyki. Zbiór zadań, PWN, Warszawa 2005.

[2] I.W. Sawieliew, Wykłady z fizyki, tom 1. i 2., Wydawnictwa Naukowe PWN, Warszawa, 2003.

[3] R. Poprawski, W. Salejda, Ćwiczenia laboratoryjne z fizyki, Cz. I-IV, Oficyna Wydawnicza PWr; wersja elektroniczna 5. wydania cz. 1. dostępna po kliknięciu nazwy Zasady opracowania wyników pomiarów z witryny Dolnośląskiej Biblioteki Cyfrowej; wersje elektroniczne pozostałych części podręcznika dostępne na stronie internetowej LPF pod adresem http://www.if.pwr.wroc.pl/LPF , gdzie znajdują się: regulamin LPF i regulamin BHP, spis ćwiczeń, opisy ćwiczeń, instrukcje robocze, przykładowe sprawozdania i pomoce dydaktycznych.

[4] W. Salejda, Fizyka a postęp cywilizacyjny, opracowanie dostępne w pliku do pobrania pod adresem http://www.if.pwr.wroc.pl/dokumenty/jkf/fizyka_a_postep_cywilizacyjny.pdf

SECONDARY LITERATURE IN POLISH:

[1] J. Massalski, M. Massalska, Fizyka dla inżynierów, cz. 1. i 2., WNT, Warszawa 2008.

[2] J. Orear, Fizyka, tom 1. 2., WNT, Warszawa 2008.

[3] Z. Kleszczewski, Fizyka klasyczna, Wyd. Politechniki Śląskiej, Gliwice 2001.

[4] L. Jacak, Krótki wykład z fizyki ogólnej, Oficyna Wydawnicza PWr, Wrocław 2001; podręcznik dostępny na stronie Dolnośląskiej Biblioteki Cyfrowej.

[5] K. Sierański, K. Jezierski, B. Kołodka, Wzory i prawa z objaśnieniami, cz. 1. i 2., Oficyna Wydawnicza SCRIPTA, Wrocław 2005; K. Sierański, J. Szatkowski, Wzory i prawa z objaśnieniami, cz. 3., Oficyna Wydawnicza SCRIPTA, Wrocław 2008.

[6] Witryna dydaktyczna Instytutu Fizyki PWr; http://www.if.pwr.wroc.pl/index.php?menu=studia zawiera duży zbiór materiałów dydaktycznych

SECONDARY LITERATURE IN ENGLISH:

[1] H.D. Young, R. A. Freedman, SEAR'S AND ZEMANSKY'S UNIVERSITY PHYSICS WITH MODERN PHYSICS, Addison-Wesley Publishing Company, wyd. 10, 2000; wyd. 12. z roku 2007; podgląd do wydania 12. z roku 2008.

[2] D.C.Giancoli, Physics Principles with Applications, 6th Ed., Addison-Wesley, 2005; Physics: Principles with Applications with MasteringPhysics, 6th Ed., Addison-Wesley 2009.

[3] R R. A. Serway, Physics for Scientists and Engineers, 8th Ed., Brooks/Cole, Belmont 2009; Physics for Scientists and Engineers with Modern Physics, 8th Ed., Brooks/Cole, Belmont 2009.

[4] Paul A. Tipler, Gene Mosca, Physics for Scientists and Engineers, Extended Version, W. H. Freeman 2007.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Physics II FZP2072
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01, PEK_W02, PEK_W03	K_W01, K_W03	C1.1	Lec 1, Lec 2	N1, N6, N7
PEK_W01, PEK_W02, PEK_W04	K_W01, K_W03	C1.2	Lec 3	N1, N6, N7
PEK_W01, PEK_W02, PEK_W05	K_W01, K_W03	C1.3	Lec 4, Lec 5	N1, N6, N7
PEK_W01, PEK_W02, PEK_W06, PEK_W07	K_W01 K_W03,	C1.4	Lec.6	N1, N6, N7
PEK_W01, PEK_W02, PEK_W08	K_W01, K_W03	C1.5	Lec 7	N1, N6, N7
PEK_W01, PEK_W09	K_W01 K_W03,	C1.6	Lec 8	N1, N6, N7
PEK_W01, PEK_W10	K_W01, K_W03	C2.1	Lec 9	N1, N6, N7
PEK_W01, PEK_W11	K_W01, K_W03	C2.2	Lec 10-Lec 12	N1, N6, N7
PEK_W01, PEK_W12	K_W01, K_W03	C2.3	Lec 13	N1, N6, N7
PEK_W01, PEK_W13	K_W01, K_W03	C2.4	Lec 14	N1, N6, N7
PEK_W01, PEK_W14	K_W01, K_W03	C2.5	Lec 15	N1, N6, N7
PEK_U03-PEK_U12, PEK_U15, PEK_U16, PEK_U17	K_W01, K_U05, K_U04	C3, C4.1-C4.4, C5	Lab 1-Lab 15	N1-N7
PEK_K01-PEK_K08	K_W01, K_W03	C5	Lec 1-Lec 15 Lab 1-Lab 15	N1-N7

SEMESTER 4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geologia Złożowa i Górnicza
Name in English: Mineral Deposit and Mining Geology
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GEG4103
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15	15	
Number of hours of total student workload (CNPS)	60		30	60	
Form of crediting	Examination		crediting with grade	crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points	2		1	2	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2		0.5	1	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses knowledge of basic geology, mineralogy and petrology.

SUBJECT OBJECTIVES

C1 Acquisition of basic concepts regarding deposit geology and mining geology and also systematic knowledge of the mineral resources deposits and their excavations in Poland.
C2 Acquisition of knowledge regarding the origins and forms of the deposits, quality parameters of the minerals and directions of their usage.
C3 Acquisition of knowledge regarding the basis of deposits classification and documentation and also methods of their search and recognition.
C4 Ability to carry out macroscopic identification and geological characterization of the most important minerals and their main varieties and also the analysis of the basic geological parameters of deposits and minerals.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge :

PEK_W01 is able to define the main concepts of deposit geology and mining geology, possesses the fundamental knowledge regarding the origins of deposits

PEK_W02 possesses knowledge of the forms of deposits, varieties and directions of their usage in Poland.

PEK_ W03possesses the fundamental knowledge regarding the methods of deposits classification and their documentation, and also their search and recognition as well as geological service of mines

relating to skills:

PEK_U01 recognizes and characterizes, on the basis of macroscopic properties, main varieties of minerals in Poland, is able to indicate minerals varieties of different qualities

PEK_U02 carries out simple analysis of aggregates and piece samples

PEK_U03 is able to determine the position of structural surfaces in the deposit, performs analyses of the involvement of tectonic deposits, sets parameters of rocks severability

PEK_U04 applies calculation methods which enable to determine parameters changeability of minerals and deposits

relating to social competences:

PEK_K01 understands the importance of minerals deposits for the economy of the country

PROGRAMME CONTENT		
Form of classes – lecture		**Number of hours**
Lec 1	Introduction of basic concepts, geological conditions of deposits	1
Lec 2	Search and recognition of deposits, categories of recognition	2
Lec 3	Types of deposits, genetic and industrial classification of deposits	2
Lec 4	Origins of deposits	4
Lec 5	Raw rock	5
Lec 6	Chemical Raw materials	2
Lec 7	Introduction to concepts of deposits of ores, copper and silver deposits	2
Lec 8	Zinc and lead deposits, other ore deposits in Poland	1
Lec 9	The creation of coal, domestic deposits of hard coal and lignite	3
Lec10	Origins of bitumen deposits , the regions of bitumen mining in Poland	2
Lec 11	Deposit classifications, criteria for deposit economic viability	2
Lec 12	Maps and deposit cross sections, the basis of deposit resources calculations, the principles of deposit documentation	
Lec13	Geological service of mines; geological premises of natural threads of deposits exploitation.	2
	Total hours	**30**

Form of classes – laboratory		Number of hours
Lab 1	Introduction to macroscopic characteristics which enable to recognize domestic mineral rock resources and their main varieties (coal lithotypes, varieties of crude oil, varieties of ores and crust minerals, hard salts and potassium- magnesium salts, sulphur deposits, aggregates, clay raw materials and carbonaceous materials, natural aggregates and special sands, and others); discussing the properties of solid minerals and determining their quality; directions of their usage and pre-treatment; discussing basic physical and mathematical and also chemical properties of other minerals	9
Lab 2	Test – testing the level of acquisition of L1 material	1
Lab 3	Practical exercises – petrographic analysis of different aggregates and petrographic description of minerals samples (raw materials in lumps, furrow, cores drilling samples, etc.)	5
	Total hours	**15**

Form of classes - project		Number of hours
	Introduction to classes Proj 1	2
Proj 1	Statistical and graphic analysis of natural divisibility of rocks, mining analysis of obtained picture	6
	Introduction to task Pr2	1
Proj 2	Analysis of different parameters of a deposit or mineral using the chosen research method	5
	Total hours	**15**

TEACHING TOOLS USED
N1. Traditional lecture with the use of multimedia presentations N2. Facilities of the geological laboratory N3. Specialized software supporting project development

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENTS

Evaluation (F – forming (Turing semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01-PEK_W03	Final oral exam
F1	PEK_U01	Written test
F2	PEK_U02	The grade (average) for reports of practical laboratory exercises
P2	PEK_U02-PEK_U03	Final grade as a weighted average F1 (65%) and F2 (35%)
F4	PEK_U04	The grade for completing project exercise Pr1
F5	PEK_U05	The grade for the report of completing project exercise Pr2
P3	PEK_U04-PEK_U05	Final grade as an average of F4 and F5

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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[2] Smirnow I.; Geologia złóż kopalin użytecznych, Wyd. Geol., 1986.
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[5] Kozłowski S.; Surowce skalne Polski, Wyd. Geol., Warszawa, 1986.
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[10] Praca zbiorowa; Bilans zasobów kopalin i wód podziemnych w Polsce (rocznik), PIG, Warszawa.
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SECONDARY LITERATURE:

[1] Dziedzic K. (i in.) (red.); Surowce mineralne Dolnego Śląska, Wyd. PAN, 1979.
[2] Praca zbiorowa; Bilans gospodarki surowcami mineralnymi Polski i świata (rocznik), PAN, Kraków.
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[5] Bolewski A., [red.]; Metody badań minerałów i skał, Wyd. Geol., 1988.
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MATRIX OD CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mineral Deposit and Mining Geology
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W20	C1	Lec 1 – Lec 4	N1
PEK_W02	K_W20	C2	Lec 3, Lec 5 – Lec 10	N1
PEK_W03	K_W20	C3	Lec 2, Lec 3 Lec 11 – Lec 13	N1
PEK_U01	K_U18	C4	Lab 1	N2
PEK_U02	K_U18	C4	Lab 2	N2
PEK_U03	K_U18	C4	Proj 1	N3
PEK_U04	K_U18	C4	Proj 1, Proj 2	N3
PEK_K01	K_W20, K_U18	C1	Lec 3, Lec 5 – Lec 10	N1

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geofizyka Stosowana
Name in English: Applied Geophysics
Main field of study: mining and geology
Level and form of studies: 1st level, full -time
Kind of subject: obligatory
Subject code: GGG 4108
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15			15	
Number of hours of total student workload (CNPS)	60			60	
Form of crediting	Examination			crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points	2			1	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2			0.5	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of physics at the level necessary to understand and describe phenomena and physical fields present in the geosphere.
2. Knowledge of mathematical analysis at the level necessary to understand mathematical concepts in the sciences of an engineering character.
3. Knowledge of fundamental concepts relating to the soil mechanics.
4. Knowledge of fundamental concepts relating to mining and mineral deposits present in Earth's lithosphere.
5. Knowledge of basic rock physical-mechanical properties.

SUBJECT OBJECTIVES

C1 Becoming familiar with the aim and subject of the research of descriptive and applied geophysics, including rock basic physical properties and also phenomena and physical fields present in the geosphere.
C2 Becoming familiar with the physical and geological basis of applied geophysics methods.
C3 Introducing surface and well logging geophysical methods of mineral deposits recognition and search.

C4 Introducing equipment and fieldwork research methodology in surface seismic, gravimetric, electrometric, and magnetic methods.
C5 Introducing issues and problems related to geophysical measurements in the borehole.
C6Introducing problems related to geophysical methods used in underground and open pit mining to monitor the condition of natural and mining hazards.
C7 Acquiring skills of processing and interpreting, at basic level, geophysical field work results.
C8Acquiring skills of analysing the results of Project work (paper report).

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge :

PEK_W01 Describes and explains rock physical basic properties, phenomena and physical fields present in the geosphere.
PEK_W02 Differentiates and describes surface and well logging geophysical methods of mineral deposits recognitions and search.
PEK_W03 Recognises the equipment used for geophysical research and explains how it works.
PEK_W04 Describes the methodology of geophysical field work research and their prospective efficacy and applications.
PEK_W05 Describes the methodology of geophysical research used in mining for monitoring natural and mining hazards.
PEK_W06 Explains the ways of processing and interpreting geophysical research results.

relating to knowledge:

PEK_U01 Processes results of geophysical surface field work research carried out with the use of the gravimetrical method and the refractive seismic method.
PEK_U02 Interprets geophysical surface field work research results carried out with the use of the gravimetrical method and the refractive seismic method.
PEK_U03Is able to analyse the results of project work in the form of a written report.

relating to social competences:

PEK_K01Understands the role and notices the necessity for application geophysical methods in mineral deposits recognition and search and also in mining.
PEK_K02Is aware of the importance and understands non-technical aspects and geophysical research consequences, including their influence on environment and emerging responsibility for ma king decisions related to this problem.
PEK_K03 Understands the necessity to formulate opinions and inform society about the achievements of applied geophysics, as one of basic methods for mineral deposits recognition and search and natural and mining hazards monitoring in mining.

PROGRAMME CONTENT		
Form of classes – lecture		**Number of hours**
Lec 1	The scope of the lecture, conditions of crediting, literature. The research subject of descriptive and applied geophysics. The overview of rock physical properties. Classification of geophysical methods. Complex geophysical researches. The methodology of geophysical measurements.	2
Lec 2	Reflexive seismic (2D, 3D technology). Physical basis. Equipment. The methodology of fieldwork research. Processing and interpretation of fieldwork measurements. Prospective efficacy and applications.	2
Lec 3	Refractive seismic. Physical basis. Equipment. The methodology of fieldwork research. Processing and interpretation of fieldwork measurements. Prospective efficacy and applications.	2
Lec 4	Gravimetric methods. Physical basis. Equipment. The methodology of fieldwork research. Processing and interpretation of fieldwork measurements. Prospective efficacy and applications.	2
Lec 5	Electric exploration methods. Physical basis. Equipment. The methodology of fieldwork research. Processing and interpretation of fieldwork measurements. Prospective efficacy and applications.	2
Lec 6	Well logging. The overview of methods. Equipment. The methodology of research. The rules of fieldwork research results processing and interpretation. Applications.	1
Lec 7	Mining geophysics. Mining seismology. Mining seismic. Mining micro-gravimetric methods.	2
	Total hours	**15**

Form of classes - project		**Number of hours**
Proj 1	The scope of a Project, conditions of crediting, literature. Discussing the guidelines for the project titled: Gravimetrical methods. Gravimetrical anomalies measurements, solution of a simple and reverse geophysical task (quantitative interpretation of gravimetrical anomalies). Distribution of individual tasks for students.	1
Proj 2	Discussing the physical basis of gravimetric research. Introduction of methodology of determination of gravity anomalies in Bouguer's reduction. Discussing the basis of quantitative and qualitative interpretation of gravimetrical anomalies. Explaining how to solve simple and reverse geophysical task.	4
Proj 3	Written test on discussed concepts of gravimetric methods. Students' individual work on a project.	3
Proj 4	Discussing the guidelines for the Project: Refractive seismic. The interpretation with the convergent hodographs method. Distribution of individual project topics among students. Presenting the basis of physical seismic research. Discussing the methodology of interpretation on the basis of convergent time travel equations (hodographs).	4
Proj 5	Written test on discussed issues of refractive seismic. Students' individual work on a project.	3
	Total hours	**15**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem lecture. N2. Multimedia presentations. N3. Discussion during lectures and projects. N4. The collection of fieldwork measurements of gravimetrical anomalies. N5. The collection of fieldwork measurements with the use of refractive seismic method. N6. Project preparation- report. N7. Consultations

EVALUATION OF SUBJECT EDUCATIONAL EFFECT ACHIEVEMENTS

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01-PEK_W06	The final grade for the exam in the form of a written test.
F1	PEK_U01-PEK_U03	The grade for project completion and proper merit
F2	PEK_U01-PEK_U03	The grade for a written test including Project issues.
P2 the final grade for the Project (the weighted average of two projects : 50% of F1 and 50% of F2)		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Burger H.R., Sheehan A.F., Jones C.H., 2006. Introduction to Applied Geophysics: Exploring the Shallow Subsurface. W.W. Norton & Company, Inc.

[2] Drzęźla B., Dubiński J., Fajklewicz Z., Goszcz A., Marcak H., Pilecki Z., Zuberek W.M. (red.), 1994. Poradnik geofizyka górniczego. Tom 1. Wydawnictwo CPPGSMiE PAN. Kraków.

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[4] Drzęźla B., Dubiński J., Fajklewicz Z., Goszcz A., Marcak H., Pilecki Z., Zuberek W.M. (red.), 1996. Poradnik geofizyka górniczego. Tom 3. Wydawnictwo CPPGSMiE PAN. Kraków.

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[13] Mendecki A.J. (ed.), 1997. Seismic Monitoring in Mines. Chapman & Hall.

[14] Mortimer Z., 2004. Zarys fizyki Ziemi. Wydawnictwa AGH. Kraków.

[15] Plewa S., 1972. Geofizyka wiertnicza. Wydawnictwo Śląsk. Katowice.

SECONDARY LITERATURE:

[1] Fowler C.M.R., 2005. The Solid Earth. An Introduction to Global Geophysics. Cambridge University Press.
[2] Milsom J., 2003. Field Geophysics. John Wiley & Sons Ltd.
[3] Reynolds J.M., 2011. An Introduction to Applied and Environmental Geophysics. Wiley – Blackwell. John Wiley & Sons.
[4] Stenzel P., Szymanko J., 1973. Metody geofizyczne w badaniach hydrogeologicznych i geologiczno-inżynierskich. Wydawnictwa Geologiczne. Warszawa.
[5] Telford W.M., Geldart L.P., Sheriff R.E., 1990. Applied Geophysics. Cambridge University Press.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Applied Geophysics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W20	C1, C2	Lec 1	N1-N3
PEK_W02	K_W20	C3, C5	Lec 2-Lec 6	N1-N3
PEK_W03	K_W20	C4	Lec 2-Lec 6	N1-N3
PEK_W04	K_W20	C3	Lec 2-Lec 6	N1-N3
PEK_W05	K_W20	C6	Lec7	N1-N3
PEK_W06	K_W20	C3, C7	Lec 2-Lec 6, Proj 3, Proj 5	N1-N3
PEK_U01	K_U18	C7	Proj 1-Proj 5	N1-N5, N7
PEK_U02	K_U18	C7	Proj 1-Proj 5	N1-N5, N7
PEK_U03	K_U18	C8	Proj 3, Proj 5	N6

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Wiertnictwo
Name in English: Drilling Technology
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG4103
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30				
Number of hours of total student workload (CNPS)	60				
Form of crediting	crediting with grade				
For group of courses mark (X) final course					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student is familiar, at basic level, with the structure and texture of rocks and their physical and mechanical features.
2. The student is familiar, at elementary level, with utilised mineral resources in Earth crust.

SUBJECT OBJECTIVES

C1 Presenting information about drilling as one of the main methods applied to search for, identify and excavate mineral deposits and to perform various engineering works.

C2 Acquainting students with various drilling technologies and techniques as well as with the drilling equipment.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 - Differentiates horizontal and directional drilling applied for exploration, excavation and engineering purposes, including shaft and tunnel drills.

PEK_W02 - Is familiar with the analysis and testing conducted in boreholes

PEK_W03 - Is familiar with legal and ecological aspects of drilling works.

relating to social competences:

PEK_K01 – Understands the necessity to promote social, economic and ecological aspects of drilling activity.

PEK_K02 – Understands the need to formulate and present information and opinions about specific aspects of drilling technologies as a tool applied to explore and excavate mineral deposits.

PROGRAMME CONTENT

Form of classes - lecture		Number of hours
Lec 1	History of drilling	2
Lec 2	Key terminology and classification of drillings.	2
Lec 3	Impact and manual drillings.	3
Lec 4	Rotary drillings of standard diameter.	8
Lec 5	Construction of hydro-geological, oil/petroleum and leach boreholes.	4
Lec 6	Off shore drilling, oil platforms.	2
Lec 7	Small-diameter and large-diameter drilling for various engineering purposes.	4
Lec 8	Boreholes research and measurements.	3
Lec 9	Legal, formal and ecological aspects of drilling technology.	2
	Total hours	**30**

TEACHING TOOLS USED

N1. Traditional lecture with multimedia presentations.

N2. Presentation of exhibits (core samples, augers, filters)

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01-PEK_W03	Crediting on the basis of a written test results.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Cząstka J.: Wiertnictwo. Wyd. Śląsk, Katowice 1969
[2] Wojnar K.: Wiertnictwo. Technika i technologia. Wyd. AGH, Kraków 1997
[3] Wojnar K., Władisławlew W.S.: Wiertnictwo. Wyd. Geol. Warszawa 1976

SECONDARY LITERATURE:

[1] Gonet A., Stryczek S., Rzyczniak M.: Projektowanie otworów wiertniczych. Wyd. AGH Kraków, 2004
[2] Jewulski J.: Napowierzchniowe zagospodarowanie złóż kopalin ciekłych. Wyd. AGH, Kraków, 2003
[3] Jewulski J.: Metody intensyfikacji wydobycia płynów złożowych. Wyd AGH, Kraków 2007
[4] AGH Drilling, Oil, Gas (czasopismo). Wyd AGH, Kraków. Dostępne w pdf na stronie http://journals.bg.agh.edu.pl/
[5] AGH Górnictwo i Geoinżynieria (czasopismo). Wyd. AGH Kraków. Dostępne w pdf na stronie http://journals.bg.agh.edu.pl/

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Drilling Technology
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01 PEK_W02 PEK_W03	K_W21	C1, C2	Lec1-Lec 9	N1, N2
PEK_K01	K_K02	C1	Lec1-Lec 9	N1
PEK_K02	K_K07	C1	Lec1-Lec 9	N1

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Przeróbka kopalin I
Name in English: Mineral Processing I
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG4104
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30				
Number of hours of total student workload (CNPS)	90				
Form of crediting	crediting with grade				
For group of courses mark (X) final course					
Number of ECTS points	3				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	3				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student possesses basic knowledge of general chemistry (organic and inorganic) and physics.
2. The student possesses elementary knowledge of mineralogy and petrology.
3. The student possesses basic mathematical knowledge and skills.
4. The student has mastered basic concepts of deposit and mining geology.

SUBJECT OBJECTIVES

C1. The objective of this course is to familiarise students with the basics of different types of processing methods and characteristic features of mineral processing including its description, analysis, evaluating and comparison of separation results.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Possesses knowledge and skills in the field of mineral processing characteristics

PEK_W02 – Is familiar with selection and application of methods of ore deposits enrichment in order to obtain materials that are further uses in steelworks, chemical industry, construction materials industry etc.

relating to skills:

PEK_U01 – Is able to search for information about physical and physicochemical mineral processing, evaluate and analyse it.

PEK_U02 – Is capable of proper selection and description of mineral resources processing method

relating to social competences:

PEK_K01 – Is able to formulate and pass on the knowledge about processing and use of mineral resources and recyclable material

PROGRAMME CONTENT

Form of classes - lecture		Number of hours
Lec 1	Introduction to the course, terms of crediting, the matter of mineral processing. From Big Bang to mineral deposits. Mineral deposits and their characteristic features.	2
Lec 2	Analysis, delineation and evaluation of separation processes.	2
Lec 3	Separation described as enrichment.	2
Lec 4	Separation described as classification.	2
Lec 5	Comminution (size reduction). Screening.	2
Lec 6	Hydraulic and pneumatic classification.	2
Lec 7	Separation in thin layer of medium (film separation).	2
Lec 8	Gravity separation (heavy medium separation).	2
Lec 9	Magnetic separation.	2
Lec 10	Electrical separation.	2
Lec 11	Principles of flotation.	2
Lec 12	Flotation of mineral materials.	2
Lec 13	Coagulation.	2
Lec 14	Floculation.	2
Lec 15	Oil agglomeration.	2
	Total hours	**30**

TEACHING TOOLS USED

N1. Traditional form of lecture supported by multimedia presentations and discussions.
N2. Consulting.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01-PEK_W02 PEK_U01-PEK_U02 PEK_K01	Final written assessment

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Wills B.A., Mineral processing technology. Pergamon Press, 1983 (3rd edition) i wszystkie wydania następne)
[2] Blaschke Z. i inni, Górnictwo Cz.V. Zarys technologii procesów przeróbczych, Skrypt AGH, Kraków, 1983
[3] Laskowski J, Łuszczkiewicz A., Przeróbka kopalin. Wzbogacanie surowców mineralnych. Skrypt Politechniki Wrocławskiej, Wrocław 1989
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[5] Kelly E.G., Spottiswood D.J., 1982. Introduction to Mineral Processing, Wiley, New York

SECONDARY LITERATURE:

[1] Bolewski A., Manecki A. Mineralogia szczegółowa. Wyd. PAE, Warszawa, 1993.
[2] Industrial minerals and rocks, 6th edition, D.D. Carr (editor), Soc. Min, Metall. Explor., Littleton, Col., 1994.
[3] Manecki A. Encyklopedia minerałów. Uczelniane Wydawnictwa Naukowo-Dydaktyczne, Kraków, 2004.
[4] Internet sites.
[5] Magazines on mineral processing.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mineral Processing I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01 PEK_W02	K_W22	C1	Lec 1-Lec 15	N1, N2
PEK_U01 PEK_U02	K_U19	C1	Lec 1-Lec 15	N1, N2
PEK_K01	K_K07	C1		

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Mechanika Górotworu
Name in English: Rock Mass Mechanics
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG4109
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15	15	
Number of hours of total student workload (CNPS)	90		30	90	
Form of crediting	Examination		crediting with grade	crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points	3		1	3	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	3		0.5	2	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses fundamental knowledge of mathematical analysis necessary to understand mathematical problems in the sciences of an engineer character.
2. Possesses fundamental knowledge in the area of mining, as one of the most important fields of technical and economic human activity.
3. Knows basic concepts of deposit and mining geology, is able to present and characterize lithological profile in main mining areas.
4. Possesses ability to carry out statistical calculations of simple rod systems (beams, frames, arches) present in underground and ground structures of mining objects.
5. Is able to discuss simple cases of strength, discuss cases statistically undeterminable.
6. Possesses knowledge of the elements of the theory of elasticity and its usage in strength hypotheses, useful in the design of basic engineering structures.
7. Possesses knowledge of mechanical properties of grounds, their structure and classification. Knows geoengineering methods of recognition of physical-mechanical properties of grounds and state of stress, deformations and displacements in grounds.
8. Is able to use Microsoft Office in order to prepare Word documents, multimedia presentation in Power Point and work with spreadsheet Excel.
9. Understands the necessity and knows possibilities of continuous learning (second and third level studies, postgraduate studies, courses), increasing professional, personal and social competences.

SUBJECT OBJECTIVES

C1 - Becoming familiar with the role and tasks of rock mass mechanics as a basic tool for explaining phenomena taking place in underground mining and for prognosis and prevention from natural danger appearing as a lack of mass rock stability after carrying out underground mining excavation

C2 - Becoming familiar with methods and assessment of mass rock endurance as a place where mining excavations take place. Taking the advantage of the results of laboratory research of rocks and the classification of geomechanical stockworks and strength criteria in order to build theoretical elastic-plastic model of mass rock mapping the behaviour and strength of the real one.

C3 - Becoming familiar with the principles of geomechanics as a science necessary to solve issues connected with the state of stability of mass rock under influence of mining works. Presenting, using widely known theories: theory of elasticity and plasticity, limit state theory and others, mathematical description of changes of primary mass rock state of tension because of the influence of underground mining work.

C4 - Presentation and explanation of the issues related to determining the state of stress and displacements in mass rock in the neighbourhood of excavations using the models of mass rock: elastic and plastic weakened properly to the depth of excavation placing.

C5 - Becoming familiar and understanding prognostic methods of the loss of mass rock stability around excavations, and acquiring the ability of proper assessment of loads on mining supports of excavations taking into consideration the cooperation with the surrounding mass rock.

C6 - Becoming familiar with the problems of quakes and crumps as phenomena of a sudden loss of mass rock stability and presenting hypotheses and theories describing crumps as geomechanical phenomena.

C7 - Becoming familiar with theories regarding exploitation pressure and presenting the state of stress in mass rock in the neighbourhood of underground wall excavations

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge :

PEK_W01 -Possesses knowledge of the theory of elasticity and uses it to mathematical description of phenomena taking place in mass rock after carrying out underground excavations. Is able to analyse the changes of primary state of tensions, understands the essence of these changes and is able to present on the graph the distribution of tensions around an excavation and carry out analysis of its development. To solve the tasks, depending on the depth of excavation placing, uses models respectively elastic and elastic and plastic implementing Coulomb-Mohr, Hoek–Brown and Saint-Venant criteria. Understands and is able to present the relationships between the tension and displacement in mass rock around corridor excavations.

PEK_W02 -Possesses fundamental knowledge in order to assess properly the condition of natural hazard in underground mining, to make prognosis the way of indicating and assessment of loads on the corridor excavation support placed on small or big depth. Understands the role of supports in loads shifting and explains how the support cooperates with the surrounding mass rock. Is also able to design the way of indicating the loads on shaft support and is able to present their development on the graph along geological profile.

PEK_W03 -Possesses general knowledge and understands what the crump is and what causes the sudden loss of mass rock stability. Is able to present the energy criterion of crump occurrence and characterize theories describing crumps as a geomechanical phenomenon.

PEK_W04 -Possesses general knowledge of theories of exploitation pressure occurrence in the neighbourhood of underground excavations. Is able to apply Budryk theory of wave pressure and beam theory on the elastic ground to comment on the problem, and also is able to take into consideration the ways of exploitation and present the solution and the distribution of tension in mass rock analysing the course of exploitation pressure.

relating to skills :

PEK_U01 -Is able to apply knowledge in the scope of geotechnical materials and use the laboratory methods for physic and mechanical properties research as well as deformation properties of rocks to be able to assess endurance and stability of mass rock surrounding the underground mining excavations. Is able to carry out the analysis of the course of the total characteristic of rock stress and deformation and indicate its parameters necessary to build a theoretical rock model as an elastic and plastic body with the weakening and also is able to use rock research results in triaxial state of compressive stress to set strength criteria parameters of rocks useful in geomechanics.

PEK_U02 -Is able to apply geomechanical classifications of stockwork in order to assess the quality and strength of mass rock, in which mining excavations and tunnel excavations are made including RMR (Rock Mass Rating) and GSI (Geological Strength Index) and is able to use them to determine parameters of Hoek - Brown i Coulomb –Mohr endurance criteria, to simplify the procedure is able to use RocLab.

PEK_U03 -Is able to work out and present the results of project work in the form of a completed project titled: "the assessment of loads acting on a corridor excavations support" presented in the form of paper elaboration. Acquires intuition necessary to assess the mass rock stability surrounding mining excavations due to preparing the project using real data regarding mining and geological conditions.

relating to social competences:

PEK_K01 –Is able to work in a team and prepare and run rock examination collectively and also work out the obtained results and present the results of the research in the form of collective paper report. Knows basic equipment used in laboratory to examine mechanical and deformation rock properties, including those for material characteristic examination in after destruction condition ,and also to examine rocks in triaxial state of compressive stress

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Syllabus, conditions for course completion, literature. The role of mass rock mechanics as a basic tool used in order to explain, predict and fight with the natural hazards in underground mining. The aim and methods of mass rock properties research, which is treated like a centre, in which and from which underground mining excavations are built.	2
Lec 2	Methodology of physical and mechanical rock parameters research necessary to assess the stability of mass rock. The basic physical properties: bulk density and proper density, bulk absorption and absorption by weight, slakeability. Basic parameters of rock endurance and analysis of factors which influence on these properties.	2
Lec 3	Rock stress-deformation characteristics before and after destruction, equipment and conditions necessary to carry out research. Process parameters and construction of an elastic and plastic rock model.	2
Lec 4	Practical importance of rock endurance criteria. Detailed analysis of the utility of Coulomb-Mohr and Hoek-Brown and de Saint-Venant criteria. Analytical and graphic model and ways of parameters denomination of these criteria.	2
Lec 5	Geomechanical classifications of stockworks and their utility in assessment of quality and strength of mass rock in which a mining excavation in made. Classifications: Laufer, RQD (Rock Quality Designation), Barton (Q-Quality Index), Bieniawski (RMR - Rock Mass Rating) i Hoek (GSI - Geological Strength Index). Presentation and usage of computer program RocLab to assess mass rock	2

	quality and endurance.	
Lec 6	Mass rock models: elastic and also elastic and plastic with the weakening showing stockwork behaviour around underground mining excavations, model parameters in uniaxial and triaxial state of stress. Mass rock strength characteristics using criteria and geomechanical characteristics of stockwork.	2
Lec 7	Primary state of stress in an untapped mass rock, ground stockwork (non-rocky) and made of rock, the course of stress along the geological profile. Generalized Hook's law, ranking equilibrium, pressure and resistance. Explaining situations in which horizontal stress is bigger than vertical.	2
Lec 8	Stress distribution in the neighbourhood of corridor excavations and tunnel excavations – solutions according to the theory of stress, the Kirsch concept, the influence of the excavations shape and boundary conditions. Presentation and analysis of solutions for excavations with circular, elliptic and rectangular cross section	2
Lec 9	The state of stress and deformations in the neighbourhood of corridor mining excavations made in the hydrostatic state of primary stress - presentation of Lame's solution.	2
Lec 10	Cooperation between the support and mass rock in corridor excavations, the role of support in protection mass rock stability. The system- support-mass rock, elastic characteristics of the support and mass rock.	2
Lec 11	Determining the state of stress and displacements in mass rock in the neighbourhood of corridor excavations placed very deeply, below the critical depth, applying, as destruction conditions, Coulomb-Mohr, Hoek-Brown and Saint-Venant criteria. Stress distribution in calculation zones assigned around the excavation.	2
Lec 12	Load characteristics of the excavation support made very deeply – deformation and static influence as load components. Determining the relationship between the ranges of destroyed zone and excavation clinching. The analysis of the development of load on the excavation roof support considering the characteristics of used support.	2
Lec 13	The assessment of load on vaulted and coating support of corridor excavations according to standards PN-G/05020 and PN-G/05600. Discussing issues regarding the loads on the shaft support according to standard PN-G/05016, the graph of loads along the geological profile.	2
Lec 14	Dynamic phenomena in mass rock- a crump as a geomechanical phenomenon related to the sudden loss of mass rock stability around mining excavations. Presentation of energy criterion of the crump origin, determining factors which influence on the danger of crumps and giving theories and hypotheses describing this phenomenon.	2
Lec 15	The state of stress in mass rock in the neighbourhood of underground wall excavations, classification of roof rocks, theories concerning the causes of exploitation pressure. The Budryk wave pressure theory – wall exploitation with the cover caving, the Sałtusowicz solution- wall exploitation with lofting and taking into consideration the working space. The beam theory on the elastic ground (Ozog's solution) – taking into consideration the bending moment and shearing forces.	2
	Total hours	**30**

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Form of classes - laboratory		Number of hours
Lab 1	The range and type of laboratory research to be carried out Turing laboratory classes, conditions of giving credits, literature. Presentation of the laboratory classes on mass rock mechanics and becoming familiar with research standpoints. Dividing students into research teams and distributing tasks to be prepared and completed collectively. Equipment for research. Becoming familiar with the equipment for the rock processing, preparing laboratory samples to be examined.	1
Lab 2	Discussing research methods of rock tensile strength R_r. Examination of rock strength for uniaxial compression "the method of well-formed attempts" Observation and explanation of the destruction process during examination of rock samples in the air-dry state and in the state of water saturation. Observation of the results and the process of destruction using dynamic load. Goal: determining bulk density, porosity and absorption by weight of rocks, determining the compression strength and deformation module and also assessment of the influence of water accumulation on these parameters.	2
Lab 3	Discussing research methods of rock tensile strength R_r. Performing the research using "the Brazilian method". Discussing the research methods of rock bending strength R_g. Analysis of calculations results using for examination the "method of small beams" depending on the scheme of loads. Carrying out the examination of rock bending strength using the "discs method"	2
Lab 4	Examination of rock shear strength, the methodology of research. Using methods: "simple shear" and "in the holder". Determining the parameters of the shear process: the angle of inner friction ϕ and cohesion c and their physical interpretation.	2
Lab 5	The measurement and description of the complete stress-deformation characteristic before destruction. Carrying out the examination in the process of the cycle load: load-unload-load to destruction and determining the parameters of the process: rock tensile strength R_c, deformation module $E_{o,}$ elasticity module E_s, Poisson's ratio ν and energy indicator of rock tendency to crumps Wet. Drawing and analysis of the process of stress-deformation characteristic of the examined rock.	2
Lab 6	The measurement and description of the complete stress-deformation characteristic of rocks before and after destruction in the conditions of static loads, the stiffness of the loading system and the way of load control. Determining the complete stress-deformation characteristic of rock and determining parameters: uniaxial compression strength R_c, residual strength $R_{cr,}$ elasticity module E_s, deformation module after destruction M. Rock parameters in conditions of dynamic loads. The structure and work of the device for running examinations, types and characteristics of sensors used for deformation and displacement measurement.	2
Lab 7	Discussing the methodology of rock research in triaxial state of compression, the equipment. Experiment with the use of Karman's apparatus and determining parameters of destruction criteria: Coulomb-Mohr i Hoek-Brown. Discussing the way of conducting examinations in the conditions of the real triaxial state of compression.	2
Lab 8	Reports assessment. Test including the methods of basic rock strength and deformation parameters research in order to assess the stability of mass rock around underground mining excavations – credits.	2
	Total hours	**15**

Form of classes- project		Number of hours
Proj 1	The scope of a project, the rules of class completion, literature. Students are given individual project topics. Discussing the guidelines for the project titled: " determining the loads acting on a corridor excavations support placed deeply in given mining-geological conditions"	1
Proj 2	Geological-mining and geotechnical conditions at the excavation placing; determining calculation geotechnical parameters of stockwork according to mining standards. Parameters and endurance characteristic of the rock mass model and determining the calculation scheme of loads.	2
Proj 3	Determining the primary state of stress in mass rock layers where the excavation is placed, illustration of the process of vertical and horizontal stress on the diagram. Discussing and analysis of changes of the primary state of stress and prognosis the local loss of stability after the underground mining excavation has been made – the statistic load of support as a result of the local loss of stability.	2
Proj 4	Discussing the calculation methods of static load, methods: Protodiakonow's, Cymbarewicz's i Sałustowicz's; creation of natural support systems in the form of pressure arch. Introduction to the new model of mass rock, explaining the concepts of an apparent angle of inner friction and an indicator of rock brevity, rock classifi-cation according to Protodiakonow.	2
Proj 5	Discussing and becoming familiar with the methods of load determining on the support of excavations placed deeply. Determining the mass rock load characteristics and the analysis of the process considering deformational and static influence as load components.	2
Proj 6	Discussing and becoming familiar with issues relating to load determination on the support of shallow excavations, calculation models according to Terzaghie and Bierbaumer	2
Proj 7	Students' presentations and the defence of projects.	2
Proj 8	Students give back ready Project, the grades. Test and crediting.	2
	Total hours	**15**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem lecture. N2. Multimedia presentations. N3. Discussion during lectures and projects. N4. Project preparation- report. N5. Project presentation and a test on the problems discussed in a project. N6. Preparation and a report regarding laboratory research. N7. Test on methods and laboratory research and laboratory equipment. N8. Consultations.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENTS

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01-PEK_W04	P1 The grade of final written exam
F, P	PEK_U03 PEK_K01	F1- The grade for completing and proper merit of a project F2- The grade for the presentation or a test covering project content P2- The final grade for the project (the weighted average ofF1 – 70% and F2 - 30%).
F, P	PEK_U01 PEK_W02 PEK_K01	F3- The grade for the preparation and completion of a laboratory research F4-The grade for the written report and the test on the methods of laboratory research and the knowledge of the laboratory equipment P3- The final grade or the laboratory (The weighted average of F3 – 40% and F4 - 60%).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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[2] CHUDEK M., Obudowa wyrobisk górniczych, część I, Obudowa wyrobisk korytarzowych i komorowych. "Śląsk", Katowice 1986.
[3] GAŁCZYŃSKI S., Podstawy budownictwa podziemnego, Oficyna Wydawnicza Pol. Wr., Wrocław 2001
[4] GERGOWICZ Z., Geotechnika górnicza. Skrypt PWr., Wrocław 1974.
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[11] SAŁUSTOWICZ A., Zarys mechaniki górotworu, "Śląsk", Katowice 1968.
[12] WIŁUN Z., Zarys geotechniki, Wyd. Komunikacji i Łączności, Warszawa 1987.

SECONDARY LITERATURE:

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[2] BORECKI M.,CHUDEK M., Mechanika górotworu. "Śląsk", Katowice 1972.
[3] FILCEK H.,KŁECZEK Z.,ZORYCHTA A., Poglądy i rozwiązania dotyczące tąpań w kopalniach węgla kamiennego. Zeszyty Nauk. AGH Górnictwo, nr.123, Kraków 1984.

[4] FRANASIK K., Mechanika górotworu - Zwalczanie zagrożeń od zawałów i tąpań w kopalniach rud miedzi. Skrypt PWr. Wrocław 1978.
[5] HOEK E.,BROWN E. T., Underground Excavations in Rock.Institution of Mining and Met.. London 1980.
[6] IZBICKI R. J., MRÓZ Z., Metody nośności granicznej w mechanice gruntów i skał, Warszawa, PWN 1976
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[10] THIEL K., Mechanika skał w inżynierii wodnej. PWN, Warszawa 1980,
[11] WOJTASZEK A., Metodyka oceny parametrów geotechnicznych dla określenia stateczności podziemnych wyrobisk górniczych, Raport SPR nr.746 Instytut Geot. i Hydr. PWr., Wrocław 1995
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[15] NORMY:
PN-98/B-02481 – Geotechnika. Terminologia podstawowa. Symbole literowe i jednostki miar.
PN-98/B-02479 – Geotechnika. Dokumentowanie geotechniczne. Zasady ogólne.
PN - G- 04200 - Kopaliny. Próbki geologiczne. Ogólne wytyczne pobierania.
PN - G- 04301 - Skały zwięzłe. Pobieranie i przygotowanie próbek do badań własności mechanicznych i technologicznych.
PN - G- 04302 - Skały zwięzłe. Oznaczenie wytrzymałości na rozciąganie metodą poprzecznego ściskania
PN - G- 04303 - Skały zwięzłe. Oznaczanie wytrzymałości na ściskanie z użyciem próbek foremnych.
PN - G- 04304 - Skały zwięzłe. Oznaczanie wytrzymałości na ścinanie proste.
PN - G- 04305 - Skały zwięzłe. Oznaczanie wytrzymałości na zginanie z użyciem próbek foremnych
PN - G- 04306 - Skały zwięzłe. Oznaczanie wytrzymałości na zginanie z użyciem próbek w postaci krążka.
PN - G- 04351 - Grunty skaliste i nieskaliste. Oznaczanie gęstości właściwej szkieletu gruntowego metodą próżniową
BN - 80/8704-15 - Oznaczanie wskaźnika wytrzymałości przy punktowym obciążeniu próbki
PN - G- 05016 - Szyby górnicze. Obudowa. Obciążenia
PN - G- 05020 - Podziemne wyrobiska korytarzowe i komorowe. Obudowa sklepiona. Zasady projektowania i obliczeń statycznych.
PN - G- 05600 - Podziemne wyrobiska korytarzowe i komorowe. Obudowa powłokowa. Zasady projektowania i obliczeń statycznych.
PN-EN 1936 - Metody badań kamienia naturalnego. Oznaczanie gęstości i gęstości objętościowej oraz całkowitej i otwartej porowatości
PN-EN 13755 - Metody badań kamienia naturalnego. Oznaczanie nasiąkliwości przy ciśnieniu atmosferycznym

SUBJECT SUPERVISOR (NAME, SURNAME, E-MAIL ADDRESS

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MATRIX OD CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Rock Mass Mechanics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W23	C1, C2	Lec 1,Lec 2, Lec 3,	N1-N3, N8
PEK_W02	K_W23	C2	Lec 4, Lec 5, Lec 6	N1-N3, N8
PEK_W03	K_W23	C3, C4	Lec 7, Lec 8, Lec 9, Lec 10	N1-N3, N8
PEK_W04	K_W23	C4, C5, C7	Lec 11, Lec 12, Lec 13, Lec 15	N1-N3, N8
PEK_U01	K_U20	C1, C2	Lab 1-Lab 8	N1-N3, N8
PEK_U02	K_U20	C2	Lab 1-Lab 8	N1-N3, N8
PEK_U03	K_U20	C1, C3, C4, C5	Proj 1-Proj 8	N4, N5, N8
PEK_K01	K_K04	C2	Lab 1-Lab 8	N6-N8

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Technika Strzelnicza I
Name in English: Blasting Technique I
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG4110
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30				
Number of hours of total student workload (CNPS)	60				
Form of crediting	crediting with grade				
For group of courses mark (X) final course					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student needs to be familiar with chemistry, physics, technical mechanics, strength of materials and geotechnical engineering in mining.
2. The student needs to be familiar, on elementary level, with basic issues of underground and surface mining technologies.
3. The student has acquired the list of names characteristic for and operative in mining.

SUBJECT OBJECTIVES

C1 Acquainting with the role and tasks of blasting technique in underground and surface mining and engineering works.
C2 Acquiring and comprehending explosion mechanics and its impact, especially on rock mass.
C3 Acquiring theories about the impact of explosion on the rock mass.
C4 Getting familiar with blasting devices – list of names, classification, symbols and principles of their use.
C5 Getting familiar with issues connected with the influence of blasting works on the surroundings of a surface mining site.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 - Has acquired the knowledge about the role and tasks of blasting technique in underground and surface mining and in engineering works.

PEK_W02 - Is familiar with explosion mechanics and its impact, especially on the rock mass.

PEK_W03 - Knows and comprehends theories about the impact of explosion.

PEK_W04 - Has acquired the knowledge about blasting devices used in mining, list of names, classification, symbols and principles of their use.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Course contents, terms of crediting, literature. Key terminology and definitions related to blasting technique.	2
Lec 2	Blasting materials, detonation and other stages of explosion, properties.	2
Lec 3	Physical impact of the explosive charge in the rock mass.	2
Lec 4	Properties of rocks and their characteristic features with relevance to a blasting technique	2
Lec 5	Blasting excavations – classification and preparation.	2
Lec 6	Blasting devices in mining– classification, characterization, requirements, symbols and use.	2
Lec 7	Primary and secondary explosives – classification, characterization, requirements, symbols and their use.	
Lec 8	Blasting equipment and its use.	
Lec 9	Blasting technique in underground mining – works principles, explosive charges, types, initiation, operating in the rock mass	2
Lec 10	Blasting technique in underground mining – blasting operations in drifts and large-diameter workings.	2
Lec 11	Blasting technique in underground mining – blasting works in shafts, direct exploitation sites; special blasting.	2
Lec 12	Blasting technique in surface mining – works principles, explosive charges, types, initiation, operating in the rock mass.	2
Lec 13	Blasting technique in surface mining – methods of blasting, technologies: block forming, aggregate forming, splitting.	2
Lec 14	Blasting in engineering works	2
Lec 15	Dangers connected with blasting techniques adopted in mining.	2
	Total hours	**30**

TEACHING TOOLS USED

N1. Informational lecture with the elements of problem-based lecture.
N2. Multimedia presentations.
N3. Discussion as a part of a lecture.
N4. Consultations.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01-PEK_W04	P1 Final grade for a written test

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Batko P. i inni: Górnicze materiały wybuchowe. Wyd. Centrum PPGSMiE PAN. Kraków, 1993.
[2] Batko P. i inni: Technika Strzelnicza, tom I. Górnicze środki strzałowe i sprzęt strzałowy. Uczelniane Wydawnictwa Naukowo – Dydaktyczne. Kraków, 1999.
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SECONDARY LITERATURE:

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[9] Sulima – Samujłło J: Inżynieria Strzelnicza, Część II i III. Skrypty AGH. Kraków, 1979.
[10] Takuski S: Roboty wiertnicze i strzelnicze w szybach. Wyd. AGH. Kraków, 1969.
[11] Normy:
- PN-C-86020: 1994 Górnicze zapalniki elektryczne. Wymagania.
- PN-C-86024: 1994 Górnicze zapalniki elektryczne. Podział i oznaczenia.
-BN-80/6091-42: Górnicze materiały wybuchowe. Obliczanie parametrów użytkowych.
- BN-89/6091-45/01: Górnicze materiały wybuchowe. Postanowienia ogólne.
- BN-89/6091-45/02: Górnicze materiały wybuchowe. Podział i oznaczenia

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Blasting Technique I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01 - PEK_W04	K_W19, K_W26, K_W35	C1-C5	Lec1-Lec15	N1-N4

SEMESTER 5

FACULTY OF GEOENGINEEIRNING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Podstawy Budowy Maszyn
Name in English: Introduction to Machine Construction
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: MMG5101
Group of courses: YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			15	
Number of hours of total student workload (CNPS)	60			60	
Form of crediting	crediting with grade			crediting with grade	
For group of courses mark (X) final course	X				
Number of ECTS points	2			2	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2			0,5	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

The student is familiar with classical mechanics, oscillating motion, is able to interpret and analyse – basing on physical laws – selected physical phenomena and processes related to classical mechanics and oscillating motion; is familiar with issues concerning strength of materials, types of simple and compound stress, is able to determine constituents of stress, and to determine the effort of material while considering compound stress. The student knows principles of technical drawing and is able to apply them in machine construction record.

SUBJECT OBJECTIVES

C1 Acquiring basic knowledge about mining machinery construction and its application in the subject 'machinery systems in mining,' and in practice while operating the machinery and maintaining their production capacity.

C2 Understands the construction of a machine basing on the record of the machine construction features described in the machine operation manual.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Acquires knowledge than enables competence in proper naming of machine components and subassemblies.

PEK_W02 – Acquires basic knowledge about mining machinery construction that forms the basis for further study of mining machinery systems.

PEK_W03

relating to skills:

PEK_U01 – Is able to assess strength of varied connection systems applied in mining machinery (welded, bolted, pinned)

PEK_U02 – Is able to develop kinematic and dynamic scheme of power transmission system in order to estimate basic kinematic quantities of a system and to formulate motion equations.

relating to social competences:

PEK_K01 – Understands the importance of machinery in machinery systems.

PEK_K02 – Is able to define possible hazards that may occur during machinery systems operation.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Key terminology in machine construction.	2
Lec 2	Welded connections, strength calculation rules, preparation for project number one.	2
Lec 3	Basics of strength calculations for machinery components, preparation for project number two.	2
Lec 4	Basic mechanical units characteristic in a machine work (force, torque, power, work, angular and rotational speed etc.)	2
Lec 5	Single-stage and multiple-stage transmission gears: cylindrical, bevel, worm etc., their importance in machine construction, aim of application, kinematic schemes. Determining basic kinematic quantities and other mechanical units.	2
Lec 6	Planetary gears applied in power transmission systems of mining machinery, schemes, kinematics, and sample calculations of basic kinematic features.	4
Lec 7	Describing components of mechanical system, determining parameters.	2
Lec 8	Mechanical vibration: key terminology, vibration analysis in linear and rotational motion.	3
Lec 9	Dynamics models in single-stage and multi-stage transmission gear.	4
Lec 10	Dynamics models of compound dynamic system.	3
Lec 11	Comprehension check, written works.	4
	Total hours	**30**

Form of classes - project		Number of hours
Proj 1	Selecting construction features for a compound mechanical system with welded joints for varied brackets and different types of welds. Selecting construction features for joints with fixed and loose pins. Discussing the selection of features, team work on results analysis. Presentation of projects.	7
Proj 2	Selecting construction features for a compound mechanical system with bolted, pinned, frictional and welded joints for varied mechanical systems. Discussing the selection of features, team work on results analysis. Presentation of projects.	8
	Total hours	**15**

TEACHING TOOLS USED	
N1	Traditional form of lectures supported by various didactic devices (board, slides, audio-visual equipment)
N2	Comprehension check: written test with calculating task and schemes drawing.
N3	Individual presentations of project work – discussion.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_U01, PEK_U02 PEK_K01, PEK_K02	Inquiring and discussion during project work, discussion and presentation of projects.
P2	PEK_W01, PEK_W02,	Written test in accordance to the lecture contents. P3 final grade, arithmetic mean from P1 and P2

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] J. Dietrych i inni Podstawy Budowy Maszyn W N T Warszawa część I, II, i III.
[2] Poradnik Inżyniera Tom drugi Zagadnienia Konstrukcyjne WNT Warszawa
[3] W. Bartelmus Diagnostyka Maszyn Górniczych Górnictwo Odkrywkowe Śląsk Katowice

SECONDARY LITERATURE:

[1] Katalog Łożysk Tocznych SKF
[2] L. Muller Przekładnie Zębate WNT Warszawa

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Introduction to Machine Construction
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01 PEK_W02	K_W24	C1, C2	Lec1- Lec 11	N1 N2
PEK_U01 PEK_U02	K_U21	C1, C2	Lec1-Lec 11 Proj 1-Proj 2	N1 N3
PEK_K01 PEK_K02	K_K07	C1, C2		N1 N2

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Elektrotechnika
Name in English: Electrotechnics
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: ELG5102
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	60		60		
Form of crediting	Examination		crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	2		2		
including number of ECTS points for practical (P) classes			2		
including number of ECTS points for direct teacher-student contact (BK) classes	1		0,5		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

relating to knowledge:

1. The student is familiar with basics about the properties of functions (trigonometric, power, exponential, and logarithmic), differential calculus and indefinite integral of a single variable function, necessary to comprehend mathematical issues related to engineering work.
2. The student is familiar with basics of electromagnetism (electrostatics, electric current, magneto-statics, electromagnetic induction, electromagnetic radiation, optics).

relating to skills:

1. The student is capable of proper and effective application of their knowledge of differential and integral calculus of function of one/single variable to analyse quality and quantity of mathematical issues related to engineering.
2. The student is capable of proper and effective application of learnt physical principles and laws to analyse quality and quantity of physical issues related to engineering work.

relating to social competences:

1. The student is aware of the necessity of continuous development of their skills (second and third level studies, post diploma studies, courses), raising professional, personal and social competences.

SUBJECT OBJECTIVES

C1 Acquisition of basic knowledge necessary to comprehend physical phenomena connected with electric current.

C2 Awareness of possibility to apply methods, techniques, and tools/instruments used in electrotechnics to engineering work in mining industry.

C3 Acquiring the skill to apply measuring methods of steady states in one-phase and three-phase electric circuits.

C4 Acquiring skill and ability to connect electric circuits, to perform power and energy measurements, examining basic parameters of motors and transformers.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01– The student is familiar with basic principles of electrotechnics and electric units.

PEK_W02– The student is familiar with basic knowledge related to electric and magnetic field including phenomena connected with electromagnetic induction and magnetic field in electric devices and machinery.

PEK_W03– The student is familiar with series and parallel RLC circuits, is able to interpret series and parallel resonance phenomena and to prepare a phasor diagram.

PEK_W04- The student has knowledge of power and energy values in one and three-phase circuits, of methods to calculate them, methods to correct the power factor in practice.

PEK_W05– The student possesses systematic knowledge about the construction and functioning of transformers and electric engines, knows methods of start-up, electrical braking and adjusting of rotational speed.

PEK_W06– The student is capable of cautious handling of low voltage electric devices, knows proper fire precautions.

relating to skills:

PEK_U01 – The student is able to measure current distribution and voltage drops in series and parallel RLC circuits of alternating current.

PEK_U02 – The student has ability to measure energy and power of electric current and to adjust conditions on the electric power transmission grip.

PEK_U03 – The student is able to indicate basic operational characteristics of AC/DC electric engines.

PEK_U04 – The student is able to perform operational research into one-phase transformers.

relating to social competences:

PEK_K01– The students is responsible for his/her individual work and is able to work as a part of a team

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Course contents, requirements, terms of crediting.	1
Lec 1-3	Basic laws in electrotechnics and electronic units; electric current and its types, voltage, potential, Ohm's law, Kirchhoff's law, resistance, classification of materials and their conductivity.	5
Lec 4-5	Electric field, capacitors; magnetic field of electric currents and its basic units, magnetic field in lead, electric magnetic circuit, electromagnetic induction, self-induction, eddy current.	3
Lec 5-7	Direct current circuits, arrow convention rules, combining sources of electric energy, alternating current, its production, basic units of alternating current, curve by phasor, rms and average values, RLC ideal elements in sine wave current circuit, phasor diagrams, series and parallel sine wave current circuits, applying complex number method to analyse electric circuits.	5
Lec 8-9	Power and energy in one-phase and three-phase circuits: work and electric power, power of alternating current collected by ideal elements RLC, apparent, real and reactive power in one-phase and three-phase circuits, The Power Triangle, PFC in one-phase and three-phase circuits, real power measurement in one-phase and three-phase systems.	4
Lec 10	One-phase transformer – structure, operating, idle state and shorting state.	2
Lec 11	Three-phase transformer. Connection systems, voltage control; auto-transformer, voltage and current transformers.	2
Lec 12	Direct current machine: construction and operation; shunt motor and inverse speed motor, start up and the adjustment of the rate of rotation, braking.	2
Lec 13	Pulsating magnetic field, shaft of pole pairs. Rotating magnetic field: generating principles, application in three-phase asynchronous and synchronous alternating current motors.	2
Lec 14	One-phase and three-phase induction motor. Construction and operation, mechanical characteristics, start-up and the adjustment of rate of rotation in squirrel-cage and slip-ring motor, braking.	2
Lec 15	Electrocution precautions; mining connections systems of one-phase and three-phase low voltage networks, direct and indirect touch prevention construction and operation of preventive differential current switch.	2
	Total hours	**30**

Form of classes - laboratory		Number of hours
Lab 1	OHS rules and regulations and internal regulations of laboratory site. Terms of crediting. General introduction to laboratory work. Description of techniques applied to measure electronic and mechanic units with the use of analogue and digital instruments.	2
Lab 2-3	Testing of simple, one-phase series and parallel RLC circuits	4
Lab 4	Measurements of power and energy in one-phase and three-phase electric circuits.	2
Lab 5	Testing of shunt motor in direct current.	2
Lab 6	Testing of three-phase, squirrel cage induction motor.	2
Lab 7	Testing of one-phase transformer.	2
Lab 8	Crediting, complementing the laboratory work	1
	Total hours	**15**

TEACHING TOOLS USED
N1. Lecture with the use of audio-visual techniques, multimedia presentations, transparencies. N2. Measuring laboratory classes.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
Lecture		
P1	PEK_W01, PEK_W02, PEK_W03, PEK_W04, PEK_W05, PEK_W06	Written and/or oral exam.
Laboratory		
F1	PEK_U01, PEK_U02, PEK_U03, PEK_U04,	Examining and assessing preparation for laboratory tasks.
F2	PEK_U01, PEK_U02, PEK_U03, PEK_U04,	Active participation in laboratory classes
F3	PEK_U01, PEK_U02, PEK_U03, PEK_U04,	Assessing reports on performed research.
P2=0,4*F1+0,3F2+0,3*F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Praca zbiorowa, Elektrotechnika i elektryka dla nieelektryków, Wydawnictwo Naukowo-Techniczne, Warszawa 2005

[2] Miedziński B., Elektrotechnika. Podstawy i instalacje elektryczne. Wydawnictwo PWN, Warszawa 2000.

SECONDARY LITERATURE:

[1] Kowalewski Z., Maszyny i napęd elektryczny, PWN, Warszawa 1989

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Electrotechnics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W25	C1	Lec 1, Lec 2	N1
PEK_W02	K_W25	C1	Lec 3	N1
PEK_W03	K_W25	C1, C2	Lec 4	N1
PEK_W04	K_W25	C1, C2	Lec 5	N1
PEK_W05	K_W25	C4	Lec 6, Lec 7, Lec 8, Lec 9, Lec 10	N1
PEK_W06	K_W25	C3, C4	Lec 11	N1
PEK_U01	K_U22	C3	Lab 1, Lab 2	N2
PEK_U02	K_U22	C3, C4	Lab 3	N2
PEK_U03	K_U22	C4	Lab 4, Lab 5	N2
PEK_U04	K_U22	C4	Lab 6	N2
PEK_K01	K_K01	C1, C2, C3, C4	Lab 2, Lab 3, Lab 4, Lab 5, Lab 6	N1, N2

FACULTY OF GEOENGINEERING, MINING ANG GEOLOGY

SUBJECT CARD

Name in Polish: Przeróbka kopalin II
Name in English: Mineral Processing II
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG5110
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	90		90		
Form of crediting	Examination		crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	3		3		
including number of ECTS points for practical (P) classes			1		
including number of ECTS points for direct teacher-student contact (BK) classes	3		2		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student is familiar with basics of general chemistry (inorganic and organic) and physics
2. The student is familiar with elementary issues of mineralogy and petrology.
3. The student has mastered basic concepts of engineering, deposit and mining geology.
4. The student is familiar with the occurrence, quality parameters and the use of mineral resources both worldwide and in Poland, knows the origins and forms of mineral deposits occurrence.
5. The student possesses basic knowledge and skills to describe mineral processing methods as well as physical and physicochemical separation processes.

SUBJECT OBJECTIVES

C1 The objective of the course is to prepare students to deal with specific tasks related to different technologies of mineral resources processing, use of recyclable mineral material and mineral waste.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Possesses knowledge of the use of minerals through learning about their characteristics and acquiring basics of processing technologies

PEK_W02 – Possesses knowledge about obtaining components and producing useful materials that constitute finished goods of mining industry, which are applied in the processing industry

PEK_W03 – Is familiar with basics of water management in processing enterprises and is aware of the impact obtaining of resources has on natural environment.

relating to skills:

PEK_U01 – Is able to search for information connected with mineral processing, evaluate and analyse it.

PEK_U02 – Is able to match processing technologies with different mineral resources.

relating to social competences:

PEK_K01 – Is able to formulate and pass on the knowledge about characteristic features and different ways of using minerals, rules of mineral processing management and their impact on natural environment and social conditioning

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Introduction, objectives and scope of lectures. Methods of obtaining mineral resources throughout the history of mankind. Quality requirements for resources and the requirements of consumers (users) and technologies to meet them. Criteria for technological and economic efficiency of processing procedures.	2
Lec 2–Lec 3	Assessing the efficiency of processing and balancing mineral suspension flow.	4
Lec 4	Technologies for comminution and components release. Methods, machinery and technological systems.	2
Lec 5	Grain classification technologies.	2
Lec 6	Construction of technological schemes.	2
Lec 7–Lec 8	Principles and practical approach to flotation, flotation machinery, technological systems.	4
Lec 9–Lec 10	Physical methods of upgrading. Technology and practical approach to gravitation upgrading. Magnetic, electrical and optical separation.	4
Lec 11, Lec12, Lec 13	Processing technologies of selected mineral resources (metallic ores, chemical and ceramic raw materials, fossil fuels).	6
Lec 14	Water management in processing enterprises. Water circulation. Methods and devices for suspensions dewatering.	2
Lec 15	Special and combined methods for resources processing. Pyro-metallurgic, hydro-metallurgic and bio-metallurgic methods.	2
	Total hours	**30**

Form of classes - laboratory		Number of hours
Lab 1	Introduction to laboratory classes. Scope and type of laboratory research. Terms of crediting. Health and Safety rules that are applicable during students' presence and work in a laboratory. Instruments and devices for mineral processing research. Principles of calculations.	2
Lab 2	Basic measurements in mineral processing.	2
Lab 3	Characteristic features of separation processes. Sorting, portioning.	2
Lab 4	Comminution technology. Function of comminution efficiency.	2
Lab 5	Grain classification technologies. Screening and sieving.	2
Lab 6	Bituminous coal flotation.	4
Lab 7	Copper ore flotation.	2
Lab 8	Gravitation upgrading by thin layer of medium.	2
Lab 9	Magnetic properties of minerals.	2
Lab 10	Magnetic upgrading.	2
Lab 11	Upgrading of bituminous coal based on heavy medium separation.	2
Lab 12	Foculation.	2
Lab 13	Supplementary tasks.	2
Lab 14	Assessment of laboratory work research. Test on familiarity with basics and technologies of mineral resources processing. Crediting of laboratory work.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Traditional form of lecture supported by multimedia presentations and discussions. N2. Report about conducted laboratory research. N3. Consultation.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01-PEK_W03 PEK_K01	Final written assessment
F, P	PEK_U01-PEK_U02	F1 – grade for quality and the merits of the given laboratory task F2 – grade for report concerning conducted laboratory research P2 – final grade for laboratory classes (weighted average mean from F1 – 40% and F2 – 60%)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Drzymala J., Podstawy mineralurgii. Oficyna Wydawnicza Politechniki Wrocławskiej, 2001, 2009
[2] Laskowski J, Łuszczkiewicz A., Przeróbka kopalin. Wzbogacanie surowców mineralnych. Skrypt Politechniki Wrocławskiej, Wrocław 1989
[3] Wills B.A., Mineral processing technology. Pergamon Press, 1983 (3rd edition) i wszystkie wydania następne (7th edition, Elsevier & BH 2006)
[4] Malewski J., Przeróbka Kopalin. Zasady rozdrabiania i klasyfikacji. Skrypt Politechniki Wrocławskiej, Wrocław 1981
[5] Blaschke Z. i inni, Górnictwo Cz. V. Zarys technologii procesów przeróbczych, Skrypt AGH, Kraków, 1983
[6] Tarleton E. S., Wakeman R. J., Solid/Liquid Separation: Equipment Selection and Process Design. Elsevier Ltd. Butterworth-Heinemann 2007, Oxford
[7] Piecuch T. Technika wodno-mułowa. Urządzenia i procesy. WNT Warszawa 2010
[8] GuptaV., Yan D.S., Mineral Processing Design and Operation. An introduction. Elsevier Amsterdam2006

SECONDARY LITERATURE:

[1] Koch R., Noworyta A., Procesy mechaniczne w inżynierii chemicznej. WNT Warszawa 1998
[2] Industrial minerals and rocks, 6th edition, D.D. Carr (editor), Soc. Min, Metall. Explor., Littleton, Col. 1994
[3] Bolewski A., Manecki A. Mineralogia szczegółowa. Wyd PAE, Warszawa 1993
[4] Manecki A. Encyklopedia minerałów. Uczelniane Wydawnictwa Naukowo-Dydaktyczne, Kraków 2004.
[5] Strony internetowe USGS (United States Geological Survey): http://minerals.usgs.gov/minerals/ (Minerals Information, Mineral Commodity Summaries, Mineral Industry Surveys)

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mineral Processing II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01 PEK_W02 PEK_W03	K_W22	C1	Lec 1-Lec 15	N1, N3
PEK_U01 PEK_U02	K_U19	C1	Lab 1-Lab 15	N2, N3
PEK_K01	K_K07	C1		

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Eksploatacja Podziemna
Name in English: Underground Mining Technology
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG5111
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	45			30	
Number of hours of total student workload (CNPS)	60			90	
Form of crediting	Examination			crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points	2			3	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2			2	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student is familiar with wide range of mining activities, as one of the most important spheres of technological and economic activity of the mankind.
2. The student has mastered key geological terminology and possesses systematic knowledge about natural resources and mineral raw materials, as well as about different ways of their extraction.
3. The student is able to use Microsoft Office tools to prepare Word documents and work with Excel spread sheets.

SUBJECT OBJECTIVES

C1. Acquainting students with issues related to underground mining.

C2. Presenting and explaining issues connected with deposits accessibility, designing and building shafts, drift and chamber mining excavations.

C3. Presenting and explaining the classification of different methods used for obtaining varied natural resources, discussing systems used for obtaining bituminous coal, halite and metallic ores.

C4. Preparing students to perform tasks related to work technology and mining machinery selection to complete a project of a shaft mine, a project of an exploitation wall in a bituminous coal mine and a preparation unit in a copper ore mine with its economy analysis.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Knows issues related to underground mining technologies for bituminous coal, metallic ores, halite and other minerals.

PEK_W02 Possesses knowledge about: accessing and preparing natural resources for underground mining, designing and building shafts, winzes, drift and chamber mining excavations.

PEK_W03 Is familiar with systems related to underground excavation and ways of conducting works in difficult geological and mining conditions

PEK_W04 Possesses knowledge about mine lining applied in underground mining and about assuring stability of underground mining excavations.

PEK_W05 Knows issues related to natural mining threats in underground mining and ways of preventing them.

PEK_W06 Possesses general knowledge related to work technology and optimal selection of machinery and instruments in underground mining enterprises.

relating to skills:

PEK_U01 Is able to apply knowledge about deposits accessibility while completing projects and present the effects of work in a form of a completed project titled ‘Shaft mining project’

PEK_U02 Is able to apply knowledge about deposits accessibility while completing projects and present the effects of work in a form of a completed project titled ‘A project of an exploitation wall in a bituminous coal mine’

PEK_U03 Is able to apply knowledge on deposits accessibility while completing projects and present the effects of work in a form of a completed project titled ‘A project of preparation unit in a copper ore mine with its economy analysis.’

PEK_U04 Is able to adapt proper technology of building mining excavations and assuring its stability in varied geological and mining conditions.

relating to social competences:

PEK_K01Understands the importance of underground mining for national economy.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Course contents, didactic purposes, terms of crediting, literature, contact with the teacher. Basic terminology, definitions related to underground mining. Classification of underground resources. General information about the resources accessibility.	3
Lec 2	The outline of underground mining technologies for bituminous coal deposits, metallic ores, halite and other minerals in Poland.	3
Lec 3	Types of development and preparation workings.	3
Lec 4	General information on shafts and their classification. Machinery and instruments for shaft mining.	
Lec 5	Support for shaft mining excavations. Drilling technology for shafts and winzes.	3
Lec 6	Classification of shaft stations and chamber excavations. Drilling technology for chamber excavations.	3
Lec 7	Machinery and instruments used for drilling underground workings.	3
Lec 8	Methods of drilling underground workings in harsh geological and mining conditions.	3
Lec 9	Mining support – classification and technologies.	3
Lec 10	General information on natural resources mining and its classification.	3
Lec 11	Systems of underground mining for bituminous coal.	3
Lec 12	Systems of underground mining for copper ores.	3
Lec 13	Systems of underground mining for zinc and lead deposits, halite and other useful minerals.	3
Lec 14	Natural threats and their prevention in underground mining companies.	3
Lec 15	Future development of underground mining in Poland and abroad and its significance for national economy.	3
	Total hours	**45**

Form of classes - project		**Number of hours**
Proj 1	Introductory classes. Scope of a project, terms of crediting, literature. Discussing project no 1 on ‘Shaft mining’. Assigning individual tasks, giving guidelines for project completion.	2
Proj 2	Discussing how to rate primary state of stress in the rock mass where shaft will be mined.	2
Proj 3	Discussing issues concerning shaft mining.	2
Proj 4	Discussing issues connected with selection of supports for the shaft.	2
Proj 5	Discussing project no 2 on ‘An exploitation wall in a bituminous coal mine’. Assigning individual tasks, giving guidelines for project completion.	2
Proj 6	Discussing natural threats and geological and mining conditions in the area of long wall underground workings.	2
Proj 7	Discussing technology used for constructing roadway and ramp for the designed exploitation wall.	2
Proj 8	Discussing issues connected with selection of machine-supported long wall workings	2
Proj 9	Discussing project no 3 on ‘Preparatory heading project in a copper ores	2

	mine'. Assigning individual tasks, giving guidelines for project completion.	
Proj 10	Discussing algorithms for determining the geometry of a mining area.	2
Proj 11	Discussing issues connected with determining the resources and estimated length of mining.	2
Proj 12	Discussing issues connected with parameters for forehead mining.	2
Proj 13	Discussing issues connected with extraction, transfer of the output and constructing supports in the preparation unit.	2
Proj 14	Discussing issues connected with economic analysis of constructing preparation heading.	2
Proj 15	Students' delivery of completed projects, assessing the form and oral or written presentation of the projects.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Form of lectures – traditional, supported by multimedia presentations with the use of audio-visual equipment, together with short educational movies concerning technology of machinery work in underground mining companies. N2. Discussion as a part of lectures and projects. N3. Preparation of projects in printed form. N4. Defence of projects in oral or written form. N5. Consulting

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01-PEK_U04	F1.1 Grading the quality and adequacy of project no1. F1.2 Grading oral or written presentation of project no1. F1 Final grade from project no 1 (weighted arithmetic mean from F1.1 – 50% and F1.2 – 50%)
F2	PEK_U01-PEK_U04	F2.1 Grading the quality and adequacy of project no2. F2.2 Grading oral or written presentation of project no2. F2 Final grade from project no 2 (weighted arithmetic mean from F2.1 – 50% and F2.2 – 50%)
F3	PEK_U01-PEK_U04	F3.1 Grading the quality and adequacy of project no3. F3.2 Grading oral or written presentation of project no3. F3 Final grade from project no 3 (weighted arithmetic mean from F3.1 – 50% and F3.2 – 50%)
P1	PEK_U01-PEK_U04	P1 Final grange from the project work, as arithmetic mean from F1, F2, F3
P2	PEK_W01-PEK_W06	P2 Final grade from an exam in the written form

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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[1] Chudek M: Obudowa wyrobisk górniczych, Część 1: Obudowa wyrobisk korytarzowych i komorowych, Wydawnictwo „Śląsk", Katowice 1986

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SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJEC
Underground Mining Technology
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W07, K_W26	C1	Lec 1, Lec 2, Proj 1, Proj 5, Proj 9, Proj 15	N1, N2, N5
PEK_W02	K_W07, K_W26, K_W32	C1, C2, C4	Lec 3-Lec 9, Proj 1-Proj 4, Proj 15	N1, N2, N3, N5
PEK_W03	K_W07, K_W26, K_W32	C1,C3, C4	Lec 7-Lec 15, Proj 5-Proj 15	N1, N2, N3, N5
PEK_W04	K_W07, K_W26	C2, C3, C4	Lec 4, Lec 5, Lec 6, Lec 8, Lec 9, Proj 7, Proj 8, Proj 12-Proj 15	N1, N2, N3, N5
PEK_W05	K_W07, K_W26, K_W30	C1, C2, C3	Lec 5, Lec 6, Lec 8, Lec 10, Lec 14, Proj 3, Proj 6, Proj 8, Proj 12, Proj 13, Proj 15	N1, N2, N5
PEK_W06	K_W07, K_W26, K_W32	C2, C3, C4	Lec 4, Lec 7, Proj 3, Proj 7, Proj 8, Proj 12-Proj 15	N1, N2, N5
PEK_U01	K_U05, K_U23, K_U32	C2, C4	Lec 3-Lec 6, Proj 1-Proj 4, Proj 15	N1-N5
PEK_U02	K_U05, K_U23, K_U32	C3, C4,	Lec 7, Lec 9, Lec 11, Proj 5-Proj 8, Proj 15	N1-N5
PEK_U03	K_U05, K_U23, K_U32	C3, C4	Lec 9, Lec 12, Lec 14, Proj 9-Proj 15	N1-N5
PEK_U04	K_U23, K_U32	C2, C3, C4	Lec 5, Lec 6, Lec 8, Lec 9, Lec 14, Proj 3, Proj 4, Proj 7, Proj 8, Proj 12, Proj 13, Proj 15	N1, N2, N5
PEK_K01	K_K01, K_K02	C1	Lec 1,Lec 2, Lec 10, Lec 15	N1, N2, N5
PEK_W01	K_W07, K_W26	C1	Lec 1, Lec 2, Proj 1, Proj 5, Proj 9, Proj 15	N1, N2, N5

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Technika Strzelnicza II
Name in English: Blasting Technique II
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG5112
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)				30	
Number of hours of total student workload (CNPS)				60	
Form of crediting				crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points				2	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes				1	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has credit in Blasting Technique I
2. The student is able to perform calculations with the use of computer software.
3. The student is able to work in a group.

SUBJECT OBJECTIVES

C1 Acquiring the rules of implementing blasting media in rock excavation and for civil engineering purposes.
C2 Acquiring the rules of preparing documentation for blasting works – selecting blasting media and calculating basic blasting parameters in an underground mining site.
C3 Acquiring the principles of preparing documentation for blasting works – selecting blasting media and calculating basic blasting parameters in a surface mining site.
C4 Acquiring the rules of measuring the impact blasting works may have on the surroundings of surface mining sites.

SUBJECT EDUCATIONAL EFFECTS

relating to skills:

PEK_U01 – Is familiar with the rules of preparing documentation for blasting works, in the field of selecting blasting media and calculating basic blasting parameters in both underground and surface mining

PEK_U02 – Is capable of correct selecting of blasting media, appropriate for use in given conditions, determined by mining type applied and the hazards that may occur.

PEK_U03 – Is able to perform correct calculations for the assumed effects of blasting with the consideration of particular conditions, especially geo-mechanical parameters of rocks in an underground mining site.

PEK_U04 – Is able to perform correct calculations for the assumed effects of blasting with the consideration of particular conditions, especially geo-mechanical parameters of rocks in a surface mining site.

PEK_U05 – Is able to prepare blasting documentation in accordance to the valid rules and regulations.

relating to social competences:

PEK_K01 – Is able to work in a team, cooperate while performing requested calculations and preparing blasting documentation.

PROGRAMME CONTENT		
Form of classes - project		**Number of hours**
Proj 1	Scope of the project, terms of crediting, literature. Assigning project topics to individual students. Discussing the details of the project titled: 'Applying blasting technique in an underground mining drift.'	2
Proj 2	Describing procedures of selecting and calculating the blasting parameters.	2
Proj 3	Matching blasting media with the given works conditions, considering also probable mining hazards.	2
Proj 4	Calculating parameters of blasting works.	2
Proj 5	Selecting initiating media (electrical, electronic and non-electrical) and performing blasting pattern measurements for electrical blasting.	2
Proj 6	Arranging blast holes: selecting drilling procedures, arranging the remaining blast holes.	2
Proj 7	Preparing descriptive and graphical blasting documentation/certificate, according to the given scheme.	2
Proj 8	Delivery and defence of the completed projects.	1
Proj 9	Scope of the project, terms of crediting, literature. Assigning project topics to individual students. Discussing the details of the project titled: 'Applying long blast holes method in a surface mine of mineral resources.'	2
Proj 10	Describing procedures of selecting and calculating the blasting parameters. Matching blasting media with the given works conditions, considering also the surrounding of a surface mining site.	2
Proj 11	Calculating parameters of blasting works.	2

Proj 12	Selecting initiating media (electrical, electronic and non-electrical) and performing blasting pattern measurements for electrical blasting.	2
Proj 13	Arranging blast holes, settling initiation pattern, blasting pattern. Preparing descriptive and graphical blasting documentation/certificate, according to the given scheme.	3
Proj 14	Measuring the impact of blasting works on the surrounding of a surface mining site.	3
Proj 15	Delivery and defence of the completed projects.	1
	Total hours	**30**

TEACHING TOOLS USED
N1. Multimedia presentations N2. Discussion as a part of the project work. N3. Consultation. N4. Preparation of a project in a form of blasting documentation.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F, P	PEK_U01-PEK_U05 PEK_K01	F1 - Grade for preparation and adequacy of the project 'Applying blasting technique in an underground mining drift'. F2 – Grade for preparation and adequacy of the project 'Applying long blast holes method in a surface mine of mineral resources.' P1 – Final grade – arithmetic mean delivered from both projects.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Batko P. i inni: Górnicze materiały wybuchowe. Wyd. Centrum PPGSMiE PAN. Kraków, 1993.

[2] Batko P. i inni: Technika Strzelnicza, tom I. Górnicze środki strzałowe i sprzęt strzałowy. Uczelniane Wydawnictwa Naukowo – Dydaktyczne. Kraków, 1999.

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[4] Hemphill G.B., Blasting operation, McGraw-Hill Book Company, New York, 1981.

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[6] Olofson S., Applied explosives technology for construction and mining, APPLEX, Sweden.

[7] Onderka Z: Inżynieria Strzelnicza, Część 1. Podstawy teoretyczne. Skrypt AGH. Kraków, 1979.

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[10] Takuski S: Roboty wiertnicze i strzelnicze w szybach. Wyd. AGH. Kraków, 1969.

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- PN-C-86020: 1994 Górnicze zapalniki elektryczne. Wymagania.
- PN-C-86024: 1994 Górnicze zapalniki elektryczne. Podział i oznaczenia.
- BN-80/6091-42: Górnicze materiały wybuchowe. Obliczanie parametrów użytkowych.
- BN-89/6091-45/01: Górnicze materiały wybuchowe. Postanowienia ogólne.
- BN-89/6091-45/02: Górnicze materiały wybuchowe. Podział i oznaczenia

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Blasting Technique II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_U01-03, PEK_U05 PEK_K01	K_U23 K_K04	C1-C2	Proj 1-Proj 7	N1-N5
PEK_U01 PEK_U02 PEK_U04 PEK_U05 PEK_K01	K_U32 K_K04	C1, C3-C4	Proj 8-Proj 15	N1-N5

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Miernictwo Górnicze
Name in English: Mining Surveying
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG5102
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30	15	
Number of hours of total student workload (CNPS)	90		60	30	
Form of crediting	crediting with grade		crediting with grade	crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points	3		2	1	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	3		1	0,5	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student is familiar, at basic level, with mathematical analysis essential for comprehending mathematical issues in engineering sciences.
2. The student is familiar, at elementary level, with underground and surface mining issues, being one of a man's technological and economic activities.
3. The student is familiar, at elementary level, with engineering geodesy and computer science.

SUBJECT OBJECTIVES

C1 The objective of the course is to familiarise the students with legal conditions for geodesy activities as a part of an operating scheme of a mining company.

C2 Acquiring knowledge about characteristics and the importance of performing traditional geodesic measurements in underground mining sites and with the use of satellites in surface mining sites.

C3 Gaining the ability to create and use basic surveying documents and their processing in GIS, especially analogue and digital maps in underground and surface mining sites. Gaining the ability to design engineering tasks and to perform geodesic measurements connected with rational and safe management of a mineral deposit.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Is familiar with basics of legal conditions for mine surveying as a part of a mining site activity, its importance and tasks related to rational and safe management of a mineral deposit.

PEK_W02 – Knows essential things about traditional and satellite geodesic surveying, its accuracy and documenting.

PEK_W03 – Is aware, at basic level, of the importance of GIS tools in industrial companies' management (incl. mining) and of GPS technology, photogrammetry to obtain spatial data.

PEK_W04 – Knows how to plan countershaft works in mining sites in order to reach deposit and prepare it for excavation.

relating to skills:

PEK_U01 – Is capable of independent and group work on geodesic surveying, applying modern surveying techniques in underground and surface mining site, documenting and assessing progress in excavation works as well as controlling geometrical condition of mining machinery and equipment.

PEK_U02 – Has preliminary skills to plan engineering tasks related to mining and surveying connected with countershaft works in mining sites.

PEK_U03 – Is able to use ArcGIS ESRI suite in an effective and expanded way. The student is able to plan, conduct and develop GPS surveying and analyse its results.

relating to social competences:

PEK_K01 – Is aware of the importance of mine surveying and the influence it has on proper functioning of a mining company.

PEK_K02 – Is able to use and pass on acquired knowledge to manage the deposit in an organised and safe way.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Importance and tasks of surveying department in underground and surface mining sites, legal conditions.	2
Lec 2	Mining maps. Ways of developing, updating, dividing and compiling the maps.	2
Lec 3	Surveying control of extraction in underground and surface mining sites.	2
Lec 4-5	Vertical and horizontal orientation of underground mining sites	4
Lec 6	Horizontal control points and vertical control network in underground and surface mining.	2
Lec 7-8	Countershaft issues, management of excavation works, special surveying.	3
Lec 9	GIS basics. Key definitions and terminology, the role of geo information systems for implementing IT solutions in management, decisions support and automation of planning.	2
Lec 10	Digital Maps Systems: methods of data capturing, updating, storing and sharing.	3
Lec 11	Data bases. Basic information, structure, integration with spatial data.	2
Lec 12	Analytic and digital photogrammetry.	2
Lec 13	Digital elevation model.	2
Lec 14	Structure of raster and vector images. Structure of integrated geo-information systems	2
Lec 15	Standardization in GIS systems. Further development and application in mining. Examples of implementation.	2
	Total hours	**30**

Form of classes - laboratory		Number of hours
Lab 1	Defining the scope of laboratory classes, terms of crediting and literature. GIS systems concept. Key issues: spatial and descriptive data capture and storage in GIS systems	2
Lab 2	Principles of GIS systems on the example of a selected application – introduction to ArcGIS ESRI suite (ArcMap, ArcCatalog, ArcToolbox). Discussing maps, data layers, table of contents, preview, maps' layout.	2
Lab 3	Designing and constructing geo-base for mining area (each participant of the laboratory has assigned mining area). Creating data layers for the given area. Crating map document.	2
Lab 4	Work on raster data, key issues: georeferencing, map projection, spatial coverage	2
Lab 5	Spatial data. Object digitalisation and modification, concerning coordinate system. Importance of topology in GIS and its principles.	3
Lab 6	Maps editing. Crating a map layout with captions. Presenting and assessing map layouts.	2
Lab 7	Crating a three-dimension model of a mining area. Presenting and assessing structure of a 3D mining area.	2
Lab 8	Forecasting and analysing conditions for GPS and GLONASS satellite research.	2
Lab 9	GPS surveying in land inventory. Digital object data base. Object and attribute.	2
Lab 10	Functioning of GPS code receivers (object positioning and navigating).	3
Lab 11 Lab 12	Land surveying, single-point positioning, differential GPS, object surveying with the use of object data base.	4
Lab 12	Processing and post-processing of GPS measurements.	2
Lab 15	Converting geostationary coordinates (B, L, h) into Cartesian coordinates (X, Y, Z) and inverse converting.	2
	Total hours	**30**

Form of classes - project		Number of hours
Proj 1	Presenting scope of projects and terms of crediting. Distributing individual project titled 'Surveying control of excavation in lignite surface mining site'. Appointing location on an analogue map and developing vertical section.	2
Proj 2	Determining the area for cross-section with the application of mechanical method with the use of digital planimeter, and analytic method.	2
Proj 3	Calculating the amount of removed waste, excavated coal and uncovered coal, ready for excavation in general and in reporting period.	2
Proj 4	Assigning individual project titled 'Vertical orientation of underground mining sites'. Calculating benchmark height on the orientation level with accuracy analysis. Developing basic trig data.	2
Proj 5	Assigning individual project titled 'Horizontal orientation of underground mining sites by Weisbach method'. Individual calculation of coordinates for the selected points in mine control network on the orientation level.	2
Proj 6	Analysis of the accuracy of conducted surveying for horizontal orientation, developing basic trig data.	2
Proj 7	Assigning individual project titled 'Developing a countershaft plan – simple and	2

	complex countershaft. Determining stages of the countershaft along the circular arc (apex, starting and end point of a circular arc with a given radius), determining lengths and angles of a circular excavation site.	
Proj 8	Determining angles and lengths for excavation work in a simple countershaft. Technical drawing of the countershaft. Developing basic trig data.	1
	Total hours	**15**

TEACHING TOOLS USED
N1. Informational lecture with the elements of problem-based lecture. N2. Multimedia presentations with the use of audio-visual devices. N3. Laboratory and project work – participants prepare written reports on the developed projects N4. Consultations.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01-PEK_W04	Written test credited with grade in accordance to the programme contents F1 – test on mine surveying F2 – test on GIS basics P1 – Final grade for lecture (weighted average F1-60%, F2-30%)
P2	PEK_U01-PEK_U03	F1 – grade for form and adequacy of laboratory reports and projects' basic trig data F2 – Grade for presenting issues from the report and from basic trig data P2 – final grade for laboratory and project work (weighted average mean derived from F1-70% and F2-30%)

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE:
[1] Zygmunt Kowalczyk: Miernictwo górnicze cz. 1 „Pomiary sytuacyjno-wysokościowe kopalń". Wydawnictwo Śląsk Katowice 1968; [2] Zygmunt Kowalczyk: „Orientacja kopalń" Wydawnictwo Śląsk Katowice 1965; [3] Ustawa z dnia 4 lutego 1994 roku. Prawo geologiczne i górnicze (Dz. U. Nr 27, poz. 96 z późniejszymi zmianami), [4] Rozporządzenie Ministra Gospodarki z dnia 19 czerwca 2002 roku w sprawie dokumentacji mierniczo-geologicznej (Dz. U. Nr 92, poz. 819), [5] Polskie Normy, [6] Włodzimierz. Kiełbasiewicz Ćwiczenia z miernictwa górniczego i ochrony terenów w górnictwie, Skrypt PWr.1979r. [7] Januszewski J., 2006: Systemy satelitarne GPS, Galileo i inne, Wydawnictwo Naukowe PWN, Warszawa. [8] Lamparski J., 2001: NAVSTAR GPS od teorii do praktyki, Wydawnictwo Uniwersytetu

Warmińsko-Mazurskiego, Olsztyn.
[9] Materiały z wykładów i instrukcje laboratoryjne.
[10] Gaździcki J.: Leksykon geomatyczny – Lexicon of Geomatics. Polskie Towarzystwo Informacji Przestrzennej, Warszawa 2002.
[11] Longley P. A., Goodchild M. F., Maguire D. J., Rhind D.W., 2006: GIS. Teoria i praktyka (Geographic Information System and Science), Wydawnictwo Naukowe PWN, Warszawa, 2006.
[12] Litwin L, Myrda G., 2005: Systemy Informacji Geograficznej. Zarządzanie danymi przestrzennymi w GIS, SIP, SIT, LIS, Wydawnictwo Helion;

SECONDARY LITERATURE:

[1] Poradnik Górnika Tom 1.
[2] Dni Miernictwa Górniczego i Ochrony Terenów Górniczych. Prace naukowe GIG. Seria: Konferencje. Wydawnictwo GIG Katowice.
[3] Przegląd Górniczy, Miesięcznik, Wyd. SIOTiG ZG, Katowice
[4] Ustawa o zagospodarowaniu przestrzennym (Dz.U. 1994r. Nr 89 poz. 415)
[5] Ustawa z dnia 4 lutego 1994 r. – Prawo geologiczne i górnicze (t.j. Dz.U. z 2005 r. nr 228, poz. 1947 ze zmianami)
[6] Ustawa o ochronie i kształtowaniu środowiska z 31 stycznia 1980 roku (tekst jednolity Dz.U. z 1994r. Nr 49 poz. 196).
[7] GEODETA - Magazyn geoinformacyjny.
[8] GPS World Magazine.
[9] Internet

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mining Surveying
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01 PEK_W02 PEK_W03 PEK_W04	K_W12, K_W27	C1, C2	Lec 1-Lec 15	N1, N 2
PEK_U01 PEK_U02 PEK_U03 PEK_K01 PEK_K02	K_U10, K_U24 K_K04, K_K07	C3	Lab 1-Lab 15 Proj 1-Proj 8	N3, N 4

SEMESTER 6

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Odwadnianie Kopalń
Name in English: Mine Dewatering
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG60105
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			15	
Number of hours of total student workload (CNPS)	30			60	
Form of crediting	Examination			crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points	1			2	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1			1	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student is acquainted with the basics of hydrogeology.
2. The student is able to read topography maps to analyse land hypsometry.
3. The student is familiar with Microsoft Excel tools.

SUBJECT OBJECTIVES

C1 The objective of the course is to prepare students to deal with specific task concerning mine drainage and mines protection against water-related hazards.

C2 The objective of the course is to get students acquainted with the influence of mine drainage processes have on the environment and ways to minimise this impact.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Is familiar with mines and deposits water accumulation states

PEK_W02 – Is acquainted with the methods of defining the influence mine drainage has on the environment.

PEK_W03 – Knows the methods of mine drainage and their protection against water –related threats.

PEK_W04 – Knows the methods of protecting the environment against the negative impact of mine drainage.

relating to skills:

PEK_U01 – Is able to calculate the amount of rainwater inlet and to design surface drainage system.

PEK_U02 – Is able to calculate the amount of groundwater inlet and to design barriers system.

PEK_U03 – Is able to design surface and sub-surface pump station in mine drainage system.

relating to social competences:

PEK_K01 – Is aware of the importance of other than technical impacts of mining activities, connected with their influence on the natural environment and the responsibility for the decisions taken.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Water accumulation in mineral deposit sites and water-related issues in mining.	2
Lec 2	Occurrence of groundwater, hydro-geological characteristics of rock mass.	2
Lec 3	Recognition and documenting of hydro-geological conditions.	2
Lec 4	Principal filtering rules, water analysis in depression cone.	2
Lec 5	Methods of determining size of water inlets in mines.	
Lec 6	Computer aided designing of geo-filtering processes connected with drainage.	2
Lec 7	Drainage by mining.	2
Lec 8	Drainage by system of wells.	2
Lec 9	Hydraulic calculations for systems of wells.	2
Lec 10	Surface method of mine drainage.	2
Lec 11	Dump site drainage and special methods for mine drainage.	2
Lec 12	Water-related threats – recognition and prevention.	2
Lec 13	Water-related damages at mining sites.	2
Lec 14	Water-related issues connected with terminating surface mining sites.	2
Lec 15	Water-related issues connected with terminating underground mining sites.	2
	Total hours	**30**

Form of classes - project		Number of hours
Proj 1	Providing initial data for partial project of drainage system for a sample surface mining site and their preliminary processing.	2
Proj 2	Developing project of drainage trench/ditch system providing protection against the rainwater inlet.	4
Proj 3	Calculating inlets of rainwater to a surface mining site.	2
Proj 4	Designing a barrier of dewatering wells.	4
Proj 5	Designing a surface and an underground pump system.	3
	Total hours	**15**

TEACHING TOOLS USED
N1. Traditional lecture accompanied by multimedia presentations with the use of audio visual equipment. N2. Calculations performed with the use Of Microsoft Excel and HYDRON 1 software.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01-PEK_W04	Final grade on the basis of a written exam results (in accordance to the programme content)
F, P	PEK_U01-PEK_U03	F1 to F4 – grades form completion of four projects. P2 – final grade for project work – arithmetic mean derived from component grades.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Bieniewski J. – Odwadnianie kopalń. Wydawnictwo Politechniki Wrocławskiej. Wrocław 1983 r.
[2] Gabryszewski T., Wieczysty A. – Ujęcia wód podziemnych, Arkady Warszawa 1985 r.
[3] Pazdro Z. - Hydrogeologia ogólna, Wydawnictwa Geologiczne Warszawa 1977 r
[4] Rogoż M., Hydrogeologia kopalniana z elementami hydrogeologii ogólnej, Wyd. GIG
[5] Katowice 2005 r.
[6] Wilk Zb. (red.) -Hydrogeologia polskich złóż kopalin i problemy wodne górnictwa. Uczelniane Wydawnictwa Naukowo-dydaktyczne, Kraków 2003 r

SECONDARY LITERATURE:

[1] Poradnik hydrogeologa
[2] Sawicki J. - Zmiany naturalnej infiltracji opadów do warstw wodonośnych pod wpływem głębokiego drenażu. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2000 r.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mine Dewatering
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W28	C1, C2	Lec 1-Lec 4	N1
PEK_W02	K_W28	C1, C2	Lec 5-Lec 6	N1
PEK_W03	K_W28	C1, C2	Lec 7-Lec 12	N1
PEK_W04	K_W28	C1, C2	Lec 13-Lec 15	N1
PEK_U01	K_U25	C1, C2	Proj 1-Proj 2	N2
PEK_U02	K_U25	C1, C2	Proj 3-Proj 4	N2
PEK_U03	K_U25	C1, C2	Proj 5	N2
PEK_K01	K_K02	C1, C2		

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: BHP i Ratownictwo I
Name in English: Occupational Safety and Health and Rescue Work I
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG6104
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	30	15	15		
Number of hours of total student workload (CNPS)	60	30	30		
Form of crediting	Examination	crediting with grade	crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	2	1	1		
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2	1	0,5		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses basic knowledge of technologies used in open-pit mines and underground mines.
2. Is able to use Microsoft Office environment to prepare documents in Word, multimedia presentations in Power Point and work with Excel spreadsheets.
3. Understands the need and knows the possibilities of constant education (2nd and 3rd level studies, postgraduate studies, and courses), improving professional, personal and social skills.

SUBJECT OBJECTIVES

C1 - To familiarize students with the basics of occupational safety in the European Union and in Poland.
C2 - To familiarize students with the principles of occupational safety monitoring in a company and principles of supervision exercised by external institutions.
C3 – To familiarize students with basic terminology and procedures associated with accidents at work and occupational diseases, and also analysis and assessment of exposure to harmful agents in the workplace.
C4 – To enable students to identify and characterize hazards of harmful and dangerous factors occurring in the work environment with particular emphasis on mines.
C5 – To create a safety culture attitude of labour by understanding phenomena associated with occupational hazards and appropriate labour evaluation in aspects of its safety.
C6 – To familiarize students with the latest developments in the field of occupational safety in highly developed organizations.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 - Possesses general knowledge about the basics of occupational safety in the European Union and in Poland.

PEK_W02 Knows rules of monitoring occupational safety in the workplace (including mines).

PEK_W03 Knows rules of supervision of occupational safety by external institutions.

PEK_W04 - Possesses general knowledge about accident hazards and hazards of harmful factors in workplaces in the mining industry.

PEK_W05 - Understands relationships and dependencies between systems and mining technologies and hazards with harmful and dangerous factors in the work environment.

PEK_W06 - Possesses general knowledge of the parameters and application of standards – which are results of legal and normative regulations associated with accidents at work, occupational diseases and harmful factors in the work environment.

PEK_W07 - Knows the mining environment and is able to characterize parameters of dangerous and harmful factors in the work environment.

PEK_W08 - Knows basic legal and normative regulations regarding accidents at work, occupational diseases and also analysis and assessment of exposure to harmful agents in the workplace.

PEK_W09 - Possesses basic knowledge about procedures after accidents, carrying out after accident documentation, occupational diseases, principles of measurements, compiling research documentations, evaluation and registration of harmful factors in the work environment, principles of co-operation with research laboratories, assessment of exposure to harmful factors and the interpretation of results.

relating to skills:

PEK_U01 - Is able to characterize occupational posts in the mining industry concerning aspects of accident hazards and hazards of harmful agents.

PEK_U02 - Is able to identify harmful, dangerous and disruptive factors in the workplace.

PEK_U03 - Is able to analyse activities in the area of forming the conditions and organization of labour based on assessment results of accident hazards and exposure to harmful factors in the work environment.

PEK_U04 - Is able to interpret results of accident analysis and research of harmful factors in the work environment.

PEK_U05 -Is able to develop and present the results of project work (paper report, multimedia presentation) after accident documentation, reports of research on assessment of exposure to harmful factors and interpretation of results.

relating to social competences:

PEK_K01- Is able to work in a team and together carry out research of the work environment and develop results and required documentation in the form of a team report. Knows examples of good practices and the promotion of health and safety, and is aware of the value and need of creating a culture of occupational safety.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Conventions and Directives regarding Occupational Health and Safety. The legal basis of occupational safety in Poland. Sources of responsibilities regarding Occupational Health and Safety (OHS).	2
Lec 2	Basic duties of employees and employers in the area of OHS.	2
Lec 3	The concept of an accident at work, types of accidents, accident rate and its measuring instruments, the assessment of an accident rate, the interpretation of accident rate indicators , after accident investigation, after accident claims.	2
Lec 4	Occupational diseases, jurisdiction in the field of occupational diseases.	2
Lec 5	Works OHS services, Occupational Health and Safety committee, social labour inspection.	2
Lec 6	National Labour Inspectorate.	2
Lec 7	National Sanitary Inspectorate, The Department of Technical Inspection, Mining Authority.	2
Lec 8	Measurement strategy of a work environment.	2
Lec 9	Dust and vibration in workplaces.	2
Lec 10	Noise in the work environment.	2
Lec 11	Microclimate, artificial lighting	
Lec 12	Chemical and biological factors in the work environment	2
Lec 13	Mechanical hazards.	2
Lec 14	Hygienic and sanitary requirements regarding work premises.	2
Lec 15	Ergonomics, training in the area of OHS.	2
	Total hours	**30**

Form of classes - classes		**Number of hours**
Cl 1	AFTER ACCIDENT PROCEDURES. Legal regulations regarding accidents at work, aspects and aims of carrying out after accident investigations, after accident procedure concerned as an element of OHS reactive monitoring. Procedures – reporting an accident, appointing an after accident committee, security of an accident site, provision of first aid, procedures at the accident site, after accident team operations. Formal and legal rules of preparation and approval of after accident documentation.	2
Cl 2	INVESTIGATION OF ACCIDENT AT WORK AND COMPLETION OF AFTER ACCIDENT DOCUMENTATION. Mechanism of origin and models of accidents, investigation of the circumstances and causes of an accident, conclusion formulation and prevention activities. Completion of after accident documentation, elements of a statistical card of accidents at work and classification of the causes of an accident. Samples and examples of after accident forms and a statistical card. Assignment of topics to prepare an after accident documentation for student teams.	2
Cl 3	LEGAL ASPECTS OF ACCIDENTS AT WORK. Legal definitions of various accidents and their examples. Elements of the definition of an	2

	accident at work in legal aspects - urgency, injury, death, external cause, the relationship with work. The circumstances resulting in the loss of claims for accidents at work. Examples of judicial jurisdiction.	
Cl 4	ANALYSIS OF ACCIDENT RATE. Keeping a register of accidents at work and statistical documents. Accident rates, scope and structure analysis, planning activities in the area of OHS. Analyses of the accident rate in the mining industry according to State Mining Authority materials - statistics, groups of risk, the main causes and circumstances of accidents, the main activities to enhance safety in the mining industry.	2
Cl 5	PRESENTATION of after accident documentations developed by teams of students, discussion on their correctness. PROMOTION and CULTURE of occupational safety. Good practices of accident prevention and creation of an occupational safety culture - alerts of accidents and potentially accidental activities, internal security codes, promotional actions of the State Mining Authority.	2
Cl 6	Accident HAZARDS in mines. Natural hazards (legal qualification), hazards associated with conducting blasting, geotechnical and other technical hazards related to the employment of foreign entities, organizational and human hazards. Examples of particularly dangerous works in the mining industry and rules of conducting them. Examples of hazards included in safety documents of mining enterprises and methods of their prevention.	2
Cl 7	OCCUPATIONAL DISEASES. Relation between occupational diseases and harmful factors in the work environment, legal list of occupational diseases, examples of judicial jurisdiction in disputes relating to the recognition of an occupational disease. Documentation of procedures of occupational disease establishment – samples of forms established by law. Keeping a register of occupational diseases. Statistics of occupational diseases in the mining industry according to State Mining Authority analysis.	2
Cl 8	Summary of classes and final test.	1
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Completion of documentation of harmful factor research of the work environment in a workplace (registry of harmful factors, research cards of harmful factors, characteristics of work posts and timing of work time, research plans of harmful factors). Stages of the research process of a work environment. Frequency of research, formal and practical rules of sampling in the workplace. Types of measuring devices and principles of metrological supervision on measuring devices according to principles of measuring coherence (standards, calibrators, reference materials, control of environmental parameters), the concept of measurement uncertainty. Formal and practical aspects of cooperation between workplaces and research laboratories, the role of a workplace in planning and preparation of research, contracting, agreeing sampling protocols. Familiarise employees with test results, the importance of research in the	2

	development of hazards awareness and occupational safety culture. Rules of preparing research reports and an assessment of the working environment due to harmful factors (an example of a report made by an accredited laboratory, sample form of student report).	
Lab 2	DUST in the work environment, criteria for harmfulness evaluation (NDS). Identification and description of the object of research, sources of hazards in mining and methods of prevention. Methodology according to the standard, measurement set, measurement strategy, the principles of conducting measurements. Practical conducting of measurements using measurement devices. Determination of exposure assessment indicators. Exposure assessment and interpretation – compliance with regulations, assessment of occupational risk, date of next research. Report from research carried out by individual students and discussion of results during consultation hours.	2
Lab 3	NOISE in the work environment, criteria for harmfulness evaluation (NDS). Identification and description of the object of research, sources of hazards in mining and methods of prevention. Methodology according to the standard, measurement set, measurement strategy, the principles of conducting measurements. Practical conducting of measurements using measurement devices. Determination of exposure assessment indicators. Exposure assessment and interpretation – compliance with regulations, assessment of occupational risk, date of next research. Report from research carried out by individual students and discussion of results during consultation hours.	2
Lab 4	General and local MECHANICAL VIBRATIONS in the work environment, criteria for harmfulness evaluation (NDS). Identification and description of the object of research, sources of hazards in mining and methods of prevention. Methodology according to the standard, measurement set, measurement strategy, the principles of conducting measurements. Practical conducting of measurements using measurement devices. Determination of exposure assessment indicators. Exposure assessment and interpretation – compliance with regulations, assessment of occupational risk, date of next research. Report from research carried out by individual students and discussion of results during consultation hours.	2
Lab 5	MICROCLIMATE in the work environment, indicators of temperate hot and cold microclimates, criteria of evaluation of the thermal load of hot and cold stress. Determination of the warmth retention of clothing with tabular methods and energy expenditure and metabolism class with tabular and measurement methods. Identification and description of the object of research, sources of hazards in mining and methods of prevention. Methodology according to the standard, measurement set, measurement strategy, the principles of conducting measurements. Practical conducting of measurements using measurement devices. Determination of exposure assessment indicators. Exposure assessment and interpretation – compliance with regulations, assessment of occupational risk, date of next research. Report from research carried out by individual students and discussion of results during consultation hours.	2
Lab 6	LIGHTING at work, evaluation criteria. Identification and description of the object of research. Methodology according to the standard, measurement set, measurement strategy, the principles of conducting measurements. Practical conducting of measurements using measurement devices. Determination of basic parameters of lighting assessment. Assessment of lighting conditions and interpretation of compliance with the requirements. Research reports carried out by teams and discussion of results during	2

	classes.	
Lab 7	CHEMICAL FACTORS in the work environment, criteria of hazard evaluation (NDS, NDSCH, NDSP). Identification and description of the object of research, sources of hazards in mining and methods of prevention. Methods of sampling and measurement strategies, examples of research with the absorption spectrometry method - set of research apparatus, principles of research methodology. Fast reading devices of chemicals in the mining environment and rules for their use. Determination of exposure assessment indicators. Assessment of exposure, cumulative exposure and interpretation – compliance with regulations, occupational risk evaluation, date of next research.	2
Lab 8	Summary of classes and test.	1
	Total hours	**15**

TEACHING TOOLS USED
N1 Informative lecture with elements of problematic lectures. N2 Multimedia presentations. N3 Didactic discussions during lectures. N4 Completion of classes and laboratory classes in the form of a report. N5 Presentation of a report. N6 Consultation.

EVALUATION OF SUBJECT EDUCATIONAL EFFECT ACHIEVEMENTS

Evaluation F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01-PEK_W09	Informative lecture with elements of problematic lectures, multimedia presentations, didactic discussions during lectures, consultation, final grade from a written exam covering the entire material.
P2, F	PEK_U01-PEK _U05 PEK_K01	F1 – Preparation of classes and laboratories in the form of reports, presentation of reports, F2- grade from a written test P2- (25% form of a report, 75% presented knowledge)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Danuta Koradecka Bezpieczeństwo pracy i ergonomia, tom 1 i 2, Wydawnictwo CIOP, Warsaw

[2] Kodeks Pracy, tekst ujednolicony ustawy, Wydawnictwo TARBONUS, Krakow Tarnobrzeg, 2009

[3] Józef Ślęzak Poradnik ochrony pracy, Wydawnictwo TARBONUS, Krakow, Tarnobrzeg , 2008

[4] Marek Gałuszka, Wiesław Langer Wypadki i choroby zawodowe - dokumentacja, postępowanie, orzecznictwo, Wydawnictwo TARBONUS, Krakow, Tarnobrzeg, 2009

[5] Andrzej Uzarczyk Metody badań czynników szkodliwych w środowisku pracy , Wydawnictwo TARBONUS, Gdańsk, Krakow Tarnobrzeg, 2008

SECONDARY LITERATURE:

[1] Rozporządzenie Ministra Pracy i Polityki Społecznej z dnia 29 listopada 2002 roku w sprawie najwyższych dopuszczalnych stężeń i natężeń czynników szkodliwych dla zdrowia w środowisku pracy (Dz. U. nr 217 z dnia 18 grudnia 2002 roku, poz.1833);

[2] Rozporządzenie Ministra Zdrowia z dnia 2 lutego 2011 roku w sprawie badań i pomiarów czynników szkodliwych dla zdrowia w środowisku pracy (Dz. U nr 33/2011, poz. 166);

[3] Rozporządzenie Ministra Gospodarki i Pracy z dnia 10 października 2005 r. zmieniające rozporządzenie w sprawie najwyższych dopuszczalnych stężeń i natężeń czynników szkodliwych dla zdrowia w środowisku pracy. (Dz. U. nr 212/2005, poz. 1769);

[4] Rozporządzenie Ministra Gospodarki i Pracy z dnia 5 sierpnia 2005 r. w sprawie bezpieczeństwa i higieny pracy przy pracach związanych z narażeniem na hałas lub drgania mechaniczne (Dz. U. nr 157/2005, poz. 1318);

[5] Norma PN-/Z-04008/07 sierpień 2002 "Zasady pobierania prób powietrza w środowisku pracy i interpretacji wyników";

[6] Norma PN-91/Z-04030/05 "Oznaczenie pyłu całkowitego na stanowiskach pracy metodą filtracyjno-wagową";

[7] Norma PN-91-/Z-04030/06 "Oznaczenie pyłu respirabilnego na stanowiskach pracy metodą filtracyjno-wagową";

[8] Norma PN-N-01307:1994 „Hałas. Dopuszczalne wartości parametrów hałasu w środowisku pracy. Wymagania dotyczące wykonywania pomiarów";

[9] Norma PN-ISO 9612:2009 „Akustyka. Wytyczne do pomiarów i oceny ekspozycji na hałas";

[10] Norma PN–EN 14253:2008 „Drgania mechaniczne. Pomiar i obliczanie zawodowej ekspozycji na drgania o ogólnym oddziaływaniu na organizm człowieka dla potrzeb ochrony zdrowia. Wymagania praktyczne";

[11] Norma PN-EN-ISO–5349-1 „Drgania mechaniczne. Pomiar i wyznaczanie ekspozycji człowieka na drgania mechaniczne przenoszone przez kończyny górne. Część 1- wymagania ogólne";

[12] Norma PN-EN-ISO–5349-2 „Drgania mechaniczne. Pomiar i wyznaczanie ekspozycji człowieka na drgania mechaniczne przenoszone przez kończyny górne. Część 2 - praktyczne wytyczne do wykonywania pomiarów na stanowiskach pracy";

[13] PN-84/E-02033 „Oświetlenie wnętrz światłem elektrycznym"

[14] PN-EN 12464-1 „Światło i oświetlenie. Oświetlenie miejsc pracy. Część 1: Miejsca pracy we wnętrzach

[15] PN-EN12464-2 „Światło i oświetlenie. Oświetlenie miejsc pracy . Część 2: Miejsca pracy na zewnątrz.

[16] PN-EN ISO 11399 „Ergonomia środowiska termicznego. Zasady i stosowanie związanych norm międzynarodowych"

[17] PN-EN27243 „Środowisko gorące. Wyznaczanie obciążenia termicznego działającego na człowieka podczas pracy oparte na wskaźniku WBGT"

[18] PN-EN ISO 7730 „Środowisko termiczne umiarkowane. Wyznaczanie wskaźnika PMV i PPD oraz określenie komfortu termicznego”
[19] PN-EN ISO11079 „Ergonomia środowiska termicznego. Wyznaczanie i interpretacja stresu termicznego wynikającego z eksploatacji na środowisko zimne z uwzględnieniem izolacyjności cieplnej (IREQ) oraz wpływu wychłodzenia miejscowego

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Occupational Safety and Health and Rescue Work I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W 01	K_W33	C1	Lec 1, Lec 2	N1-N3, N6
PEK_ W 02	K_ W33	C2	Lec 1, Lec 5,	N1-N3, N6
PEK_ W 03	K_W33	C2	Lec 1, Lec 6, Lec 7	N1-N3, N6
PEK_ W 04	K_ W33	C4	Lec 4, Lec 8	N1-N3, N6
PEK_ W 05	K_W33	C4	Lec 8	N1-N3, N6
PEK_ W 06	K_W33	C3	Lec 14	N1-N3, N6
PEK_ W 07	K_W33	C4	Lec 8-Lec 13, Lab 1-Lab 7	N1- N6
PEK_ W 08	K_W33	C3	Lec 3, Lec 4, Lec 15 Cl 1-Cl 7, Lab 1-Lab 7	N1- N6
PEK_ W 09	K_W33	C3	Lec 3, Lec 4, Lec 15 Cl 1-CL 7, Lab 1-Lab 7	N1-N6
PEK_U 01	K_U34	C3, C4, C5	Lec 3, Lec 4	N1-N6
PEK_U 02	K_U33	C4	Lec 8-Lec 13 Lab 1-Lab 7	N1-N6
PEK_U 03	K_U33	C3, C4, C5, C6	Lab 1-Lab 7	N1-N6
PEK_U04	K_U33	C3, C4	Cl 1-Cl 7, La1-La7	N1-N6
PEK_U 05	K_U33	C5, C6	Cl 1-Cl 7, Lab 1-Lab 7	N1-N6
PEK_U 06	K_K04	C5, C6	Lec15, Cl 1-Cl 7, Lab 1-Lab 7	N1-N6

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Ekonomika w Górnictwie
Name in English: Economics in Mining
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: EKG6102
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	45		30	15	
Number of hours of total student workload (CNPS)	60		60	30	
Form of crediting	Examination		crediting with grade	crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points	2		2	1	
including number of ECTS points for practical (P) classes			2	1	
including number of ECTS points for direct teacher-student contact (BK) classes	2		2	0,5	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student is familiar with basic issues connected with mining, its technological and organisational schemes.
2. The student is familiar with the basics of mathematical analysis, essential to comprehend mathematical issues in engineering and economic sciences.
3. The student knows and is able to apply probability calculus and mathematical statistics models.
4. The student is familiar with the basics of free market economy.
5. The student is able to use Excel spread sheet.
6. The student understands and knows the possibilities for further professional, personal and social development.

SUBJECT OBJECTIVES

C1. Acquiring basic knowledge, considering its practical application, about project management.
- C1.1. Merits of project-based approach
- C1.2. Preparing and launching the project
- C1.3. Project planning
- C1.4. Project monitoring

C2. Acquiring basic knowledge about costs estimation, management accounting and financial reporting in companies.

C3. Acquiring knowledge about basic methods of economical assessment in investment projects

enabling their proper application.

C4. Acquiring knowledge about the methods to assess the investment profitability, considering the risk factor:
  C4.1. basic methods
  C4.2. advanced methods (Monte Carlo simulation, VaR, CFaR, material options)
  C4.3.specific methods for geological and mining projects
  C4.4. methods considering unfair activities and frauds
  C4.5.specific methods for bilateral monopoly of a lignite surface mining site and a power plant

C5. Acquiring basic skills in preliminary project planning (Project Data Sheet, Project basis)

C6. Acquiring the skills to use the data from financial reports in companies and in management accounting systems.

C7. Acquiring the skill to prepare a simple financial model of an investment and to assess its profitability.

C8. Acquiring basic skills in practical use of profitability analysis techniques with the consideration of risk factor that is:
  C8.1. application of basic techniques
  C8.2. selecting rate of discount considering risk factor
  C8.3.identifying risk factors in value chain in mining production
  C8.4.foreseeing unfair activity and fraud

C9. Exercising the skill to analyse the functioning of bilateral monopoly of mining sites and power plants and to understand profits deriving from their vertical integration.

C10. Acquiring competence to adopt project-oriented way.

C11. Exercising economical attitude and decisions making with the consideration economic criteria in engineering projects.

C12. Developing the ability to notice risk factors in business activities such as mining especially, and the necessity to foresee the consequences of undertaken actions and economical assessment of their results.

C13. Developing the ability to notice the need and necessity for fair and ethical activity, clear procedures concerning information about mineral deposits, risk factors involved and profitability.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Is familiar with the origins and basic features of project approach

PEK_W02 – Is familiar with the basics of leading, classical methodology concerning project management

PEK_W03 – Is familiar with the basic issues concerning main processes in project management

PEK_W04 – Is familiar with the basic issues concerning techniques and tools for project planning

PEK_W05 – Is familiar with the basic issues concerning techniques and tools for project monitoring

PEK_W06 – Is familiar with the basic issues concerning contents of and interactions in balance, profit and loss account, cash flow statements

PEK_W07 – Knows basic issues concerning cost estimation

PEK_W08 – Is familiar with the meaning of future and current value of cash flows

PEK_W09 – Knows basic methods for assessing the efficiency of an investment (NPV, IRR, recoupment period) and range of their application

PEK_W010 – Knows principles for financial modelling of an investment

PEK_W011 – Is familiar with the basic techniques in profitability analysis with unreliability and risk quantification

PEK_W012 – Is familiar with general issues concerning optimisation of surface mining sites

PEK_W013 – Is familiar with basic issues related to the advanced techniques of profitability analysis with unreliability and risk quantification

PEK_W014 – Understands the impact of flexibility in decision making on optional value that would

increase the value of a project

PEK_W015 – Understands what kinds of risk a mining project may be subject to at every level of the value chain

PEK_W016 – Understands consequences of unfair activity for all market participants

PEK_W017 – Understands specifications of bilateral monopoly of mining sites and power plants and if familiar with the benefits that the vertical integration brings

relating to skills:

PEK_U01 – Is able to perform an analysis of a simple project conditions

PEK_U02 – Is able to define the objectives and project life cycle

PEK_U03 – Is able to define organisation and scope of a simple project

PEK_U04 – Is able to define the business grounds for a project and perform its risk analysis

PEK_U05 – Is able to develop and present a simple project Data Sheet

PEK_U06 – Is able to interpret and apply basic data found in a balance sheet, a profit and loss account and a cash flow statement

PEK_U07 – Is able to differentiate fixed and variable costs, is able to calculate a break-even point for sales

PEK_U08 – Is able to calculate future and current money value and to simple calculating tasks on money value in time

PEK_U09 – Is able to perform financial modelling for a simple investment (with the use of a spread sheet) and rate its profitability with the use of IRR, NPV and PBP methods

PEK_U010 – Is capable of correct profitability analysis for mutually exclusive and non-exclusive projects

PEK_U011 – Is able to apply basic financial functions of a spread sheet

PEK_U012 – Is able to apply basic techniques of an investment profitability analysis with the consideration of risk factors

PEK_U013 – Is able to calculate company's equity cost and match risk premium

PEK_U014 – Is aware of hazards related to geological and mining projects, is familiar with possible risk quantification techniques and proper interpretation of the results

PEK_U015 – Is able to appreciate benefits that derive from fair activity and clear information on mineral deposits and company's actions for the wellbeing of investors, clients and market reliability

PEK_U016 – Is able to explain specific organisation of mining sites and power plants and enumerate benefits that may derive from vertical integration

PEK_U017 – Is able to make optimal decision regarding selection of mining machinery corresponding with the given manner of excavation with the consideration of technological parameters, cost of purchasing and maintenance of the machinery

relating to social competences:

PEK_K01 – Is able to think and act in systematic, creative and entrepreneurial way

PEK_K02 – Is able to work in a team

PEK_K03 – The student's attitude is fixed on economic activity and decision making in engineering projects

PEK_K04 – Is aware that activity in business, especially in mining, requires decision making in conditions of uncertainty and risk due to which it is necessary to foresee the consequences of one's actions and pre-assess their results

PEK_K05 – Is aware of the negative consequences of unfair activities and appreciates the importance of ethical and clear activity

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Introduction to project management	2
Lec 2	Analysis of project environment, preparing and launching the project	2
Lec 3	Outlining objectives and a life cycle of a project	2
Lec 4	Outlining organisation and scope of a project	2
Lec 5	Outlining activities, resources and costs of a project	2
Lec 6	Outlining communication, risk and quality	2
Lec 7	Monitoring of a project	2
Lec 8	Introduction to accountancy	2
Lec 9	Balance sheet of a company – constituents and their colligations	2
Lec 10	Profit and Loss Account, Cash Flow Statement – basic constituents, mutual connections between both reports	2
Lec 11	The concept of costs in financial accounting and management accounting. Classification of costs. Sales break-even point.	2
Lec 12	Time value of money. Calculating future and current value of money.	2
Lec 13	Basic methods for investment efficiency assessment (NPV, IRR, recoupment period). Pros and cons of each method. Range of application.	2
Lec 14	Estimating cash flow in an investment. Developmental and reconstructive investments.	
Lec 15	Examples of mining investment projects and profitability estimation	2
Lec 16	Risk in investment projects	1
Lec 17	Techniques applied to estimate risk in an investment project.	1
Lec 18	Discount rate, equity cost and risk premium – KGHM investment in Congo	1
Lec 19	Vulnerability and scenarios analysis and decision tree learning	1
Lec 20	Optimisation of lignite mining sites in accordance to Lerchs and Grossmann algorithm as specific case of vulnerability analysis	2
Lec 21	Monte Carlo models – CrystalBall and @Risk software	2
Lec 22	Szmonces *Sęk* – VaR and CFaR	1
Lec 23	Material options – creating option's value due to flexible actions	1
Lec 24	Risk in value chains of geological and mining projects	1
Lec 25	Case study – BreX, Enron – ethics in mining business and not only.	1
Lec 26	Bilateral monopoly of lignite mining site and a power plant.	2
Lec 27	Benefits from vertical integration of a mining site and a power plant.	2
	Total hours	**45**

Form of classes - laboratory		**Number of hours**
Lab 1	Activity: project-process-task	2
Lab 2	Presentation of individual reports ' My project idea'	2
Lab 3	Activity: Environment analysis, analysis of shareholders fore case study, establishing of projects, appointing teams	2
Lab 4	Activity: project objectives, realisation line, team presenting their own project	2

Lab 5	Activity: Life cycle, project structure, project scope; team presenting the elements of project's Data Sheet	2
Lab 6	Activity: Preliminary estimation of project risk; team presenting the elements of project's Data Sheet	2
Lab 7	Activity: team presenting project's Data Sheet	2
Lab 8	Calculation tasks – a difference between cash inflow and revenue, between cost and expense	2
Lab 9	Calculation task – defining company's assets, their value and sources of financing	2
Lab 10	Calculation task – preparation of simplified financial reports in a spread sheet. Analysing the influence of given changes on reports' elements.	2
Lab 11	Calculating future and current money value. Solving tasks with the use of spread sheet functions.	2
Lab 12	Calculating index of an investment profitability with the use of a spread sheet. Interpreting the results – discussion.	2
Lab 13-Lab 14	Investment financial modelling - solving tasks with the use of a spread sheet.	4
Lab 15	Final crediting test - solving tasks with the use of a spread sheet.	2
	Total hours	**30**

Form of classes – project		**Number of hours**
Proj 1	Defining the scope of project and terms of crediting for the course. Distributing individual instructions about the project: The analysis of profitability of mining exploration for the given mineral deposit.	1
Proj 2	Defining consumers demand for a given resource. Defining the quantity of production and basic technological parameters of the designed mining site. Selecting machinery and other technical equipment suitable for the investment. Identifying and estimating essential costs.	2
Proj 3	Types of mining investment costs. Calculating costs of the project in the following years with the consideration of money value change in time. Costs by type and by function	4
Proj 4	Defining final sales price for the resource and revenues in following periods of analysed project.	2
Proj 5	Estimating profitability of a mining project with the use of simple and discount methods of capital budgeting.	2
Proj 6	Analysis of profitability vulnerability to changes in the selected financial and technological parameters of the project.	2
Proj 7	Presenting the projects and assessing their validity. Group discussion.	2
	Total hours	15

TEACHING TOOLS USED
N1. Interactive lecture with slideshow and discussion. N2. Laboratory work: group work on the elements to define a sample project. N3. Laboratory work: presenting the elements of a project's Data Sheet developed by the group as a part of independent study N4. Consultations N5. Independent study – group development of project Data Sheet N6. Independent study – literature study.

N7. Laboratory work – independent calculating exercises with the use of a spread sheet.
N8. Laboratory work – discussion, calculating tasks help of a teacher
N9. Independent work – homework tasks with the use of a spread sheet.
N10. Case study and discussion
N11. Deriving knowledge from folk wisdom.
N12. Exam in form of a test with score reduction and zero expected value for a 'blind guess'.
N13. Project – dealing with a sample investment project in mining with help of a teacher
N14. Project – independent work op project solutions.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01-PEK_U04	Presenting the elements of project Data Sheet
F2	PEK_U06-PEK_U11	Continuous assessment of individual work on tasks at home and during laboratory classes.
F3	PEK_W06-PEK_W10 PEK_K03	Discussion in laboratory group, oral assessment.
F4	PEK_W11-PEK_W16 PEK_U14-PEK_U16	Free discussion in the course of a lecture, possibility for oral assessment of knowledge gained on previous lectures
F5	PEK_U12-PEK_U13	Students solving simple tasks at the board.
F6	PEK_U06-PEK_U12	Continuous assessment of progress in project stages.
P1	PEK_U01-PEK_U04, PEK_K01-PEK_U02	Presenting project Data Sheet.
P2	PEK_W01-PEK_U05	Written test (examining knowledge)
P3	PEK_W06-PEK_W10 PEK_U06-PEK_U11 PEK_K03	Test in computer laboratory – individual calculations with the use of a spread sheet.
P4	PEK_W06-PEK_W10 PEK_K03	Written exam in a test form.
P5	PEK_W11-PEK_W16 PEK_U12-PEK_U16	Written exam in a test form with score reduction. Test requires simple calculations to obtain correct answers for a few of the questions.
P6	PEK_K4	Encouraging students to analyse their strategy for choosing the answers with the consideration of crediting threshold and score reductions ensuring zero expected value for a 'blind guess'.
P7	PEK_K05	Penalty for cheating during the exam (e.g. no crediting)
P8	PEK_U06-PEK_U12	Written report and oral assessment on project contents.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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[3] Jajuga K., Jajuga T., 2006. Inwestycje. Instrumenty finansowe, aktywa niefinansowe, ryzyko finansowe, inżynieria finansowe, Wydawnictwo Naukowe PWN, Warszawa.
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[7] Jurdziak L., 2005. Kopalnia węgla brunatnego i elektrownia w warunkach liberalizacji rynku energetycznego. Energetyka. 2005, nr 6, s. 380-388.
[8] Jurdziak L., 2008. Integracja działań czy integracja instytucji? Systems: Journal of Transdisciplinary Systems Science. 2008, vol. 13, spec. iss. 1/2, s. 223-232.
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJEC
Economics in Mining
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W31	C1.1	Lec 1	N1, N4, N6
PEK_W02	K_W31	C1.1	Lec 1	N1, N4, N6
PEK_W03	K_W31	C1.1, C1.2	Lec 2	N1, N4, N6
PEK_W04	K_W31	C1.3	Lec 3-Lec 6	N1, N4, N6
PEK_W05	K_W31	C1.4	Lec 7	N1, N4, N6
PEK_W06	K_W31	C2	Lec 8-Lec 10	N1, N4, N6
PEK_W07	K_W31	C2	Lec 11	N1, N4, N6
PEK_W08	K_W31	C3	Lec 12	N1, N4, N6
PEK_W09	K_W31	C3	Lec 13	N1, N4, N6
PEK_W10	K_W31	C3	Lec 14-Lec 15	N1, N4, N6
PEK_W11	K_W31	C4.1	Lec 16-Lec 19	N1, N4, N6, N10
PEK_W12	K_W31	C4.1, C4.3	Lec 20	N1, N4, N6
PEK_W13	K_W31	C4.2	Lec 21-Lec 22	N1, N4, N6, N11
PEK_W14	K_W31	C4.2	Lec 23	N1, N4, N6
PEK_W15	K_W31, K_W35, K_K02	C4.3	Lec 24	N1, N4, N6
PEK_W16	K_W06	C4.4	Lec 25	N1, N4, N6, N10
PEK_W17	K_W10, K_W31	C4.5	Lec 26-Lec 27	N1, N4, N6
PEK_U01	K_U28	C5	Lab 1-Lab 3	N2-N5
PEK_U02	K_U28	C5	Lab 4-Lab 5	N2-N5
PEK_U03	K_U28	C5	Lab 5	N2-N5
PEK_U04	K_U28	C5	Lab 6	N2-N5
PEK_U05	K_U28	C5	Lab 7	N2-N5
PEK_U06	K_U28	C6	Lab 8-Lab 10, Proj 3, Proj 4, Proj 6	N7, N8, N9, N10, N11
PEK_U07	K_U28	C6	Lab 8, Proj 3, Proj 4, Proj 6	N7, N8, N9, N10, N11
PEK_U08	K_U28	C7	Lab 11, Proj 3, Proj 4	N7, N8, N9, N10, N11
PEK_U09	K_U28	C7	Lab 12-Lab 14, Proj 3-Proj 6	N7, N8, N9, N10, N11
PEK_U10	K_U28	C7	Lab 13-Lab 14, Proj 5, Proj 6	N7, N8, N9, N10, N11
PEK_U11	K_U28	C7	Lab 11-Lab 12, Proj 3-Proj 6	N7, N8, N9, N10, N11
PEK_U12	K_W31	C8.1	Lec 16-Lec 19	N1, N4, N6
PEK_U13	K_W31	C8.2	Lec 18	N1, N4, N6
PEK_U14	K_W31	C8.3	Lec 20, Lec 24	N1, N4, N6
PEK_U15	K_W31	C8.4	Lec 25	N1, N4, N6, N10
PEK_U16	K_W10, K_W31	C9	Lec 26-Lec 27	N1, N4, N6
PEK_U17	K_W35	C10	Lec 2	N10, N11

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Systemy Maszynowe
Name in English: Machinery Systems
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: MMG6102
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	45		15	15	15
Number of hours of total student workload (CNPS)	90		30	30	30
Form of crediting	Examination		crediting with grade	crediting with grade	crediting with grade
For group of courses mark (X) final course					
Number of ECTS points	3		1	1	1
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	3		0,5	0,5	1

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Familiarity with mining activities such as exploitation, comminution, transport, reload, stocking of material.
2. Ability to sequence the given activities and methods of their completion resulting from accessibility of mining technologies.
3. Ability to define the importance of key components in systems of energy transfer (engines, pumps, clutches, drives/gearboxes, shafts etc.)

SUBJECT OBJECTIVES

C1. Gaining basic knowledge about machinery and machinery systems used in all branches of mining.
C2. The ability to select machinery on the basis of the assumed efficiency and their functionality.
C3. Acquaintance with the basic issues connected with the specific construction of mining and transporting machinery.
C4. The ability to perform basic engineering calculations and select typical components of machinery on the example of a belt conveyor.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Is familiar with basic range of use and functions of mining machinery for exploitation, transfer and stacking.

PEK_W02 – Is familiar, at the basic level, with safety restrictions connected with mining machinery use.

PEK_W03 – The student's knowledge enables him to define the role and meaning, and indicate technical solution for basic mining machinery mechanisms.

relating to skills:

PEK_U01 – Is able to use his/her knowledge about the analysis of the results of usability parameters survey related to construction elements of the selected subassemblies of mining machinery.

PEK_U02 - Has the ability to perform basic engineering calculations and select typical components of machinery on the example of a belt conveyor.

PEK_U03 – Has the ability prepare and present issues related to construction, operation and selected construction aspects of particular mining machinery and transportation devices that are parts of mining machinery systems.

relating to social competences:

PEK_K01 – Is able to work as a part of a team, prepare and conduct laboratory task, analyse the results and present them in the form of team-prepared paper report.

PROGRAMME CONTENT

Form of classes – lecture		Number of hours
Lec 1	Course contents, objectives, terms of crediting, literature, contact with the teacher. Key terminology and definitions related to machinery systems applied in mining.	1
Lec 2	Describing and presenting specific solutions of continuous and cyclical transportation.	2
Lec 3	Transportation by belt conveyors. Classification of belt conveyors. Components of belt conveyors (rollers, power drums, route, weighers, engines, cleaning devices). Advantages and disadvantages of their use.	3
Lec 4	Conveyor belts and their systems.	2
Lec 5	Hoisting and its devices (rope and rail hoisting equipment, cranes).	3
Lec 6	Rail transport/haulage, unloading. Characteristic features and the range of applications.	2
Lec 7	Rubber-tired, hydraulic and pneumatic transport.	2
Lec 8	Primary power sources, power transmission systems in mining machinery. Examples of different solutions and their use.	4
Lec 9	Basic calculations on power engine efficiency.	3
Lec 10	Bucket wheel excavators and belt-type stackers. Technological systems with supplementary devices.	4
Lec 11	Single-bucket excavators and loaders, cooperation with transportation systems.	4
Lec 12	Self-propelled comminution units– technological solutions and range of applications.	4
Lec 13	Self-propelled milling machines – technological solutions and range of applications.	4
Lec 14	Long wall mining systems – machinery and restrictions of their use	4
Lec 15	Selection of machinery based on efficiency considerations.	3
	Total hours	**45**

Form of classes - laboratory		Number of hours
Lab 1	Course contents, objectives, terms of crediting, Health and Safety training, contact with the teacher. Key terminology and definitions related to conveyor belts, belt connections and pulleys. Laboratory equipment.	2
Lab 2	Examining the dynamic resistance of pulleys rotation and defining their circular oscillation.	2
Lab 3	Assessing rollers dynamic imbalance.	2
Lab 4	Examining transverse elasticity of the belt and its ability to become concave. Examining belt's fire resistance.	2
Lab 5	Rating extensibility resistance of a conveyor belt with textile core, expansion when torn and expansion with a given load.	2
Lab 6	Rating rubber extensibility resistance.	2
Lab 7	Rating conveyor belt resistance to operating damages resulting from punching.	2
Lab 8	Evaluation of students' reports on laboratory research.	1
	Total hours	**15**

Form of classes - project		Number of hours
Proj 1	Scope of the project, terms of crediting, literature. Assigning individual project topics. Discussing project guidelines regarding basic calculations of a conveyor belt.	2
Proj 2	Defining key technological parameters of a conveyor belt. Calculation the efficiency of conveyor belts.	2
Proj 3	Calculating the motion resistance of conveyor belt (primary method): - calculating individual masses - calculating resistance components - calculating motion resistance for given variant of route load	4
Proj 4	Calculating engine power and selecting proper engines. Condition for friction coupling.	2
Proj 5	Calculating belt forces and checking its proper selection.	2
Proj 6	Presenting and defending completed projects with a follow up discussion.	2
Proj 7	Delivering completed projects and their evaluation.	1
	Total hours	**15**

Form of classes - seminar		Number of hours
Sem 1	Introduction, assignment of seminar topics to individual students. Subject matter is comprehensive and expands the range of knowledge presented in the lecture.	1
Sem 2	Speeches if individual students (20-25 minute presentations) and follow-up discussion.	14
	Total hours	**15**

TEACHING TOOLS USED
N1. Informational lecture with the elements of problem-based lecture. N2. Multimedia presentations. N3. Discussion as a part of a lecture, project work and seminar. N4. Project preparation in a form of a report. N5. Project presentation and a test on the issues comprised in the project work. N6. Preparation and report on conducted laboratory research. N7. Consultations.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01-PEK_W04	P1 - Final written exam grade.
F, P	PEK_U01	F1 – Grade for preparing and performing laboratory research, F2 – Grade for a written report, test on laboratory research methods and laboratory instruments, P2 – Final grade for laboratory work (weighted average mean F1-40%, F2-60%).
F, P	PEK_U02	F3 – Grade for project form and adequacy, F4 – Assessing familiarity with project's topical issues, P3 – Final grade for project work (weighted average mean F3-30%, F4-70%).
P	PEK_U03	P4 - Presentation by participants of the seminar is discussed by the group. Final grade for seminar is weighted average mean from: 1. Substantial adequacy and register of a presentation – 70% 2. Participation in open discussion following each presentation – 30%.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Hardygóra M. i inni.: „Taśmy przenośnikowe". Wydawnictwo Naukowo-Techniczne, Warszawa 1999.
[2] Żur T., Hardygóra M.: „Przenośniki taśmowe w górnictwie". Wyd. Śląsk, Katowice 1996.
[3] Gładysiewicz L.: „Przenośniki taśmowe. Teoria i obliczenia". Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2003.
[4] Uberman R. Technologia i organizacja transportu w górnictwie odkrywkowym.
[5] Kulczak S. Urządzenia transportowe w górnictwie, cześć IV, Transport szybami pionowymi, skrypt Pol. Wrocławska.

SECONDARY LITERATURE:

[1] Antoniak J.: Przenośniki. taśmowe w górnictwie podziemnym i odkrywkowym. Wydawnictwo Politechniki Śląskiej. Gliwice 2006.
[2] Antoniak J., Suchoń J.; Górnicze przenośniki zgrzebłowe. Wydawnictwo „Śląsk". Katowice 1983.
[3] Franasik k., Żur T.: Mechanizacja podziemnych kopalń rud. Wydawnictwo „Śląsk", Katowice 1983
[4] Wachowicz J.: „Zagrożenia pożarowe w kopalniach powodowane stosowaniem materiałów organicznych". Główny Instytut Górnictwa, Katowice 2010.
[5] Magazine: Transport Przemysłowy i Maszyny Robocze.
[6] Polskie Normy/Polish Standards

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Machinery Systems
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W24	C1, C2	Lec 2-Lec 8; Lec 10-Lec 14	N1, N2, N3,N7
PEK_W02	K_W24	C2,C3	Lec 2, Lec 3, Lec 6,Lec 10, Lec 12-Lec 15	N1, N2, N3,N7
PEK_W03	K_W24	C1, C3	Lec 8,Lec 9	N1, N2, N3,N7
PEK_U01	K_U29	C4	Lab 1-Lab 8	N2, N6, N7
PEK_U02	K_U29	C2	Proj 2-Proj 7	N3, N5, N7
PEK_U03	K_U29	C2, C3	Sem 1-Sem 2	N2, N3, N7
PEK_K01	K_U29; K_W24	C2, C4	Lab 1-Lab 8; Proj 2-Proj 7	N5, N6

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Wentylacja i Pożary I
Name in English: Mine Ventilation and Fires I
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG6106
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	60		60		
Form of crediting	Examination		crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	2		2		
including number of ECTS points for practical (P) classes			1		
including number of ECTS points for direct teacher-student contact (BK) classes	2		2		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student is familiar with the basics of mathematical analysis, essential for comprehending mathematical issues in engineering sciences.
2. The student is familiar, at basic level, with mining issues, especially with underground deposit mining.
3. The student is familiar with the basics of physics, especially thermodynamics.
4. The student is familiar, at elementary level, with natural disasters occurrence in underground mining sites.
5. The student is able to use text editors and spread sheets (with elements of programming) to develop documents, perform calculations and prepare multimedia presentations.
6. The student understands and knows the possibilities for further development (II and III level studies, post-diploma studies, courses), for increasing their professional, personal and social competence.

SUBJECT OBJECTIVES

C1 Acquainting with the role and tasks of mining aerology in the scope of valid legal conditions.

C2 Learning about parameters and regulation describing mine air and its changes that may result from fire, gas, dust and heat threats.

C3 Comprehending theoretical issues about the air flow in a mine.

C4 Presenting and explaining issues related to cooperation between fans and ventilation network.

C5 Learning about devices that facilitate or hinder the air flow in ventilation network.

C6 Acquiring theoretical basics and regulations for airing separate mining workings.

C7 Acquiring theoretical basics and rules for designing ventilation network in a mining site.

C8 Acquiring the rules of ventilation surveying, applied instruments and preparing input data for computation of ventilation networks.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Is familiar with the condition of the mine air regarding possible natural threats and the impact it may have on the mine crew health.

PEK_W02 – Is familiar with the operation of the ventilation network in a mine and knows the regulations of the air distribution regarding natural threats and costs of ventilation.

PEK_W03 – Is able to describe basic elements of a ventilation network and to map it.

PEK_W04 – Is able to define basic principles of the air flow in ventilation network.

PEK_W05 – Is able to define complex ventilation parameters: resistance of an excavation site, energy dissipation, natural depression, potential and decrease in air potential.

PEK_W06 – Is familiar with the rules of safe and economic cooperation between a fan and ventilation network, and regulations regarding joint operation of fans in a ventilation network.

relating to skills:

PEK_U01 – Is able to take the measure of air parameters, to perform an air balance in a ventilation network.

PEK_U02 – Is able to describe characteristic features of fans, basing on the taken measurements.

PEK_U03 – Is able to design ventilation pipes system/ air-duct system for a blind drift.

PEK_U04 – Is able to interpret and assess the condition of the air regarding the safety of workers.

relating to social competences:

PEK_K01 – Is able to work in a team, collaborate while performing a task, elaborate the results and present the results of the performed task in the form of team report.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Mines ventilation – historic trait. Objectives of Mining Aerology. Atmospheric air.	2
Lec 2	Mine air (toxic and explosive substances in mine air, tolerable amounts of toxic and explosive substances in mine air).	2
Lec 3	Characteristic features of mine air (thermodynamic variables, balancing, gaseous solutions, physical features of the air, the Mollier diagram (h-x chart), moist air changes, enthalpy, mixing of air streams.	2
Lec 4	Thermal comfort in excavation sites, heat balance of a human body, comfort index, climatic standards.	2
Lec 5	Components of a mine ventilation network. Mapping of ventilation network (ventilation maps and schemes, different air currents).	2
Lec 6	Type of air flow in air split system, equation of continuity of airflow, equation of airflow in an excavation site, energy dissipation in an air split system and endemic resistance.	2
Lec 7	Resistance in air splits. Endemic resistance. Sample hole air flow. Serial and parallel resistance connections.	2
Lec 8	Air potential and its decrease. Potential scheme of a ventilation network.	2
Lec 9	Laws for nodes and loops in ventilation system.	2
Lec 10	Calculating forced air distribution. Air distribution controllers.	2
Lec 11	Principles of air distribution in a mine. Air distribution in ventilation areas.	2
Lec 12	Natural ventilation, natural depression.	2
Lec 13	Mining ventilation devices, cooperation of fans and their operation in a ventilation network.	2
Lec 14	Ventilating devices. Air loss.	2
Lec 15	Ventilation of separate mining working, ventilation pipes system. Designing ventilation pipes system.	2
	Total hours	**30**

	Form of classes - laboratory	**Number of hours**
Lab 1	Describing key parameters of the mining site air. Presenting methods of measuring speed, temperature, moisture and pressure of the air. Legal conditions regarding ventilation surveying.	2
Lab 2	Parameters survey. Determining volume flow and mass of the air in a pipeline and in a drift mine. Calibration of instruments for air speed measurements.	2
Lab 3	Describing parameters of a fan operation, measuring characteristic features of a fan, developing characteristic features of a fan and the analysis of safe cooperation between fans and a ventilation network (pipeline).	2
Lab 4	Describing methods of determining natural depression (thermal), necessary measurements for its calculation. Determining depression in a network loop with the use of selected methods.	2
Lab 5	Describing methods of rating air condition in mining sites. Considering varied states of the air, rating air conditions basing on Polish and international standards.	2
Lab 6	Describing principles of air-duct systems, necessary measurements for defining pipeline parameters (resistance in a leaking pipeline, leakproofness factor).	2
Lab 7	Describing types of an airflow, examining transition from laminar movement into	2

	turbulent movement. Analysing factors that influence the airflow in pipelines. Taking measurements essential for determining linear resistance in a pipeline and endemic resistance.	
Lab 8	Assessing reports on the conducted laboratory research. Test on principles and methods applied in ventilation surveying.	1
	Total hours	**15**

TEACHING TOOLS USED
N1. Lecture in its traditional form, supported by multimedia presentations. N2. Laboratory – work-stand classes with the use of instruments for measuring physical properties of the air. N3. Presentation of the report. N4. Didactic discussion as a part of lectures and laboratory work. N5. Consultations.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01- PEK_W06	Final grade for a written exam.
P2	PEK_U01-PEK_U04 PEK_K01	F1- Grade for oral presentation of written reports (30%) F2- Grade for a written test (70%) P2- Final grade for laboratory work (weighted arithmetic mean from F1-30% and F2-70%)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Wacławik J.: Wentylacja kopalń tom I i II, Wyd. AGH, Kraków 2010.
[2] Roszkowski J., Pawiński J., Strzemiński J.: Przewietrzanie kopalń, Wyd. Śląsk, Katowice 1995.
[3] Madeja-Strumińska B., Strumiński A.: Aerotermodynamika górnicza, Wyd. Śląsk, Katowice 1997.
[4] Nędza Z., Rosiek F.: Wentylacja kopalń cz. 1 i 2, skrypty Politechniki Wrocławskiej 1983.
[5] McPherson M. J.: Subsurface Ventilation and Environmental Engineering, Published by Chapman & Hall, London 1 993.
[6] Roszczynialski W., Trutwin W., Wacławik J.: Kopalniane pomiary wentylacyjne, Wyd. Ślask, Katowice 1992.

SECONDARY LITERATURE:

[1] Madeja-Strumińska B., Strumiński A.: Aerotermodynamika górnicza, Wyd. Śląsk, Katowice 1997.
[2] Poradnik górnika t. III, Wyd. Śląsk, Katowice 1974
[3] Szymański W., Wolańczyk F.: Termodynamika powietrza wilgotnego: Przykłady i zadania, Oficyna wydawnicza Polit. Rzeszowskiej, Rzeszów 2008.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mine Ventilation and Fires I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W30	C1, C2	Lec 1, Lec 3, Lec 12	N1, N4
PEK_W02	K_W30	C2, C5	Lec 10, Lec 11, Lec 14	N1, N4
PEK_W03	K_W30	C7	Lec 5, Lec 8	N1, N4
PEK_W04	K_W30	C2, C3	Lec 7, Lec 9	N1, N4
PEK_W05	K_W30	C2	Lec 6, Lec 7, Lec 8, Lec 12	N1, N4
PEK_W06	K_W30	C4	Lec 13	N1, N4
PEK_U01	K_U27	C2, C8	Lec 9	N1, N4
PEK_U02	K_U27	C4	Lec 13	N1, N4
PEK_U03	K_U27	C6	Lec 15	N1, N4
PEK_U04	K_U27	C1	Lec 2, Lec 4	N1, N4
PEK_K01	K_K04	C8	Lab 1-Lab 8	N1, N2, N3, N4, N5

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Eksploatacja i Obróbka Skał
Name in English: Rock Extraction and Processing
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG6107
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		15		
Number of hours of total student workload (CNPS)	30		30		
Form of crediting	crediting with grade		crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	1		1		
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1		0,5		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student possesses basic knowledge about inner structure of minerals and its influence on their physical and chemical properties. The student is familiar with main mineral-forming and rock-forming processes, especially concerning forming processes of mineral resources and their deposits. The student is familiar with classification and characteristics of most significant mineral resources.
2. The student has mastered key geological terminology of mineral resources deposits and mining, is familiar with rock types and with structure, texture, genetics and mineral composition of most common rocks in all types.
3. The student possesses basic knowledge about machinery and machinery systems used in all branches of mining, as well as on their construction specific for mining purposes.

SUBJECT OBJECTIVES

C1 Acquainting students with meaning, types, occurrence and use of rock minerals in different branches of economy, construction, road construction, architecture.

C2 Presenting problems concerning preparation for mining, development and the selection of extraction process of a given rock minerals deposit.

C3 Acquainting students with issues concerning rock minerals extraction for aggregate.

C4 Acquainting students with technologies of rock minerals extraction for rock blocks and their intended use as a stonework element, and prospective development of such technologies

C5 Acquainting students with types, use and stages of stone elements processing

C6 Presenting issues connected with quality requirements concerning products obtained as a result of tooling and processing of rock minerals

C7 Acquainting students with methods of examining the selected technological, physical and mechanical proprieties of products obtained from rock minerals and their rating criteria

C8 Acquiring skills such as taking measurements, calculating the results and preparing report based on the research

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 - Possesses knowledge about the types and characteristics of rock minerals, is able to indicate places of their occurrence and present the range of their use.

PEK_W02 - Is able to point out the problems connected with mineral deposit development and characterise the system of extracting rock minerals deposits.

PEK_W03 - Is able to present technology and problems concerning rock minerals extraction for aggregates.

PEK_W04 - Is able to present and match the method of rock minerals extraction for blocks with characteristic features of the deposit and type of rock mineral.

PEK_W05 - Is able to define, match and adapt proper technology and type of machinery to the given stage of extraction, type of extracted rock and shape of the stonework element.

PEK_W06 - Possesses knowledge and is aware of significance of quality requirements concerning products obtained as a result of excavation and processing of rock minerals.

relating to skills:

PEK_U01 – Is able to take measurements, prepare reports and rate the results of research

relating to social competences:

PEK_K01 – Is aware of the significance of rational deposit management resulting from adopted technology due to irreversibility of wrong decisions results and a loss of mineral deposits that are mostly owned by State.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Rock minerals extraction. Rock processing –preface, introduction to the lecture, course content, requirements, literature. Main rock minerals – occurrence, use. Preparatory works related to rock minerals extraction.	3
Lec 2	Mineral deposit development: purpose, conditions, ways of development, Systems for mineral deposit selection, types of underground workings, classification and schemes of systems. Excavation for aggregate – technological systems, parameters of extraction levels, blasting techniques – blasting effects and parameters.	2
Lec 3	Extraction of rock minerals for blocks – characteristics of deposits, key features of rocks, loosening surfaces, methods and ways of rock extraction for blocks, extraction systems. Rock splitting method, wedging- wedges, splitting tools, drilling and blasting techniques.	2
Lec 4	Converting rock to blocks – cutting our block from rock deposit – mechanical, thermic and hydraulic methods. The use of stonework elements, their processing (shaping, sizing, texturizing).	2
Lec 5	Primary processing of blocks – block saws with pendulous and linear motion, circular blades diamond rope saws.	2
Lec 6	Secondary processing of stone elements, shaping, sizing – circular blades, milling machines, hammer machining, water jet machining. Processing of stone elements surface, texturizing – abrasive machining, hammer machining, flame machining, and hydraulic machining.	2
Lec 7	Economic analysis of rock processing. Standard requirements for stone elements.	2
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Introduction to the course, Health and Safety training.	1
Lab 2	Determination of density and bulk density (igneous and sedimentary rock). Determination of density and bulk density of aggregate.	2
Lab 3	Determination of capillary water absorption.	2
Lab 4	Determination of abrasion resistance (micro Deval).	2
Lab 5	Determination of aggregate crushing and disintegration resistance (Los Angeles method).	2
Lab 6	Determination of resistance to bending under concentrated force.	2
Lab 7	Determination of compression resistance in air dry state and in state of water saturation (igneous and sedimentary rock).	2
Lab 8	Determination of skid resistance with the use of pendulum instrument.	2
	Total hours	**15**

TEACHING TOOLS USED
N1. Form of lectures – traditional, supported by multimedia presentations with the use of multimedia equipment. N2. Form of laboratory – preparation of each laboratory task in accordance to pre-received instructions, taking measurements, preparation of a report comprising the results of the measurements, their analysis and conclusions, discussion on the results of laboratory work.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01 – PEK_W06	P1 Final grade from the written test
P2	PEK_U01 PEK_K01	F1 – Assessing familiarity with the laboratory task, based on answering questions asked by the teacher in the oral form. F2 – Grade from the report. P2 – Final grade is an arithmetic mean derived from answering the questions and the reports.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Bęben. A. - Maszyny i urządzenia do wybranych technologii urabiania surowców skalnych. Śląsk. Katowice 1998 r.

[2] Frankiewicz Wiesław, Glapa Wojciech: Górnictwo i przeróbka kamienia łamanego. W: Surowce skalne. Kruszywa mineralne. Red. nauk. Roman Ney. Kraków: Wydaw. IGSMiE PAN,

[3] Frankiewicz Wiesław, Glapa Wojciech, Galos Krzysztof: Technika i technologia eksploatacji kruszyw naturalnych i piasków przemysłowych. W: Surowce skalne.. [Red.] Roman Ney. Kraków: Wydaw. Instytutu Gospodarki Surowcami Mineralnymi i Energią PAN 2002

[4] Frankiewicz Wiesław, Glapa Wojciech, Galos Krzysztof: Technika i technologia eksploatacji kamieni budowlanych i drogowych. W: Surowce skalne. Kamiemie budowlane i drogowe [Red.] Roman Ney. Kraków: Wydaw. Instytutu Gospodarki Surowcami Mineralnymi i Energią PAN 2003

[5] Frankiewicz Wiesław, Glapa Wojciech: Normy stosowane w dokumentowaniu, projektowaniu i w odkrywkowej eksploatacji złóż. Kopaliny Podstawowe i Pospolite Górnictwa Skalnego. 2006 nr 1

[6] Hawrylak H. i inni - Maszyny i prace pomocnicze górnictwie odkrywkowym. Śląsk. Katowice 1974.

[7] Korzeniowski J. - Elementy projektowania kamieniołomów drogowych. Politechnika Wrocławska . Wrocław 1974. Skrypt

[8] Kozioł W., Uberman R. - Technologia i organizacja transportu w górnictwie odkrywkowym. Wydawnictwa
AGH. Kraków 1994.

[9] Kozłowski Z. - Technika prowadzenia robót w kopalniach odkrywkowych. Śląsk. Katowice 1974.

[10] Wiśniewski S. I inni - Zasady projektowania i budowy kopalń. Cz. VIII. Śląsk. Katowice 1974.
[11] Poradnik Górnictwa Odkrywkowego - Śląsk. Katowice 1968.

SECONDARY LITERATURE:

[1] Frankiewicz Wiesław: Metody badań właściwości kamienia naturalnego po wprowadzeniu norm europejskich. W: Kamień architektoniczny i dekoracyjny. Materiały konferencji naukowej. Kraków, 23-24 września 2003. Kraków:
[2] 2. Górnictwo Odkrywkowe – czasopismo - www.igo.wroc.pl/
[3] Świat Kamienia – czasopismo - www.swiat-kamienia.pl/pl/
[4] Nowy Kamieniarz – czasopismo - http://nowykamieniarz.pl/

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Rock Extraction and Processing
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01-PEK_W06	K_W19, K_W22	C1-C6	Lec 1-Lec 7	N 1
PEK_U01 PEK_K01	K_U4, K_U19 K_K01	C6-C8	Lab 1-Lab 8	N 2

SEMESTER 7

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Prawo Geologiczne I Górnicze
Name in English: Geological and Mining Law
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: PRG7101
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15				15
Number of hours of total student workload (CNPS)	30				30
Form of crediting	crediting with grade				crediting with grade
For group of courses mark (X) final course					
Number of ECTS points	1				1
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1				0,5

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student is familiar with the basics of Polish and European Union law.
2. The student is familiar with the basics of geology and mining.

SUBJECT OBJECTIVES

C1 The objective of the course is to get acquainted with the basics of Geological and Mining Law in order to work in regulated professions of geology and mining.

C2 The objective of the course is to learn how to apply legal rules of geology and mining to specific situations that may occur during maintenance of a mining facility.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Is acquainted with Geological and Mining Law at the level that enables work in mining professions.

relating to skills:

PEK_U01 – Is able to apply their knowledge of principles of Geology and Mining Law to specific situations that may occur during maintenance of a mining facility.

relating to social competences:

PEK_K01 – Is aware of the importance of other than technological aspects and results of an activity of a mining engineer, its impact on natural environment and responsibility for the decisions taken, is aware of the necessity to develop operating safety culture in mining industry.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Basics of legal system in Poland – geological and mining law in legal systems of Poland and European Union.	2
Lec 2	Subject of geological and mining law. Mining property, its operational use and other competences.	1
Lec 3	Licences.	2
Lec 4	Professional qualifications of a mining expert, professional liability.	2
Lec 5	Geological works.	2
Lec 6	Mining facility, its maintenance, mining rescue services.	4
Lec 7	Fees, responsibility for damage, administration, national geological service and control.	2
	Total hours	**15**

Form of classes - seminar		**Number of hours**
Sem 1	Introduction to seminar, distribution of topics of presentations to individual students. Topics of presentations are related to contemporary issues of geological and mining law discussed during lectures, as well as legal issues resulting from secondary legislation to Geology and Mining Law Act in aspects of their application in situations related to mining facility maintenance.	1
Sem 2-7	Speeches if individual students (20-25 minute presentations) and follow-up discussions.	14
	Total hours	**15**

TEACHING TOOLS USED
N1 Lectures in their traditional form, with multimedia presentations and audio-visual equipment. N2 Presentation of seminar participants ought to be supported by multimedia, also with the use of digital documenting.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01	Crediting grade for a written test.
P2	PEK_U01 PEK_K01	The participant's speech is discussed by the group; results of the discussion are graded. Grades are for: F1- adequacy of the presentation F2- form of the presentation F3- participation in discussion Grades are considered during final assessment of seminar work. Final grade is a weighted arithmetic mean of the above three grades, with 0.6, 0.2, and 0.2 respectively.

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Lipiński – Prawo geologiczne i górnicze – komentarz. Wydawnictwo Amber,2003 [2] Prawo geologiczne i górnicze – Wydawnictwo SITG, 2011 [3] Radecki - Ochrona środowiska w prawie geologicznym i górniczym [4] Dzienniki Ustaw 2011, 2012 [5] Internetowy System Informacji Prawnej Sejmu RP **SECONDARY LITERATURE:** Internet sites: Sejmu RP, MŚ, MG I WUG
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Geological and Mining Law
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W34	C1	Lec 1-Lec 7	N1
PEK_U01	K_U31	C2	Sem 2-Sem 7	N2
PEK_K01	K_K02	C2	Lec 1-Lec 7 Sem 2-Sem 7	N1, N2

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Rekultywacja i Zagospodarowanie Terenów Pogórniczych
Name in English: Post-mining Land Reclamation and Development
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: OSG7101
Group of courses: YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15			15	15
Number of hours of total student workload (CNPS)	30			30	30
Form of crediting	crediting with grade			crediting with grade	crediting with grade
For group of courses mark (X) final course	X				
Number of ECTS points	1			1	1
including number of ECTS points for practical (P) classes				0,5	
including number of ECTS points for direct teacher-student contact (BK) classes	1			0,5	0,5

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Descriptive geometry and technical drawing.
2. Principles if mining.
3. Principles of geology.
4. Hydrogeology.
5. Soil mechanics.
6. Surface mining technology.

SUBJECT OBJECTIVES

C1. Preparation for rational and optimal planning of further maintenance of post mining land.
C2. Introducing formal and legal conditions of reclamation and development of post mining land.
C3. Presenting issues connected with settling forms of development and ways of reclaiming land after exploitation.
C4. Introducing the role of spatial planning while designing the way of post mining development of land.
C5. Presenting stages of reclamation.
C6. Acquiring the skill of developing and presenting design documentation related to reclamation and development of post mining land.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Is familiar with formal and legal regulations concerning post mining land reclamation and development.

PEK_W02 – Possesses knowledge about setting forms of development and ways of reclaiming land after exploitation.

PEK_W03 – Is familiar with issues related to the role of spatial planning while designing the way of post mining development of land.

PEK_W04 – Knows how to prepare designing documentation related to reclamation and development of post mining land.

PEK_W05 – Is able to prepare and present the effect of project work (project – on paper, multimedia presentation)

relating to skills:

PEK_U01 – Is able to optimise the choice of the direction of post mining land reclamation.

PEK_U02 – Is able to prepare a concept of post-mining land development and simplified reclamation project.

PEK_U03 – Is able to prepare and give a presentation concerning project work completion.

relating to social competences:

PEK_K01 – Is aware of other than technical aspects and results of mining engineer activity, including the impact it has on natural environment and irreversibility of one's decisions.

PEK_K02 – Is able to think and act as an entrepreneur.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Mining and its impact on natural environment (types and directions of environment transformations), post mining land reclamation and development and its role in environmental protection.	2
Lec 2	Formal and legal aspects of post mining land reclamation and development (Environmental Protection Law, geological and mining law, act on protection of farming and forest land, act on spatial management and act on prevention and damage repair in the environment).	2
Lec 3	Environment management in spatial planning process, the use of post- mining land in small scale and large scale mining. Conditions of selecting the way of land development and post mining land reclamation, stages of development, optimization of development choice.	2
Lec 4	Reclamation stages Stage I – preparatory reclamation – recognition, conditions of reclamation (location, surface, terrain, geological structure etc.), deciding on the ways of reclamation and their correlation with technical and economic assumptions. Stage II – primary reclamation (technical) – discussing action taken on the wasteland (topography, terrain, regulations on hydrogeological conditions, technological methods of soil reclamation, protection and use of valuable materials for farming or foresting purposes, reconstruction or construction of necessary roads, bridges and culverts for land use). Stage III – detailed/secondary reclamation (biological) – principles of biological restoration on post mining land (herbaceous and woody plants and their anti-erosion and humus-forming properties0, utilization of toxic waste, fertilisation and plantings care.	5

Lec 5	Rating the effects of reclamation and development, costs and funds for post mining land reclamation and development.	2
Lec 6	Examples of specific solutions adapted during reclamation and development of post mining land both in Poland and worldwide.	2
	Total hours	**15**

Form of classes - project		**Number of hours**
Proj 1	Scope of the project, terms of crediting, literature. Assigning individual project topics connected with a concept of post mining development and project of land reclamation.	2
Proj 2 Proj 3 Proj 4 Proj 5 Proj 6 Proj 7	Discussing and acquainting project related issues. Students' individual project work.	12
Proj 8	Students' delivery of completed projects.	1
	Total hours	**15**

Form of classes - seminar		**Number of hours**
Sem 1	Introduction to seminar (scope and form of presentation), terms of crediting, assignment of seminar topics to individual students. Subject matter is comprehensive and expands the range of knowledge presented in the lecture	2
Sem 2 Sem 3 Sem 4 Sem 5 Sem 6 Sem 7 Sem 8	Speeches if individual students (20-25 minute presentations) and follow-up discussions.	13
	Total hours	**15**

TEACHING TOOLS USED
N1. Informational lecture with the elements of problem-based lecture. N2. Multimedia presentations N3. Discussion as a part of a lecture, project work and seminar. N4. Project preparation in the written form. N5. Project presentation. N6. Consultation.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1 – grade for project merits	PEK_W01-PEK_W05, PEK_U01-PEK_K02	Textual and graphical version of a project.
F2 – grade for merits of a paper and form of presentation	PEK_W05, PEK_U03	Presentation of a paper.
F3 – grade for a written/oral assignment	PEK_W01-PEK_W05, PEK_U01, PEK_K01,	Positive grade for a written/oral assignment
P – the final grade from the subject (weighted arithmetic mean for project work 45%, seminar 25% and lecture 30%)		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Chwastek J., 1972, Ochrona i rekultywacja powierzchni w górnictwie odkrywkowym, Wyd, Politechniki Wrocławskiej, Wrocław;Chwastek J., 1980, Miernictwo górnicze i ochrona terenów w górnictwie, Wyd. Polit. Wroc., Wrocław, s. 1-356;

[3] Dwucet K., Krajewski W., Wach J., 1992, Rekultywacja i rewaloryzacja środowiska przyrodniczego, Wyd. Uniwersytet Śląski, Katowice;

[4] Karczewska A., 2008, Ochrona gleb i rekultywacja terenów zdegradowanych, Wydawnictwo Uniwersytetu Przyrodniczego we Wrocławiu, Wrocław;

[5] Kasztelewiecz, 2010, Rekultywacja terenów pogórniczych w polskich kopalniach odkrywkowych, Wyd.: Fundacja Nauka i Tradycje Górnicze z siedzibą wydział Górnictwa i Geoinżynierii Akademii Górniczo-Hutniczej im. Stanisława Staszica w Krakowie, Kraków;

[6] Kozłowski S., 1990, Zasady ochrony i kształtowania środowiska przyrodniczego na obszarach eksploatacji złóż kopalin, Wyd.: SGGW-AR, Warszawa;

[7] Dwucet K., Krajewski W., Wach J., 1992, Rekultywacja i rewaloryzacja środowiska przyrodniczego, Wyd. Uniwersytet Śląski, Katowice;

[8] Maciak F., 1999, Ochrona i rekultywacja środowiska, SGGW, Warszawa;Maciejewska A., 2000, Rekultywacja i ochrona środowiska w górnictwie odkrywkowym, Oficyna Wyd. Politechniki Warszawskiej, Warszawa;

[10] Malewski J. (red), 1999, Zagospodarowanie wyrobisk. Technologiczne, przyrodnicze i gospodarcze uwarunkowania zagospodarowania wyrobisk poeksploatacyjnych surowców skalnych Dolnego Śląska, Oficyna Wyd. PWr, Wrocław;

[11] Ostrowski J. (red), 2001, Ochrona środowiska na terenach górniczych, Wyd. Instytutu Gospodarki Surowcami Mineralnymi, Kraków.

SECONDARY LITERATURE:

[1] Dubel K., 2000, Uwarunkowania przyrodnicze w planowaniu przestrzennym, Wyd. Ekonomia i Środowisko, Białystok,

[2] Gawlikowska E., 2000, Ochrona georóżnorodności na Dolnym Śląsku, Wyd. Kartograficzne Polskiej Agencji Ekologicznej S.A., Warszawa,

[3] Warsztaty Górnicze 2005 z cyklu „Zagrożenia naturalne w górnictwie", Mat. Konferencyjne, 2005, Kraków

[4] Kozłowski S. 1991, Gospodarka a środowisko przyrodnicze, PWN, Warszawa,

[5] Internet sites provided during lecture and seminar.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Post-mining Land Reclamation and Development
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W29 K_U26, K_U32 K_K02	C2	Lec 1	N1, N2, N3, N6
PEK_W02		C1, C3, C4	Lec 2, Lec 7 Lec 8	N1, N2, N3, N6
PEK_W03		C4	Lec 3	N1, N2, N3, N6
PEK_W04		C1-C6	Lec 2-Lec 8	N1, N2, N3, N6
PEK_W05		C6	Proj 1-Proj 8 Sem 1-Sem 8	N2, N3, N4, N5, N6
PEK_U01	K_W29 K_U01, K_U05 K_U26, K_U34	C1, C3, C4	Lec 3	N1, N2, N3, N6
PEK_U02	K_W29 K_U01, K_U05 K_U26, K_U34 K_K02, K_K06	C6	Proj 1-Proj 8	N1, N2, N3, N4, N6
PEK_U03	K_W29 K_U01, K_U05	C6	Sem 1-Sem 8	N2, N3, N6
PEK_K01	K_W29 K_U01 K_K02	C2, C3, C4	Lec 1, Lec 2, Lec 3, Lec 6-Lec 8	N1, N6
PEK_K02	K_W29 K_U01 K_K02, K_K06	C6	Proj 1-Proj 8 Sem 1-Sem 8	N2, N3, N4, N5, N6

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Gospodarka Złożem i Zarządzanie Produkcją
Name in English: Mineral Deposit and Production Management
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG7108
Group of courses: YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15			30	
Number of hours of total student workload (CNPS)	30			30	
Form of crediting	crediting with grade			crediting with grade	
For group of courses mark (X) final course	X				
Number of ECTS points	1			1	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1			0,5	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge about issues related to economic geology, environmental protection, deposits extraction, mineral deposits processing, and economics. Crediting from the subject post-mining land reclamation and development, with the project completed as a part of that course (Elements of the project form basis for the project herewith)
2. Computer office suite skills.

SUBJECT OBJECTIVES

C1 Acquiring knowledge about planning and organising mining production process in a life cycle of a mine site.
C2 Acquiring rules of planning and controlling technological operations related to extracting and processing mineral deposits, machinery and devices market for mineral industry.
C3 Presenting issues connected with the deposit management in the light of technology, economics and environmental protection.
C4 Exercising the skill of systematic approach to mining production process and the use of computer technology.
C5 Preparing for independent project work related to launching or upgrading of mining production, as well as for assessing its efficiency at the stage of *feasibility study.*
C6 Exercising the skill to prepare and present rapports of the conducted analysis and projects.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Knows products of mining activity and rules of mineral resources markets.

PEK_W02 – Possesses knowledge about the basic parameters concerning quality and quantity of domestic mineral and rock deposits as well as the requirements for the products of their processing.

PEK_W03 – Learns about the development scheme of a mining/investment project and its details until the stage of feasibility study.

PEK_W04 – Learns about quality and quantity relations between quality and mineral deposit, technology of extraction and processing of the mineral, environmental protection and production efficiency.

PEK_W05 – Possesses knowledge about the methods of economic assessment of the investment with the consideration of reclamation costs and the development of post-production area.

relating to skills:

PEK_U01 – Is able to plan and design technology of excavation and processing of mineral resource in rock mining.

PEK_U02 – Is familiar with mining machinery and processing devices market, and is able to select machinery proper for the given needs.

PEK_U03 – Is able to estimate an economic value of the investment that involves production of construction aggregates at the stage of feasibility study of an investment project.

PEK_U04 – Is able to develop and present the results of project work (written report, multimedia presentation)

relating to social competences:

PEK_K01 – Is able to recognise possibilities and threats on mineral resources market.

PEK_K02 – Has developed innovative approach to issues related to mineral deposits management.

PROGRAMME CONTENT

	Form of classes - lecture	**Number of hours**
Lec 1	Lecture scope, terms of crediting, literature. Course profile, objectives and applied methods of educating. Correlation between the course contents and the profile and programme contents of other courses within the same specialization and faculty. Key terminology related to production organisation and management; life cycle of a mining site, quality of deposits and their processing products; measures, norms, rating methods, resources market, prices, costs.	5
Lec 2	Review of processing and mining technologies: types and systems of operations, notions of system and process, efficiency, capacity, reliability and efficient working time. Methods of production technology planning: quality and quantity schemes, operations, models of operations, calculation and optimisation of operation systems.	5
Lec 3	Technical means in production process: machinery and devices, market, types, parameters, reliability, methods of proper matching of technical means with planned technologies/ operations. Production efficiency: costs structure, calculation of costs, reclamation costs of post-production area, unitary production costs.	4
Lec 4	Final test (test, personalised set of tasks) of student competence.	1
	Total hours	**15**

Form of classes - project		Number of hours
Proj 1	Project: production process. Scope of project, terms of crediting, literature. Introduction to project work: assumptions, objectives, form, schedule. Data base, preparing individual data for a project. Verifying the data, detailed project description, samples, project stages, progress control schedule.	5
Proj 2	Planning and organisation of production process: technologies, mechanization: progress control, additional information, students' independent project work. Setting quality schemes – concept of technology; progress control, discussion, additional information, self-study, individual consulting.	5
Proj 3	Quality and quantity calculations: progress control, discussion, additional information, explanations, individual consulting.	5
Proj 4	Selection of basic devices and machinery to production scheme: progress control, discussion, additional information, explanations, catalogues, individual consulting.	5
Proj 5	Calculating capacity of production system: progress control, discussion, explanations, individual consulting. Production efficiency calculations (investment cost, operation cost, unitary cost): progress control, discussion, explanations, individual consulting.	5
Proj 6	Discussing and bringing closer project-related issues. Independent project work. Economy calculations: reclamation costs.	2
Proj 7	Presentation of completed projects. Project crediting (course crediting). Partial crediting.	3
	Total hours	**30**

TEACHING TOOLS USED
N1 Informational lecture with the elements of problem-based lecture.
N2 Multimedia presentations.
N3 Didactic discussion as a part of lecture and project work.
N4 Preparation of project in the form of report.
N5 Test of students' knowledge about the subject.
N6 Controlling project progress.
N7 Presentation of the project.
N8 Consultation.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1		Assessing project's adequacy.
F2		Project form and performance
P1		Partial grade for crediting in lecture comprehension: written test (random sets and questions, negative and positive scoring points. Reference point for lecture crediting is a test with the best score and bonuses for participation in lectures.
P2		Partial grade for crediting in project work (weighted arithmetic mean – 60% adequacy, 40% form).
P3		Final grade for group of courses: arithmetic mean from partial grades for lecture and project work.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Drzymała J., Podstawy przeróbki kopalin, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2006
[2] Malewski J, Modrzejewski S., Modelowanie i optymalizacja systemów i procesów wydobycia i przeróbki kruszyw łamanych, Wydawnictwo Górnictwo Odkrywkowe, Wrocław, 2008
[3] Malewski J., Społeczne i technologiczne aspekty gospodarki złożem na przykładzie rud miedzi, Wiadmości WUG, 5/2008
[4] Malewski J., Zarządzanie produkcją – kluczową technologią rozwoju przemysłu wydobywczego rud miedzi i surowców towarzyszących, Cuprum, nr 1/2008
[5] MetsoMinerals, Basics in Mineral Processing, 2005
[6] Monografia KGHM, (pod red. Piestrzyńskiego), Lubin 2007
[7] Szamałek K., Podstawy geologii gospodarczej i gospodarki surowcami mineralnymi, PWN, Warszawa 2007
[8] Wills B.A., Mineral Processing Technology
[9] Wirth H., Kudełko J.,Wanielista K., Metody oceny przemysłowych projektów inwestycyjnych, Cuprum nr 20/2001

SECONDARY LITERATURE:

[1] Czasopisma branżowe:
a. Górnictwo Odkrywkowe (Wyd. IGO-Wrocław
b. Przegląd Górniczy (Wyd. NOT, Katowice)
c. Rudy i Metale Nieżelazne (Wyd. NOT, Katowice)
d. Górnictwo i Geoinżynierii (Wyd. AGH, Kraków),
e. Przegląd Geologiczny (Wyd. PIG Warszawa).
f. Cuprum (Wyd. ZBR Cuprum-KGHM, Wrocław)
g. Gospodarka surowcami mineralnymi, Komitet Zrównoważonej Gospodarki Surowcami PAN, Wydawnictwo Sigmie PAN, Kraków
h. Górnictwo i Geologia, Prace Naukowe Instytutu Górnictwa Politechniki Wrocławskiej, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław.

[2] Portale: www.Informine.com, www.teberia.pl, www.dbc.wroc.pl/libra

Katalogi firmowe maszyn Metso Minerls, Sandvik, DSP,Mifama,ŁZG i inne

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mineral Deposit and Production Management
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Mining and Geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W35	C3	Lec 1-Lec 2	N1-N3, N6
PEK_W02	K_W35	C4	Lec 2	N1-N3, N6
PEK_W03	K_W35	C5	Lec 3,	N1-N3, N6
PEK_W04	K_W35	C5-C6	Lec 3-Lec 4	N1-N3, N6
PEK_U01	K_U32	C1-C3	Proj 1-Proj 4	N1-N3, N6
PEK_U02	K_U32	C5	Proj 5-Proj 7	N4, N6
PEK_U03	K_U32	C6	Proj 8	N4, N6
PEK_U04	K_U32	C6	Proj 9-Proj 10	N4-N6
PEK_K01	K_K07	C5	Lec 1-Lec 2	
PEK_K02	K_K07	C5	Lec 3-Lec 4	

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: BHP i Ratownictwo II

Name in English: Occupational Safety and Health and Rescue Work II

Main field of study: mining and geology

Level and form of studies: 1st level, full-time

Kind of subject: obligatory

Subject code: GGG7109

Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	30	15			
Number of hours of total student workload (CNPS)	30	30			
Form of crediting	Examination	crediting with grade			
For group of courses mark (X) final course					
Number of ECTS points	1	1			
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1	1			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses basic knowledge of widely considered issues in mining, especially regarding underground exploitation of mining deposits.
2. Possesses basic knowledge of natural hazards occurring in underground mines.
3. Understands the need and knows the possibilities of constant education (2nd and 3rd level studies, postgraduate studies, courses), improving professional, personal and social skills.

SUBJECT OBJECTIVES

C1 - To familiarize students with the organization and functioning of mine rescue in Poland and in the world.
C2 – To sum up information about natural hazards occurring in the mining industry, ways of identification and combating.
C3 - To familiarize students with general principles of conducting rescue operations and also actions which are necessary to undertake for certain types of hazards.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Knows the rules of the organization and functioning of mine rescue in Poland.
PEK_W02 – Possesses knowledge of natural hazards in the mining industry and their principles of identification and methods of reduction.
PEK_W03 – Knows equipment of mine rescue teams and ways of conducting rescue operations.

relating to skills:

PEK_U01 – Is able to characterize basic natural hazards in the mining industry.
PEK_U02 – Is able to assess the nature and extent of natural hazards depending on the values of parameters which characterize them.
PEK_U03– Is able to formulate general principles of conducting rescue operations and indicate actions necessary to be undertaken for certain types of hazards.

relating to social competences:

PEK_K01 – Is aware of the value and need of creating a culture of safety in the mining industry and responsibility for the health and lives of other workers.
PEK_K02 – Is aware of the importance of behaving in a professional manner and complying with principles of professional ethics.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Mine rescue - historical background. Mine rescue organization in Poland and abroad. Organization and tasks of KSRG and JRG.	3
Lec 2	General principles of rescue operations. Plan of rescue and mutual aid.	3
Lec 3	Gas hazards. Toxicity and explosiveness of mine gases. Detection and measurement of gas concentrations in the atmosphere of a mine. Automatic measurement systems.	3
Lec 4	Methane hazards, methane content, methane-bearing capacity, hazard categories, methane emission into mines, ceiling accumulations of methane,	3
Lec 5	Predicting methane hazards, methane drainage of layers (principles of filtration, methods of methane drainage of drift and exploitation mines, boreholes and installations for methane drainage)	3
Lec 6	Coal dust (explosiveness of coal dust, anti-explosion protection). Organization and tactics of rescue action during gas and coal dust explosions.	3
Lec 7	Ejection of gas and rock. Characteristics and causes of the phenomenon, factors affecting ejection hazards, methods of hazard identification, methods of hazard combating, principles of conducting mining works in conditions of ejection hazards. Organization and rescue tactics during the ejection of gas and rock.	3
Lec 8	Roof falling hazards (rock bursts, roof falling, rock slides), organization and tactics of rescue action during roof falling.	3
Lec 9	Water hazards, organization and tactics of rescue actions during a sudden water irruption into a mine.	3
Lec 10	Organization and rescue tactics during energy and machinery failure. Basics of first aid.	3
	Total hours	**30**

Form of classes - class		Number of hours
Cl 1	Basic information about the physiology of human respiration and the requirements for breathing apparatus associated with it.	3
Cl 2	Open circuit apparatus (hose breathing apparatus, compressed air breathing apparatus).	2
Cl 3	Isolating devices used in the mining industry.	2
Cl 4	Escape breathing apparatus (isolating and filtrating) used in mining and industry.	2
Cl 5	Rescue clothing, personal protective equipment, communications equipment, lighting equipment, equipment for first aid.	2
Cl 6	Equipment for rescue actions used with roof falling and water hazards.	2
Cl 7	Equipment for rescue actions used with energy and mechanical hazards. Test of possessed knowledge.	2
	Total hours	**15**

TEACHING TOOLS USED
N1. Form of lecture - traditional, content illustrated with multimedia presentations. N2. Form of classes – traditional, content illustrated with multimedia presentations with demonstrations of selected rescue equipment. N3. Didactic discussions during lectures and classes. N4. Consultations.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENTS

Evaluation F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01-PEK_W03	Final grade from exam in the form of a test.
P2	PEK_U01-PEK_U03 PEK_K01, PEK_K02	Final grade from a test.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Bądzelewicz H., Ofiok J., Rogacz J., Stokłosa J.: „Organizacja i taktyka w ratownictwie górniczym", Katowice, wyd. Śląsk,
[2] Bądzelewicz H., Stokłosa J. : „Sprzęt w ratownictwie górniczym", Katowice, Wyd. Śląsk,
[3] Cechak K., Olszówka A.: „Ratownictwo górnicze", Katowice, wyd. Śląsk,
[4] Gawliczek. J.: „Ratownictwo górnicze w kopalniach głębinowych", Katowice, wyd. Śląsk,
[5] Kuchejda J.: „Ratownik górniczy", Katowice, wyd. Śląsk,
[6] Sikora M., Urbański J.: „Ratownictwo górnicze", Skrypt Pwr.

SECONDARY LITERATURE:

[1] „Bezpieczeństwo pracy i ochrona środowiska w górnictwie", miesięcznik WUG
[2] „Przegląd górniczy", miesięcznik
[3] „Biuletyn informacyjny z zakresu ratownictwa górniczego", wydawany przez CSRG
[4] „Ratownictwo Górnicze", kwartalnik CSRG w Bytomiu
[5] Implementing regulations regarding current Geological and Mining Law
[6] Websites of rescue equipment manufacturers.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Occupational Safety and Health and Rescue Work II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W33	C1	Lec 1	N1, N3, N4
PEK_W02	K_W33	C2	Lec 3-Lec 9	N1, N3, N4
PEK_W03	K_W33	C3	Lec 2, Lec 10	N1, N3, N4
PEK_U01	K_U30	C2	Lec 3-Lec 9	N1, N3, N4
PEK_U02	K_U30	C2	Lec 3-Lec 9	N1, N3, N4
PEK_U03	K_U30	C3	Lec 2, Lec 6-Lec 9, Cl 1-Cl 7	N1, N2, N3, N4
PEK_K01	K_K02	C3	Lec 10	N1, N3, N4
PEK_K02	K_K03	C3	Lec 10	N1, N3, N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Wentylacja i Pożary I
Name in English: Mine Ventilation and Fires II
Main field of study: mining and geology
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG7113
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15	15	
Number of hours of total student workload (CNPS)	30		30	30	
Form of crediting	Examination		crediting with grade	crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points	1		1	1	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1		0,5	0,5	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student is familiar with the basics of mathematical analysis, essential for comprehending mathematical issues in engineering sciences.
2. The student is familiar with the basics of technical thermodynamics.
3. The student is familiar with mining issues, mainly with the development process and underground mining.
4. The student is familiar with mine ventilation issues and mine air rating, mapping of ventilation networks, principles of ventilation, ventilating devices, air distribution in mines and ventilation surveying.
5. The student is able to use text editors and spread sheets (with elements of programming) to develop documents, perform calculations and prepare multimedia presentations.
6. The student understands and knows the possibilities for further development (II and III level studies, post-diploma studies, courses), for increasing their professional, personal and social competence.

SUBJECT OBJECTIVES

C1 Learning about the construction of digital models of ventilation networks, calculation methods for free and forced air flow in ventilation networks, methods of examining safety and efficiency of ventilating networks and maintenance of the selected graphic and calculation systems.

C2 Comprehending methods of designing a mine ventilation system.

C3 Comprehending phenomena that occur during underground fire, and their early detection.

C4 Comprehending malfunctions in ventilation networks during fire, methods of limiting hazard area and extinguishing underground fires.

C5 Comprehending methods of fire fighting and terminating of underground fire areas.

C6 Comprehending possible methods of upgrading, assessing and forecasting air condition and its temperature in mining sites.

C7 Comprehending operation rules of HVAC machinery, types of on-site and centralised HVAC

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 – Is familiar with methods of calculating free and forced air flow in ventilation networks, creating digital models of ventilation networks, knows at least one graphic and calculation system for performing fir an HVAC calculations.

PEK_W02 – Is familiar with the basics of designing ventilating in a mine site, especially with planning required amounts of air in mining site, determining resistance in air splits, selecting controllers of air flow and selection of main fans for a ventilation network.

PEK_W03 – Is familiar with all the stages of underground fire. Is familiar with the methods of early detection of underground fires, methods of extinguishing exogenous and endogenous fires, application of ventilation devices in order to protect the crew and minimise material loss caused by fire. Possesses general knowledge about assessing fire stage in fire areas, opening up and terminating of such areas.

PEK_W04 – Is familiar with rules and legal conditions of fire fighting actions in underground mining sites.

PEK_W05 – Is familiar with general issues of assessing air condition related threats and of possible improvement of air condition with the use of ventilating means. The students is familiar with basics of air condition forecasting in mining sites, operating rules of HVOC machinery, on-site and centralised HVOC systems applied in mines.

relating to skills:

PEK_U01 – The student is able to create digital models of a ventilation network, perform calculations of air flow in such networks with the use of selected graphic and calculation systems.

PEK_U02 – Is able to determine air potential field and its distribution in ventilation networks and to prepare potential schemes of these networks.

PEK_U03 – Is able to prepare preliminary concept of a mine ventilation system.

PEK_U04 – Is able to estimate pyrophoric properties of coal with the use of Olpiński method and to assess fire hazards in a mine.

PEK_U05 – Is able to analyse the results of survey conducted in order to prevent endogenous fires.

PEK_U06 – Is able to analyse and assess malfunctioning of ventilation system resulting from fire.

PEK_U07 – Is able to assess fire stage in dammed areas.

PEK_U08 – Is able to plan the arrangement of anti-fire devices in a mine.

PEK_U09 – Is able to assess air condition in mining sites and indicate possible improvements.

relating to social competences:

PEK_K01 – Is able to work in a team, collaborate while performing a task, elaborate the results and present the results of the performed task in the form of team report.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Digital imagining of ventilation networks, examining the structure of ventilation networks.	2
Lec 2	Calculating natural air flow in simple and compound ventilation networks.	4
Lec 3	Threat of underground fire, burning process, fir gases, fire depression.	2
Lec 4	Causes on underground fires and its stages. Coal and its pyrophoric properties as contributing factor.	2
Lec 5	Assessing fire threat. Early detection of exogenous and endogenous fires. Preventing exogenous and endogenous fires.	2
Lec 6	Active and passive participation in underground fire extinguishing. Securing of a mine site during fire.	2
Lec 7	Malfunctions of ventilation network during underground fire. Stabilization of air flow directions and distribution in methane mines. Eliminating smoke.	2
Lec 8	Methods of extinguishing underground fires. Reversion in ventilating during fire. Additional securements of descending air currents.	2
Lec 9	Rules and regulation of fire fighting action. Crew evacuation.	1
Lec 10	Assessing fire stage in a dammed area. Quick extinguishing of fire areas. Opening and terminating underground fire areas.	2
Lec 11	Physical and thermal properties of a rock mass and rocks, geo-thermal stage and gradient, primal temperature of rocks. Assessing air threats in mines. Possibilities of improving air condition in mines without the necessity of applying special cooling devices. Forecasting of air threats in mining sites.	2
Lec 12	Operation of compressing and absorbing HVOC devices. Air conditioning machinery applied in mining.	2
Lec 13	HVOC operation rules in preparatory and excavation works. Central HVOC. Controlling ventilation, fire and air related threats in accordance to valid rules and regulations in mining.	4
	Total hours	**30**

	Form of classes - laboratory	**Number of hours**
Lab 1	Describing methods of determining air potentials, parameters essential for determining air potentials and their drop in laboratory ventilation network. Potential scheme for such network.	2
Lab 2	Describing methods of early detection of endogenous fires. Estimating pyrophoric properties of coal with the use of Olpiński method, in accordance to PN-93/G-04558 standard.	2
Lab 3	Assessing efficiency of single-stage HVOC compressor. Measurement of key parameters of cooling agent, preparing circulation diagram of thermodynamic agent, energy efficiency rating and coefficient of performance.	2
Lab 4	Describing selected methods of calculating air distribution in ventilating networks. Operation of graphic and calculating ventilation network.	3
Lab 5	Construction of graphic and digital models for ventilation networks of different complexity.	2
Lab 6	Calculating air distribution in ventilation networks for different ventilation stages.	4
	Total hours	**15**

	Form of classes - project	Number of hours
Proj 1	Range of project classes, term of crediting, literature. Assigning individual projects topics. Describing guidelines for project work: 1) Preparing project of ventilation system in a mine for the given geological and mining conditions and natural threats. 2) Planning fire precautions in a mine, basing on the analysis of possible malfunctioning of air flow caused by the fire outbreak.	1
Proj 2	Preparing ventilation map and ventilation schemes in ventilation network, basing on the assumed opening out and deposit begging.	2
Proj 3	Calculating demand for air in flats and chambers; assuming air distribution in whole ventilation network. Determining air splits resistance and energy dissipation.	2
Proj 4	Regulating air distribution, selecting proper controllers and parameters of main fans.	2
Proj 5	Selecting main fans for ventilation network. Security and efficiency analysis.	2
Proj 6	Analysis of probable starting points for fire outbreak. Determining fire depression.	2
Proj 7	Analysis of possible malfunctions in ventilation network; finding seat of fire, eliminating smoke, smoke prevention, distribution of fire fighting devices in ventilation network.	4
	Total hours	**15**

TEACHING TOOLS USED
N1. Lecture in its traditional form, supported by multimedia presentations. N2. Laboratory – work-stand classes with the use of instruments for measuring physical properties of the air. N3. Presentation of the report. N4. Didactic discussion as a part of lectures, laboratory work and project work. N5. Consultations.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01- PEK_W05	Final exam grade for a written test.
P2	PEK_U01- PEK_U05 PEK_K01	F1 – Grade for oral presentation of written reports (30%) F2 – Grade for a written test (70%) P2 – Final grade for laboratory work (weighted average mean from F1-30% and F2-70%)
P3	PEK_U06-PEK_U09	Final grade for project work and its presentation.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Wacławik J.: Wentylacja kopalń tom I i II, Wyd. AGH, Kraków 2010.
[2] Strumiński A.: Zwalczanie pożarów w kopalniach głębinowych, Wyd. Śląsk, Katowice 1996.
[3] Roszkowski J., Pawiński J., Strzemiński J.: Przewietrzanie kopalń, Wyd. ŚWT, Katowice 1995.
[4] Roszczynialski W., Trutwin W., Wacławik J.: Kopalniane pomiary wentylacyjne, Wyd. Śląsk, Katowice 1992.
[5] McPherson M. J.: Subsurface Ventilation and Environmental Engineering, Published by Chapman & Hall, London 1 993

SECONDARY LITERATURE:

[1] Łuska P., Nawrat S.: Klimatyzacja kopalń podziemnych: urządzenia chłodnicze. Biblioteka Szkoły Eksploatacji Podziemnej, Kraków 2002.
[2] Łuska P., Nawrat S.: Klimatyzacja kopalń podziemnych: systemy chłodnicze. AGH Uczelniane Wydawnictwa Naukowo-Dydaktyczne, Kraków 2008.
[3] Maciejasz Z., Kruk F.: Pożary podziemne w kopalniach, cz. 1. Wyd. Śląsk, Katowice 1977.
[4] Szymański W., Wolańczyk F.: Termodynamika powietrza wilgotnego: Przykłady i zadania, Oficyna wydawnicza Polit. Rzeszowskiej, Rzeszów 2008.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mine Ventilation and Fires II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
mining and geology

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W30	C1	Lec 1, Lec 2, Proj 2	N1, N4, N5
PEK_W02	K_W30	C2	Lec 2, Proj 3, Proj 4, Proj 5	N1, N4, N5
PEK_W03	K_W30	C3	Lec 3, Lec 5, Lec 6	N1, N4, N5
PEK_W04	K_W30	C5	Lec 9	N1, N4, N5
PEK_W05	K_W30	C6, C7	Lec 11, Lec 12, Lec 13	N1, N4, N5
PEK_U01	K_U27	C1	Lec 1, Proj 2, Proj 3	N1, N4, N5
PEK_U02	K_U27	C1	Lec 1, Lab 1	N1, N2, N3, N4, N5
PEK_U03	K_U27	C2	Lec 2	N1, N4, N5
PEK_U04	K_U27	C3	Lec 4, Lab 2	N1, N2, N3, N4, N5
PEK_U05	K_U27	C3	Lec 5, Proj 5, Proj 6	N1, N4, N5
PEK_U06	K_U27	C4	Lec 7, Lec 8, Proj 7	N1, N4, N5
PEK_U07	K_U27	C4	Lec 10, Proj 7	N1, N4, N5
PEK_U08	K_U27	C4	Lec 6, Proj 7	N1, N4, N5
PEK_U09	K_U27	C6, C7	Lec 8	N1, N4, N5
PEK_K01	K_K01	C1, C2, C4, C6	Lab 1-Lab 6, Proj 1	N1, N2, N3, N4, N5