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, part-time
Kind of subject: obligatory
Subject code: MMG1201
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	10			30	
Number of hours of total student workload (CNPS)	60			120	
Form of crediting	crediting with grade			crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points	2			4	
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. 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.	2
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.	2
Lec 3	Orthogonal parallel projection. Polyhedron-straight line intersection. Polyhedron-plane intersection. Polyhedra penetration.	2
Lec 4	Orthogonal parallel projection. Penetration of solids of revolution and penetration of solids of revolution with rigid bodies.	2
Lec 5	Projection with elevations. Space elements and relations between them. Applications of projections with elevations in terrain topography representations. Final test.	2
	Total hours	**10**

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.	3
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.	3
Proj 4	Orthogonal parallel projection. Penetration of solids of revolution and penetration of solids of revolution with rigid bodies.	3
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.	3
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	**30**

TEACHING TOOLS USED
1. Traditional lecture elements of an interactive lecture, using mainly handwriting techniques and computer presentations prepared in PowerPoint, AutoCAD and Data Mine. 2. Project – interactive class, using problem solving methods, students solve spatial graphic problems in representations over a plane, using hand drawing and pencil technique tools. 3. Project – reading a geometric form of 3-dimensional objects from projections – multiple choice test, graphic quizzes and puzzles. 4. Students' own work – successful preparation of about 9 thematic drawings. 5. Students' own work – individual literature studies 6. 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
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, part-time
Kind of subject: obligatory
Subject code: GGG1201
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	20				
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. Necessary general knowledge (at the level of secondary education) to understand engineering problems related to technology of mineral deposits exploitation.
2. Necessary general knowledge (at the level of secondary education) related to the centre of the Earth and processes shaping it as well as the origin of rocks and minerals.
3. Elementary knowledge (at the level of secondary education) related to widely understood world economy, necessary to understand the role and significance of mining exploitation, which, by supplying minerals, has always been and still is the basis of technical and economic human activity

SUBJECT OBJECTIVES

C1 - Acquisition of knowledge on the role and practice of mining, which, by supplying minerals, has been the basis of technical and economic human activity since the beginnings of civilisations.

C2 - Acquisition of knowledge on the history of using mineral deposits and development of the technology of mineral deposits exploitation, which was one of the most significant incentives for knowledge and technology development over centuries (including the introduction of the origin and role of contemporary professional customs in mining).

C3 - Acquisition of elementary knowledge on mineral deposits creation and occurrence, which determine their exploitation methods and technical solutions used in mining.

C4 - Presentation and explanation of basic technical problems of mineral deposits exploitation,

especially issues related to: searching for deposits and first driving, deposit geology, rock workability, orogenic belt mechanics, mining excavation casing, underground engineering, mine dewatering and ventilation, mining transport (vertical and horizontal), mining mechanisation, mining threats and their prevention, mine rescue work as well as elements of geological and mining law.

C5 - Acquisition of knowledge on technology and systems of underground deposits exploitation.

C6 - Acquisition of knowledge on technology and systems of surface mining.

C7 - Learning and understanding specialist mining nomenclature.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01-has elementary knowledge of widely understood mining engineering as one of the most important technological and economic areas of human activity

PEK_W02 -has knowledge on the role, goals and significance of mining exploitation, understands elementary significance of minerals mining as a technical and economic basis of human activity.

PEK_W03 -has general knowledge of the history of using mineral deposits and the development of deposits exploitation technology over centuries, knows the origin and role of contemporary professional customs in mining.

PEK_W04-has general knowledge of the creation of mineral deposits as well as the form and construction of mineral deposits which determine exploitation methods and technical solutions used in mining.

PEK_W05-has general knowledge and can understand basic technical problems in surface and underground mining of minerals, with reference to : searching for deposits and first driving, deposit geology, rock workability, orogenic belt mechanics, mining excavation casing, underground engineering, mine dewatering and ventilation, mining transport (vertical and horizontal),mining mechanisation, mining threats and their prevention, mine rescue work as well as elements of geological and mining legal regulations.

PEK_W06 -has general knowledge of functioning and systems of underground deposits exploitation.

PEK_W07 -has general knowledge of functioning and systems of surface deposits exploitation.

PEK_W08 -knows and can use specialist mining nomenclature.

relating to social competences:

PEK_K01-realizes the social role of a technical university graduate and especially understands the need to formulate and spread in society information and opinions on achievements in mining and other aspects of mining engineering activity, e.g. in mass media; makes attempts to inform and spread opinions in an understandable way;

PEK_K02-has knowledge allowing for undertaking polemics with people who do not understand the role and significance of mining in the development of civilisation, technology and culture in history and today.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Course syllabus, crediting conditions and literature. The role and significance of mining. Development of the mineral mining technology over centuries. Geological and mining legal regulations.	2
Lec 2	Useful minerals deposits – types and genesis, form and construction of deposits. Searching for deposits, deposits assessment and calculation methods, balancing criteria. Terminology of underground mining.	1

Lec 3	Technology of rock workability in underground mining. Basic issues in, orogenic belt mechanics: static and dynamic symptoms of orogenic pressure, mining excavation casing (basic notions and division of casings).	1
Lec 4	Underground mining: types of opening-out headings, basic opening-out structures in underground mines (mine model).	1
Lec 5	Underground mining: shafts – shaft sinking, casing, equipment. Vertical transport winding gear. Shaft bottom and chambers.	1
Lec 6	Underground mining: preparing deposits for exploitation, technology of underground excavation construction and maintenance.	1
Lec 7	Underground mining: exploitation systems – breast mining, disposal of post-exploitation caverns – floor management, exploitation directions.	2
Lec 8	Underground mining: threats in underground mining, ventilation, air-conditioning, dewatering and lighting in underground mines, mine rescue work. Mine disposal.	2
Lec 9	Surface mining – technologies of deposits exploitation in surface mining, surface mining minerals – types of minerals, use, occurrence, deposits characteristics. Surface mining terminology – basic definitions and technological processes, types of excavations, elements of surface mining excavation.	2
Lec 10	Opening-out headings in surface mining – goal, factors influencing opening-our area, opening-out methods and machines. Exploitation systems and ways of mining front moving in surface mining – requirements, types, systems characteristics	2
Lec 11	Technologies in surface mining of rock minerals: Exploitation for aggregates – machine work modes; power shovels, transport, basics of drilling and blasting works – blasting methods, basic blasting effects, parameters of blasting openings, blasting network scheme.	1
Lec 12	Technologies in surface mining of rock minerals: Exploitation of solid minerals for blocks – characteristics of deposits allowing exploitation for blocks, stages of the process of gaining blocks from unmined rock, block working methods. Characteristics of block working methods, rock working elements.	1
Lec 13	Technology of brown coal exploitation – exploitation systems, types of bucket ladder excavator, bucket ladder excavator working methods.	1
Lec 14	Removing and dumping of overlay – working methods of excavators and dumping conveyors.	1
Lec 15	Drowned mineral exploitation technologies – working types, exploitation systems, excavators, transport of output.	1
	Total hours	**20**

TEACHING TOOLS USED
N1. Informative lecture with elements of problem lecture. N2. Multimedia presentations. N3. Didactic discussions during lectures. N4. 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
P	PEK_W01-PEK_W08 PEK_K01-PEK_K02	P1 Final result of a written exam.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] CHUDEK M., Podstawy górnictwa, Wydawnictwo "Śląsk".
[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 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 Wyd. Techn., Katowice 1994.
[10] NOWAK K., KOSTRZ J. Górnictwo. Część 1. Wyd. „Śląsk", Katowice 1989.
[11] PIECHOTA S. Podstawowe zasady i technologie wybierania kopalin stałych, Wyd. PAN IGSMiE, Kraków 2003.
[12] PIECHOTA S. Podstawy górnictwa kopalin stałych, Wyd. AGH, Kraków 1996,
[13] PIECHOTA S. Technika podziemnej eksploatacji złóż i likwidacji kopalń. Wyd. 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 Wyd. Techn., Katowice 1993.
[2] GOSZCZ A., Elementy mechaniki skał oraz tąpania w polskich kopalniach węgla i miedzi, Biblioteka Szkoły Eksploatacji Podziemnej, Wyd. 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, Wyd. AGH
[7] Górnictwo Odkrywkowe – czasopismo - www.igo.wroc.pl/
[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 the 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: Technologie Informacyjne
Name in English: Information Technologies
Main field of study: mining and geology
Level and form of studies: 1st level, part-time
Kind of subject: obligatory
Subject code: INZ0535
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	20				
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. Computer sciences and mathematics at the level required in secondary school.

SUBJECT OBJECTIVES

C1 Acquisition of knowledge on basic information technologies related to:
- C1.1 computer organisation and operation
- C1.2 system and utility software,
- C1.3 selected applications,
- C1.4 computer networks and Internet,
- C1.5 security.

SUBJECT EDUCATIONAL EFFECTS
relating to knowledge: PEK_W01 has knowledge of the basics of computer operation and architecture PEK_W02 has knowledge of rules related to using computers and computer uses PEK_W03 has ordered knowledge on professional use of selected examples of application software. PEK_W04 knows basic rules of computer network and Internet functioning, information gathering and network communication. PEK_W05 has knowledge on threats and security rules related to computers and network. **relating to social competences:** PEK_K01 realizes that there are norms, ethical rules and established customs in IT society.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Introduction and basic notions in IT.	1
Lec 2	Representation, encrypting and data processing on a computer	2
Lec 3	Computer architecture basics	2
Lec 4	Peripherals and memory	2
Lec 5	Algorithms, data structures and programming	2
Lec 6	Software, operating systems	1
Lec 7	Professional use of text editors	1
Lec 8	Spreadsheets	1
Lec 9	Data presentation and management graphics	1
Lec 10	Database elements	1
Lec 11	Computer networks and the Internet; introduction	2
Lec 12	Computer networks and Internet; services and network applications	1
Lec 13	Computer security, data encryption, electronic signature.	3
	Total hours	**20**

TEACHING TOOLS USED
N1. Traditional lecture with multimedia presentations.

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_W05 PEK_K01	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, Wyd. PWN, 2012
[3] Sikorski W., ECDL. Podstawy technik informatycznych i komunikacyjnych, PWN 2009
[4] Wojciechowski A. Usługi w sieciach informatycznych. Wyd. PWN 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? Wyd. PWN, 2011

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

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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 the 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 13	N1

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, part-time
Kind of subject: obligatory
Subject code: OSG1201
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	20				
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 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_W01Has 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_W02Has synthetic knowledge of natural processes in the atmosphere, hydrosphere and lithosphere, which have substantial influence on the use natural resources of the Earth

PEK_W03Knows 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_K01Understands 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	Cosmic environment of the inhabitants of planet Earth	2
Lec 2	The Earth's atmosphere	4
Lec 3	Earth's climate – changes, its role in human development	2
Lec 4	Earth's hydrosphere – resources and water cleanliness	4
Lec 5	Natural diversity of land environment	4
Lec 6	Knowledge of the environment as the basis for using Earth's resources	2
Lec 7	Condition and protection of the natural environment of the Earth with particular emphasis on the natural environment of Poland	2
	Total hours	**20**

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	Method of evaluating educational effect achievement
P	K_W01-K_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)

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

mgr Jerzy Cygan, jerzy.cygan@pwr.wroc.pl

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_W14	C1	Lec 1	N1
PEK_W02	K_W11	C2	Lec 2-Lec 6	N1
PEK_W03	K_W11	C3	Lec 7	N1
PEK_K01	K_K02	C2, C3	Lec 1-Lec 7	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, part-time
Kind of subject: optional / university-wide
Subject code: MAP9947
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20	20			
Number of hours of total student workload (CNPS)	120	120			
Form of crediting	Examination	crediting with grade			
For group of courses mark (X) final course					
Number of ECTS points	4	4			
including number of ECTS points for practical (P) classes	0	4			
including number of ECTS points for direct teacher-student contact (BK) classes	2	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 to 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	Elementary functions. Exponential, logarithmic, trigonometric functions, inverse trigonometric functions.	2
Lec 2	Numerical sequence. Monotonic and limited sequence. Boundary and infinite sequence of numbers. E (mathematical constant)	2
Lec 3	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.	3
Lec 4	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.	2
Lec 5	The derivative of the function at the point. Sided and Wrong derivatives. Derivatives of basic elementary functions. Differentiation. Derivatives of higher orders.	2
Lec 6	Geometric interpretation of the derivative. Tangent. Differentials and their applications to approximate calculations. The rule de L `Hospital.	2
Lec 7	Mean value theorems (Rollethe and Lagrange). Taylor and Maclaurin formulas and their applications.	2
Lec 8	Intervals of monotonicity of functions. Local extremes functions. Necessary and sufficient conditions of existence of local extremes. The value of the smallest and the largest function in a closed interval.	2
Lec 9	Indefinite integrals and their basic properties. Integration by parts. Integration by substitution. Integration of rational functions.	4
	Total hours	**20**

Form of classes - class		Number of hours
Cl 1	Application of the laws of logic and set theory. 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 2	Calculating the limits of appropriate and inappropriate number sequences and functions (at a point) and unmarked expressions. Determining function asymptotes.	2
Cl 3	Continuity and function at a point on the interval. The use of theorems a continuous function on a closed interval to the issues of extreme and approximate equations.	2
Cl 4	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).	2
Cl 5	Determining the rules of Taylor / Maclaurin to estimate accuracy. Usage of L'Hospital's rule to calculate limits.	2
Cl 6	Investigation of the function - monotonicity, convexity, local extremes. Estimating global extremes.	2
Cl 7	The calculation of integrals - integration by parts and by substitution. Integration of rational functions. Integration of trigonometric functions.	4
Cl 8	Final test.	2
	Total hours	**20**

TEACHING TOOLS USED
1. Lecture 2. Laboratories 3. Consultations 4. 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. Definicje, twierdzenia, wzory. Oficyna Wydawnicza GiS, Wrocław 2002.
[3] M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2011.
[4] W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, Cz. I, PWN, Warszawa 2006.
[5] J. Pietraszko, Matematyka. Teoria, przykłady, zadania, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2000.

SECONDARY LITERATURE:

[1] M. Gewert, Z. Skoczylas, Oprac. Analiza matematyczna 1. Kolokwia i egzaminy. GiS, Wrocław 2002.
[2] R. Leitner, Zarys matematyki wyższej dla studiów technicznych. Cz. 1, 2 WTN, Warszawa 1994.
[3] F. Leja, Rachunek różniczkowy i całkowy ze wstępem do równań różniczkowych, PWN, Warszawa 2008.
[4] H. i J. Musielakowie, Analiza matematyczna, T. I, cz. 1 i 2, Wydawnictwo Naukowe UAM, Poznań 1993.
[5] W. Stankiewicz, Zadania z matematyki dla wyższych uczelni technicznych, Cz. B, PWN, Warszawa 2003.

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

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Komisja programowa Instytutu Matematyki i Informatyki

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mathematical Analysis 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_W01	C1, C4	Lec1	N1, N3, N4
PEK_W02	K_W01	C2, C4	Lec 2-Lec 8	N1, N3, N4
PEK_W03	K_W01	C3, C4	Lec 9	N1, N3, N4
PEK_U01	K_U02	C1, C4	Cl 1	N2, N3, N4
PEK_U02	K_U02	C2, C4	Cl 2, Cl 5	N2, N3, N4
PEK_U03	K_U02	C2, C4	Cl 3, Cl 4, Cl 6	N2, N3, N4
PEK_U04	K_U02	C3, C4	Cl 7	N2, N3, N4
PEK_K01-PEK_K02	K_K07	C1-C4	Lec 1-Lec 9 Cl 1-Cl 8	N1-N4

SEMESTER 2

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, part-time
Kind of subject: obligatory
Subject code: MMG2201
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20	20			
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 has basic knowledge concerning mathematical analysis, algebra and physics necessary to understand mathematical issues of engineering character.

SUBJECT OBJECTIVES

C1 Acquiring by the student theoretical knowledge of flat and spatial static regimes.
C2 Acquiring by the student modelling skills and the ability to solve flat static regimes.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:
PEK_W01 Gaining basic knowledge concerning static flat and spatial systems of systems.
PEK_W02 Gaining detailed knowledge of the active forces and the calculation of passive forces and cross-sectional forces.

relating to skills:
PEK_U01 Ability to identify types of flat and spatial regimes.
PEK_U02 Ability to solve flat regimes concerning reaction and cross-section forces.
PEK_U03 Ability to check solutions correctness concerning flat and spatial regimes.

relating to social competences:
PEK_K01 Understanding the importance of static solutions for the correct operation of a structure.
PEK_K01 Understanding dangers connected with lack of static solutions control.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Subject Technical Mechanics Vector and scalar. Vectors algebra. Analytical presentation of free vector in space and on a plane. Multiplication and division of a vector by a number. Addition and subtraction of vectors. Plan of forces and polygon of forces. Scalar and vector product of vectors. THE AXIOMS of statics. The equivalent of two vectors. Force projection on a straight line. Resultant and components. Graphical determination of resultant of flat converging force system. The balance of such a system in terms of graphics. Projection sum theorem of sum of vectors. Analytical determination of resultant of flat converging force system. The balance of such a system in terms of analytics.	2
Lec 2	Point torque. General moment of force. A pair of force. Analytical determination of resultant of flat of any force system. The balance of such a system. Reduction of spatial convergent and any system of forces. Central vector and a wrench.	2
Lec 3	Straight torque. Analytical conditions of spatial convergent and any system of forces. Balance of three and four forces on a plane. Culmann issue. Elements of graphostatics. Columnar polygon. Graphical determination of resultant of any flat force system. Graphical determination of point torque.	2
Lec 4	Elements of a rigid body kinematics. Degrees of freedom. Centre of an instantaneous rotation. Kinematics of discs. Geometric reproducibility and static determination. Rigid body statics. Connections. Reactions. Supports. Division of loading forces. Statics of beams and frames which are statically determined. Interactions and internal forces: longitudinal force, transverse force, bending moment and torque. Definitions, marking agreements. Internal forces graphs - rules of performance. Differential connections between internal forces.	2
Lec 5	Statics of beams and frames which are statically determined. (to be continued)	2
Lec 6	Statics of beams and frames which are statically determined. (to be continued)	2
Lec 7	Continuous beams, linked. Interaction and internal forces. Analytical and graphical methods.	2
Lec 8	Flat trusses: definitions, static determination and geometric unchangeability. Methods: balancing nodes and Cremona.	2

Lec 9	Flat trusses. Methods: Ritter, Culmann.	2
Lec 10	Arc statics. Interaction and internal forces: bending moment, cross-section and longitudinal force. Internal forces graphs. Statics of three-linked arcs.	2
	Total hours	**20**

Form of classes - lecture		**Number of hours**
Cl 1- Cl 10	Detailed presentation of issues presented while classes on the example of exercises.	20
	Total hours	**20**

TEACHING TOOLS USED
N1. Lecture: presentation and theory discussion and examples with the use of audio - video equipment. N2. Classes: solving problems on a board on my own and together with students.

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
P1	PEK_W01, PEK_W02,	Exam - oral and written part
P2	PEK_U01, PEK_U02, PEK_U03 PEK_K01, PEK_K02	Written test during the 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.

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

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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 main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W13	C1, C2	Lec 1-Lec 6	N1
PEK_W02	K_W13	C1, C2	Cl 1-Cl 6	N2
PEK_U01	K_U11	C1, C2	Lec 1-Lec 3, Cl 1-Cl 3	N1, N2
PEK_U02	K_U11	C1, C2	Lec 3-Lec 6, Cl 3-Cl 6	N1, N2
PEK_U03	K_U11	C1, C2	Lec 7-Lec 10, Cl 7-Cl 10	N1, N2
PEK_K01	K_K07	C1, C2	Lec 7-Lec 10	N1, N2
PEK_K02	K_K07	C1, C2	Lec 7-Lec 10	N1, N2

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, part-time
Kind of subject: obligatory
Subject code: GKG2204
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	20		20		
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					
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, types of geodetic measurements, elements of spatial references systems	2
Lec 2	Types of maps: content of maps, geometric interpretation, scales, measurement units: length, area and angles, recalculation of angle measurements	2
Lec 3	Measurements of terrain details: methods, technical instructions, introductory results analysis, direct and indirect measurements of distance, straight lines and angles determination	2
Lec 4	Theodolite, measurement of horizontal and vertical directions, calculation of angles	2
Lec 5	Calculus of coordinates in the plane: calculation of the coordinates of a polygonal traverse, deviation and correction, area and cubature calculation methods	2
Lec 6	Elements of the calculus of errors: types of errors, identically and non-identically accurate observations, mean error, observation function error	2
Lec 7	Topographic measurements: geometric levelling, level circuits measurements, geometric surface levelling, trigonometric levelling	2
Lec 8	Completion and control measurements: data determination for setting out objects, setting out slopes, level and rectilinearity testing in construction elements of buildings	2
Lec 9	Basics of analytical and digital photogrammetry, applications in mining	2
Lec 10	Elements of SIP/GIS used in management support in mining	2
	Total hours	**20**

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 and polar method, a field sketch,	2
Lab 3	Charting an analogue map	2
Lab 4	Geometric interpretation of economic maps: interpolation of contour lines, structure sections of mining areas	2
Lab 5	Area and cubature calculation	2
Lab 6	Angle measurements: theodolite, optical and digital tacheometer, measurements of horizontal and vertical directions	2
Lab 7	Topographic measurements – geometric levelling of level circuits	2
Lab 8	Coordinates calculus: calculation of coordinates of a polygonal traverse	2
Lab 9	Intersection, measurements of geometric elements	2
Lab 10	Analytical and digital photogrammetry: presentation of stereophotogrammetric models, determination of coordinates	2
	Total hours	**20**

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 EFFECT 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-PEKU03	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 10	N1, N4, N5
PEK_W02	K_W12	C2	Lec 2 -Lec 4, Lec 7	N1, N4, N5
PEK_W03	K_W12	C3	Lec 5	N1, N4, N5
PEK_W04	K_W12	C3	Lec 2, Lec 8	N1, N4, N5
PEK_U01	K_U10	C1, C2	Lab 1-Lab 3 Lab 6-Lab 7	N2, N3, N5
PEK_U02	K_U10	C3	Lab 4, Lab 5 Lab 8-Lab 10	N2, N3, N5
PEK_U03	K_U10	C3	Lab 10	N2, N3, N5

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, part-time
Kind of subject: obligatory
Subject code: GEG2201
Group of courses: YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			20	
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			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 Student knows the most important geological processes forming the lithosphere and their mineral deposits and understands their interrelationship. The student is also aware of 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 students 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, geological profiles. The student is also able to present a geological structure in a form of sketches 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.	1
Lec 4	The Mesozoic Era.	1
Lec 5	The Cenozoic Era.	1
Lec 6	The Earth’s structure.	1
Lec 7	The egzogenic geological processes.	1
Lec 8	The endogenic geological processes.	1
	Total hours	**10**

Form of classes - project		Number of hours
Proj 1	Basic concepts concerning stratigraphy, tectonics, geological cartography, making measurements using a geological compass.	6
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.	3
Proj 4	Making a stratigraphic section on the basis of a borehole profile.	3
Proj 5	Making a geological map sheet with a proper lithological profile, a proper stratigraphic section and a proper legend.	6
	Total hours	**20**

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	K_W03, K_W04, K_U02, K_U03, K_K01-K_K03	Test on the basic issues concerning stratigraphy, tectonics, and geological cartography.
F2 – F5	K_W03, K_W04, K_U01-K_U03, K_K01-K_K03	Students will be graded on the basis of the individual completion of 4 projects and the ability to use a geological compass.
P	K_W01-K_W04, K_U01-K_U03, K_K01-K_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:

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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: Podstawy Ekonomii
Name in English: Introduction to Economics
Main field of study: mining and geology
Level and form of studies: 1st level, part-time
Kind of subject: obligatory
Subject code: EKG2201
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10				10
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. The limits of the production capacity.	1
Lec 2	Economic growth.	1
Lec 3	Trade (D. Ricardo model). The model of money circulation.	1
Lec 4	Supply and demand. The examples and consequences of price regulation.	1
Lec 5	Production costs.	1
Lec 6	The elasticity of supply and demand.	1
Lec 7	Perfect competition. Pure monopoly.	1
Lec 8	Oligopoly. Monopolistic competition.	1
Lec 9	Market structures.	1
Lec 10	Material welfare vs. economic freedom.	1
	Total hours	**10**

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.	9
	Total hours	**10**

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 test requires 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:

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SECONDARY LITERATURE:

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[4] Hall R.E., Taylor J.B.: Makroekonomia - teoria, funkcjonowanie i polityka, Wydawnictwo Naukowe PWN 1995.
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[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 10	N 1, N4, N5, N8
PEK_W03 PEK_W04	K_W21	C2	Sem 1-Sem 7	N 2, N3, N6-N7
PEK_U01 PEK_U02 PEK_U03	K_U42	C1	Lec 1-Lec 10	N 1, N4, N5, N8
PEK_U03 PEK_U04 PEK_U05	K_U42	C2	Sem 1-Sem 7	N 2, N3, N6-N7
PEK_K01 PEK_K02 PEK_K03	K_K01-K_K07	C1, C2	Lec 1-Lec 10 Sem 1-Sem 7	N 1, N4, N5 N 2, N3, N6-N7
PEK_K04	K_K01-K_K07	C1	Lec 1	

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, part-time
Kind of subject: optional / university-wide
Subject code: MAP9944
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	20			
Number of hours of total student workload (CNPS)	120	120			
Form of crediting	Examination	crediting with grade			
For group of courses mark (X) final course					
Number of ECTS points	4	4			
including number of ECTS points for practical (P) classes	0	4			
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 able to examine convergence of sequences and calculate limits of functions of one variable.
2. The student is familiar with and knows how to use the indefinite integral of a function of one variable.
3. 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. Gaining basic knowledge of ordinary differential equations.
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

PEK_W04 The student has basic knowledge of ordinary differential equations

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

PEK_U05 The student is able to solve linear differential equations of first and second order

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.	2
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. The partial derivatives of the first order. Definition. Geometric interpretation. Higher order partial derivatives. Schwarz's theorem.	2
Lec 5	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.	2
Lec 6	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.	2
Lec 7	Double integrals. The definition of the double integral. Geometric and physical interpretation. Calculation of double integrals normal regions. Properties of double integrals. Double integral in polar coordinates.	3

Lec 8	Integral triple. Definition. Physical interpretation. Replacement of the iterated triple integrals. Change of variables in cylindrical and spherical coordinates.	3
Lec 9	Applications of double and triple integrals in geometry and physics.	2
Lec 10	Ordinary differential equation. The differential equation with separated variables.	2
Lec 11	Linear differential equation of the first order.	1
Lec 12	Linear differential equation of second order with constant coefficients.	3
Lec 13	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. Selected criteria for convergence of series of non-negative words.	2
Lec 14	Power series. The definition of a power series. The radius and interval of convergence. Theorem of Cauchy-Hadamard. Power series of Taylor and Maclaurin. The development of functions into power series.	2
	Total hours	**30**

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	Determination of areas of natural functions of several variables and study the charts. Calculation of limits and testing the continuity of functions of several variables. Calculation of partial derivatives. Determination of the tangent plane.	2
Cl 3	Estimating using differentials. Calculation of the directional derivative and the gradient. Determination of the extremes of functions of two and three variables. Determination of conditional extremes.	2
Cl 4	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.	2
Cl 5	Calculation of triple integrals over normal regions. Reversal iterated integrals. The calculation of integrals of replacing variables in spherical coordinates. The use of the integral in the war for engineering calculations.	2
Cl 6	Determination of the general integrals and solving initial value problems of ordinary differential equations with separated variables, linear first-order and second-order linear with constant coefficients.	4
Cl 7	Calculating the sum of numerical series. The study of conditional and unconditional convergence using methods known in the lecture. Study of convergence of power series. Determination of the Maclaurin series. The approximate calculation of the series and integrals.	2
Cl 8	Final test	2
	total hours	**20**

TEACHING TOOLS USED
1. Lecture 2. Exercises 3. Consultations 4. 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
P – Cl	PEK_U01-PEK_U05 PEK_K01-PEK_K02	Oral and written form of crediting the student
P - Lec	PEK_W01-PEK_W4 PEK_U01-PEK_U05 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.
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[5] W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, Cz. I-II, PWN, Warszawa 2006.

SECONDARY LITERATURE:

[1] M. Gewert, Z. Skoczylas, Analiza matematyczna 2, Definicje, twierdzenia, wzory. Oficyna Wydawnicza GiS, Wrocław 2012.
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[3] R. Leitner, Zarys matematyki wyższej dla studiów technicznych, Cz. 1-2, WNT, Warszawa 2006.
[4] H. i J. Musielakowie, Analiza matematyczna, T. I, Cz. 1-2 oraz T. II, Cz. 1, Wydawnictwo Naukowe UAM, Poznań 1993 oraz 2000.
[5] J. Pietraszko, Matematyka. Teoria, przykłady, zadania, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2000.
[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 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_W01	C1, C5	Lec 1-Lec 3	N1, N3, N4
PEK_W02	K_W01	C2, C5	Lec 4-Lec 9	N1, N3, N4
PEK_W03	K_W01	C3, C5	Lec 13-Lec 14	N1, N3, N4
PEK_W04	K_W01	C4, C5	Lec 10-Lec 12	N1, N3, N4
PEK_U01	K_U02	C1, C5	Cl 1	N2, N3, N4
PEK_U02	K_U02	C2, C5	Cl 2-Cl 3	N2, N3, N4
PEK_U03	K_U02	C2, C5	Cl 4-Cl 5	N2, N3, N4
PEK_U04	K_U02	C3, C5	Cl 7	
PEK_U05	K_U02	C4, C5	Cl 6	
PEK_K01-PEK_K02	K_K01, K_K07	C1-C5	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, part-time
Kind of subject: optional / university-wide
Subject code: FZP1014
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	20	20			
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 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 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 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/natężenie 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	**20**

Form of classes -class		Number of hours
Cl 1	Organisational matters. Task solving within the range of: the dimensional analysis, estimation of physical quantities, vector and differential-integral calculus	2
Cl 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
Cl 3	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	2
Cl 4	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
Cl 5	Solving kinematics and dynamics tasks of rigid body rotation around a fixed axis and the principle of conservation of momentum	2
Cl 6	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
Cl 7	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	2
Cl 8	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
Cl 9	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
Cl 10	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.	2
	Total hours	**20**

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

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] D. Halliday, R. Resnick, J. Walker, Podstawy fizyki, tom 1. i 2., 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.
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[2] J. Orear, Fizyka, tom 1., 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.
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[7] W. Salejda, R. Poprawski, J. Misiewicz, L. Jacak, Fizyka dla wyższych szkół technicznych, Wrocław 2001; dostępny jest obecnie rozdział Termodynamika pod adresem: http://www.if.pwr.wroc.pl/dokumenty/podreczniki_elektroniczne/termodynamika.pdf
[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)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Physics I FZP1014
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	Lec1, Lec2	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	Lec 5-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-Lec 12	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, part-time
Kind of subject: obligatory
Subject code: GEG3201
Group of courses: YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10		20		
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	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		1		

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.

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.

relating to skills:

PEK_U01 – On the basis of independent defining their physical features, the student is able to recognise and describe 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	<u>Principles of mineralogy, including:</u> Forming of minerals in nature. Classification of minerals Characteristic features of selected native element minerals, sulphide/sulphide and sulphosalt/sulfosalt. Characteristic features of selected halide, oxide and hydroxide. Characteristic feature of selected carbonate, nitrate, borane, sulphate, phosphate and organic compounds. Characteristic features of selected silicate and aluminosilicate	5, including: 1 1 1 1 1
Lec 3	Principles of petrology, including: Petrology of igneous rocks. Petrology of sedimentary rocks. Petrology of metamorphic rocks.	4, including: 1 2 1
	Total hours	**10**

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.	5
Lab 2	Recognition and mineral, structural, textural and genetic characteristics of most significant igneous rocks.	5
Lab 3	Recognition and mineral, structural, textural and genetic characteristics of most significant sedimentary rocks.	5
Lab 4	Recognition and mineral, structural, textural and genetic characteristics of most significant metamorphic rocks.	5
	Total hours	**20**

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	K_W01, K_W02, K_U01, K_U02, K_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	K_W01-K_ W04, K_U01-K_U03, K_K01-K_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.
[4] BOLEWSKI A., MANECKI A., 1993 – Mineralogia szczegółowa. Wydawnictwo PAE, Warszawa.
[5] BOLEWSKI A., PARACHONIAK W., 1988 – Petrografia. Wydawnictwa Geologiczne, Warszawa.
[6] BOLEWSKI A., KUBISZ J., MANECKI A., ŻABIŃSKI W., 1990 – Mineralogia ogólna. Wydawnictwa Geologiczne, Warszawa.
[7] CHODYNIECKA L., GABZDYL W., KAPUŚCIŃSKI T., 1988 – Mineralogia i petrografia dla górników. Wydawnictwo „Śląsk", Katowice.
[8] HEFFERAN K., O'BRIEN J., 2010 – Earth Materials. Wiley-Blackwell, Chichester, UK.
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[10] ŁYDKA K., 1985 – Petrologia skał osadowych. Wydawnictwa Geologiczne, Warszawa.
[11] MAJEROWICZ A., WIERZCHOŁOWSKI B., 1990 – Petrologia skał magmowych. Wydawnictwa Geologiczne, Warszawa.
[12] MANECKI A., MUSZYŃSKI M., 2008 – Przewodnik do petrografii. Uczelniane Wydawnictwa Naukowo-Dydaktyczne, AGH, Kraków.
[13] PENKALA T., 1983 – Zarys krystalografii. PWN, Warszawa.
[14] PHILPOTTS A. R., AGUE J. J., 2009 – Principles of igneous and metamorphic petrology. Cambridge University Press, Cambridge, UK.
[15] VERNON R. H., CLARKE G. L., 2008 – Principles of metamorphic petrology. Cambridge University Press, Cambridge, UK.

SECONDARY LITERATURE:

[1] BOJARSKI Z., GIGLA M., STRÓŻ K., SUROWIEC M., 2007 – Krystalografia. Wydawnictwo Naukowe PWN, Warszawa.
[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.
[6] HURNIK B., HURNIK H., 2005 – Materia kosmiczna na Ziemi, jej źródła i ewolucja. Wydawnictwo Naukowe Uniwersytetu im. Adama Mickiewicza w Poznaniu, Poznań.
[7] MANECKI A., 2004 – Encyklopedia minerałów. Minerały Ziemi i materii kosmicznej. Wydawnictwo AGH, Kraków.
[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_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, part-time
Kind of subject: obligatory
Subject code: GEG3202
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	20		10		
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		1		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of mathematical analysis, necessary to understand engineering mathematical problems.
2. Basic notions related to general geology and petrography, ability to present and characterise a lithological profile.
3. Ability to work in Microsoft Office environment – Word documents, Excel spreadsheets.

SUBJECT OBJECTIVES

C1 – Acquisition of knowledge on the role and perspectives of hydrogeology as a branch of science dealing with properties, movement and resources of underground water.
C2 - Acquisition of knowledge on basic properties of underground waters and ability to assess its quality.
C3 - Acquisition of knowledge on research methods and assessment of rock properties characterising their ability to collect, carry and give up water.
C4 – Learning and understanding models of underground water flow and ability to forecast flows in simple cases.
C5 - Acquisition of knowledge on assessment rules of underground water resources.
C6 - Acquisition of knowledge on mechanisms causing threats related to water underground flow (scouring, ground liquefaction).

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01. Has knowledge of basic properties of underground water, on the basis of properties can assess water quality, has orientation which waters should be especially protected, which meet criteria of curative waters.

PEK_W02. Has knowledge of basic hydrogeological properties of rocks and methods used to determine them. This is related to the ability to collect, carry and give up water by rocks.

PEK_W03. Has knowledge of regulations and equations describing underground water flow.

PEK_W04. Has general knowledge of basic properties of underground water resources, their protection and pollution.

relating to skills:

PEK_U01 is able to define quality of underground water on the basis of its properties.

PEK_U02 is able to determine basic hydrogeological properties of rocks and assess their accuracy.

PEK_U03 is able to assess ability to collect, carry and give up water by rocks on the basis of their properties.

PEK_U04 is able to forecast inflow of water to a well for simple coastal conditions, using analytical methods.

relating to social competences:

PEK_K01 is able to work in a team as well as together with other students prepare and conduct hydrogeological research on rock properties, analyse obtained results and present results of conducted research in a form of a written report prepared together with other students.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Course syllabus, crediting conditions, literature. Underground waters as a part of hydrosphere.	1
Lec 2	Water properties. Waters in the aeration and saturation zone. Genesis and age of underground waters.	3
Lec 3	Hydrogeological properties of rocks.	2
Lec 4	Dependence of water occurrence on geologic structure. Division of underground waters. Underground water level variation. Sources.	1
Lec 5	Elementary laws of underground water movement. Flow theories.	3
Lec 6	Underground water flow equations.	1
Lec 7	Analytical solutions for selected flow tasks.	2
Lec 8	Research on underground water resources. Water intakes.	1
Lec 9	New and traditional geophysical methods used in hydrogeological research. Underground waters and mining.	1
Lec 10	Physicochemical properties of underground waters. Curative waters.	3
Lec 11	Underground waters resources and their protection. Pollution of water and protection of its quality.	1
Lec 12	Hydrogeological documentation. Water and the legal system.	1
	Total hours	**20**

Form of classes - laboratory		Number of hours
Lab 1	Scope and type of laboratory research to conducted during classes, crediting conditions and literature. Division of students into research teams and allocation of team tasks. Tests of active and passive capillarity as well as filtration coefficient.	2
Lab 2	Analysis of grain-size of rocks and determination of hydrogeological properties of rocks on its basis (grain-size curve, reliable diameter of grain, reliable diameter of ducts, specific surface area, filtration coefficient). Tests of filtration coefficient with a stationary flow method.	2
Lab 3	Research on non-laminar flow parameters.	2
Lab 4	Research on critical hydraulic gradient resulting in ground liquefaction. Research and solutions related to flat flow and contamination transport for a piston flow model.	2
Lab 5	Report assessment. Additional test for students who need to catch up on classes. Crediting.	2
	Total hours	**10**

TEACHING TOOLS USED
N1.Traditional lecture with multimedia presentations. N2. Laboratory work at a test stand. N3. Test – laboratory research methods and apparatus. N4. Report on conducted research. N5. 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
P	PEK_W01-PEK_W04	P1 Final result – written test
F, P	PEK_U01-PEK_U04 PEK_K01	F1 – written tests and the conducted laboratory research F2 – written tests P2 – final laboratory grade is a weighted average of F1 – 70% and F2 - 30%

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Z. Pazdro, B. Kozerski, Hydrogeologia ogólna - Warszawa, Wyd. Geol., 1990.

[2] M. Rogoż, Dynamika wód podziemnych, Katowice, GIG 2007.

A. Macioszczyk, Podstawy hydrogeologii stosowanej, Wyd. 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. Wyd. Eduk. 2007.

[2] H. P. Jordan, A. S. Kleczkowski, J. Silar, W. M. Szestakow, S. Witczak, Ochrona wód podziemnych , Wyd. Geol., Warszawa 1984,

[3] Ryszard Kulma, Podstawy obliczeń filtracji wód podziemnych, Wyd. AGH Kraków 1995,

[4] Aleksandra Macioszczyk, Hydrogeochemia, Wyd. Geol., Warszawa 1987,

[5] Mieczysław Wacławski, Geologia inżynierska i hydrogeologia, część II – Hydrogeologia, Wyd. Zakł. Graficzne Politechniki Krakowskiej 1995.

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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 the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W17	C1, C2	Lec 1, Lec 2, Lec 10, Lec 11	N1
PEK_U02	K_W17	C3	Lec 3, Lec 8, Lab 1-Lab 5	N1-N5
PEK_U013	K_W17	C4	Lec 5, Lec 6	N1
PEK_U014	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 1-Lab 4	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 4	N1-N5
PEK_K01	K_K04		Lab 1-Lab 4	N2-N5

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, part-time
Kind of subject: obligatory
Subject code: CHG3201
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	20		20		
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 them to describe and characterise 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. Chemical bond.	2
Lec 3	States of aggregation of matter.	2
Lec 4	Solutions.	2
Lec 5	Chemistry of geological processes.	2
Lec 6	Phase borders. Chemical reactions.	2
Lec 7	Electro-chemistry.	2
Lec 8	Thermodynamics.	2
Lec 9	Elements of organic chemistry.	2
Lec 10	Environmental chemistry and chemistry of explosive materials.	2
	Total hours	**20**

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	Colloids	2
Lab 5	Metals corrosion	2
Lab 6	Non-metals corrosion	2
Lab 7	Combustion	2
Lab 8	Polymers	2
Lab 9	Coal	2
Lab 10	Assessment of reports and laboratory tests. Test of basic chemical processes. Crediting.	2
	Total hours	**20**

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 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 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 Wydawnocza 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
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)
prof. dr hab. Inż Jan Drzymała, jan.drzymala@pwr.wroc.pl

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

SUBJECT EDUCATIONAL OUTCOME	Correlation between subject educational outcome and educational outcome defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01 PEK_W02	K_W05	C1	Lec 1-Lec 10	N1, N3
PEK_U01	K_U07	C1	Lab 1-Lab 10	N2, N3
PEK_K01	K_K07	C1		

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, part-time
Kind of subject: obligatory
Subject code: GGG4202
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
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	1				
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's crust.

SUBJECT OBJECTIVES

C1 Presenting information about drilling technology 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 - Student 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	1
Lec 2	Key terminology and classification of drillings.	2
Lec 3	Impact and manual drillings.	2
Lec 4	Rotary drillings	6
Lec 5	Construction of hydro-geological, oil/petroleum and leach boreholes.	2
Lec 6	Small-diameter and large-diameter drilling for various engineering purposes.	2
Lec 7	Boreholes research and surveying.	3
Lec 8	Legal, formal and ecological aspects of drilling technology.	2
	Total hours	**20**

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	K_W01-K_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/

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

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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	Lec 1-Lec 8	N1, N2
PEK_K01	K_K02	C1	Lec 1-Lec 8	N1
PEK_K02	K_K07	C1	Lec 1-Lec 8	N1

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, part-time
Kind of subject: obligatory
Subject code: GGG3201
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	20		10		
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					
including number of ECTS points for direct teacher-student contact (BK) classes	2		0,5		

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 determination of physical and mechanical properties of soil to identify subsoil and establish 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.	1
Lec 2	Basic notions, rocks and soils, soil formation processes, classifications – scope of research.	1
Lec 3	Soil as a three-phase structure. Types of particles and minerals. Soil texture and structure, mineral particle-water system.	1
Lec 4	Physicochemical interaction between soil particles and water: ion exchange capacity, electro-kinetic phenomena, thixotropy phenomenon.	1
Lec 5	Physical properties, compacting and consistence states.	1
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.	1
Lec 8	Soil shrinkage – compaction law. Preconsolidation pressure.	1
Lec 9	Soil strength, strength types, research methods and results interpretation.	1
Lec 10	Dependence of stress condition in orogenic belt on deadweight and external loads. The Boussinesqu and Flammant task.	1
Lec 11	Stresses in subsoil, practical methods of stress determination in orogenic belt.	2
Lec 12	Subsoil deformation, consolidation basis.	1
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	**20**

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.	1
Lab 4	Research on boundaries of soil consistence, determination of soil states.	1
Lab 5	Examination of soil compressive strength in oedometer, determination of strength parameters, interpretation of obtained results.	1
Lab 6	Examination of soil shearing strength in a direct shearing apparatus – determination of strength parameters, interpretation of obtained results.	1
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.	1
	Total hours	**10**

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)

dr inż. Monika Bartlewska–Urban, monika.bartlewska@pwr.wroc.pl

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: Fizyka II
Name in English: Physics II
Main field of study: mining and geology
Level and form of studies: 1st level, part-time
Kind of subject: optional / university-wide
Subject code: FZP1015
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	20		10		
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 defined by programme requirements for candidates taking matura examination in mathematics and physics with astronomy at the extended level, basis of mathematical analysis, 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, and) 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 , a) 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, 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 interactions , 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	3
Lec 3	Electric current	2
Lec 4, 5	Magnetostatics	3
Lec 6	Electrostatic induction. Maxwell's equations	2
Lec 7	Electromagnetic waves	2
Lec 8	Basics of wave optics	1
Lec 9	Elements of the special relativity theory	2
Lec 10-12	Quantum Physics	2
Lec 13	Fundamentals of solid state physics	1
Lec 14	Elements of nuclear physics	1
Lec 15	Selected aspects of particle physics and astrophysics	1
	Total hours	**20**

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 and thermodynamic quantities preparing a report	2
Lab 4	Performing measurements of the selected electromagnetic quantities, optical or quantum quantities, preparing a report	2
Lab 5	Supplementary classes, Assessment	2
	Total hours	**10**

TEACHING TOOLS USED
N1. 1 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

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENTS

Evaluation F – forming (during semester), P – concluding (at semester end)	Educational effect number	Method of evaluating educational effect achievement
P1	PEK_U03-PEK_U17, PEK_K01-PEK_K06, PEK_K08	Answering questions discussions, written tests, evaluation of each report
P2	PEK_W01-PEK_W14, PEK_W17, PEK_U01-PEK_U14, PEK_U17, PEK_K01, PEK_K03-PEK_K06, PEK_K08	Oral and written exam

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
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_W04	K_W01, K_W03	C1.2	Lec 2, Lec 3	N1, N6, N7
PEK_W05	K_W01, K_W03	C1.3	Lec 3, Lec 4	N1, N6, N7
PEK_W06, PEK_W07	K_W01, K_W03	C1.4	Lec 5	N1, N6, N7
PEK_W08	K_W01, K_W03	C1.5	Lec 6	N1, N6, N7
PEK_W09	K_W01, K_W03	C1.6	Lec 7	N1, N6, N7
PEK_W10	K_W01, K_W03	C2.1	Lec 7, Lec 8	N1, N6, N7
PEK_W11	K_W01, K_W03	C2.2	Lec 8, Lec 9	N1, N6, N7
PEK_W12	K_W01, K_W03	C2.3	Lec 9	N1, N6, N7
PEK_W13	K_W01, K_W03	C2.4	Lec 10	N1, N6, N7
PEK_W14	K_W01, K_W03	C2.5	Lec 10	N1, N6, N7
PEK_W01-PEK_W17, PEK_U01-PEK_U17	K_W01, K_U05, K_U04	C3, C4.1-C4.4	Lab 1-Lab 5	N1-N7
PEK_K01-PEK_K08	K_W01, K_W03	C5	Lec 1-Lec 10 Lab 1-Lab 5	N1-N7

SEMESTER 4

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: ELG4804
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		10		
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	0,75		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 competence.

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 1-2	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.	3
Lec 3	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.	2
Lec 4-5	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.	3
Lec 5-6	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.	2
Lec 6	One-phase transformer – structure, operating, idle state and shorting state.	1
Lec 7	Three-phase transformer. Connection systems, voltage control; auto-transformer, voltage and current transformers.	2
Lec 8	Direct current machine: construction and operation; shunt motor and inverse speed motor, start up and the adjustment of the rate of rotation, braking. Pulsating magnetic field, shaft of pole pairs. Rotating magnetic field: generating principles, application in three-phase asynchronous and synchronous alternating current motors.	1 1
Lec 9	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 10	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	**20**

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	Testing of simple, one-phase series and parallel RLC circuits	2
Lab 3	Measurements of power and energy in one-phase and three-phase electric circuits.	2
Lab 4	Testing of shunt motor in direct current.	2
Lab 5	Testing of one-phase transformer.	2
	Total hours	**10**

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 10	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,	N2
PEK_U04	K_U22	C4	Lab 5	N2
PEK_K01	K_K01	C1, C2, C3, C4	Lab 2, Lab 3, Lab 4, Lab 5	N1, N2

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, part-time
Kind of subject: obligatory
Subject code: GEG4202
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		10	10	
Number of hours of total student workload (CNPS)	60		30	60	
Form of crediting	Examination			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	1		1	2	
including number of ECTS points for direct teacher-student contact (BK) classes	2		1	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 mineral and deposits

relating to 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	Origins and types of deposits, genetic and industrial classification of deposits	3
Lec 3	Raw rock	2
Lec 4	Chemical Raw materials	2
Lec 5	Introduction to concepts of deposits of ores, copper and silver deposits	2
Lec 6	Zinc and lead deposits, other ore deposits in Poland	1
Lec 7	The creation of coal, domestic deposits of hard coal and lignite	2
Lec 8	Origins of bitumen deposits , the regions of bitumen mining in Poland	2
Lec 9	Search and recognition of deposits, categories of recognition, deposits classifications, criteria for deposit economic viability	3
Lec 10	Deposit documentation, the basis of deposits calculation, geological premises of natural threads of deposits exploitation.	2
	Total hours	**20**

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	6
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.)	3
	Total hours	**10**

Form of classes - project		Number of hours
Proj	Introduction to classes Pr1	1
Proj 1	Statistical and graphic analysis of natural divisibility of rocks, mining analysis of obtained picture	4
	Introduction to task Pr2	1
Poj r2	Analysis of different parameters of a deposit or mineral using the chosen research method	4
	Total hours	**10**

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 EFFECT ACHIEVEMENTS

Evaluation (F – forming (Turing semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01-PEK_W 03	Final oral exam
F1	PEK_U01	Written test
F2	PEK_U02	The grade (average) for reports of practical laboratory exercises
P2	PEK_U02-PEK_U 03	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 :

[1] Gruszczyk H.; Nauka o złożach, Wyd. Geol., Warszawa, 1984.
[2] Smirnow I.; Geologia złóż kopalin użytecznych, Wyd. Geol., 1986.
[3] Sokołowski J.; Geologia regionalna i złożowa Polski, Wyd. Geol, 1990.
[4] Ney R. (red.); Surowce mineralne Polski, Wyd. Centrum PPGSMiE, PAN, Kraków; Surowce energetyczne. Węgiel kamienny, węgiel brunatny – 1996, Surowce chemiczne. Sól kamienna – 1996, Surowce metaliczne. Cynk, ołów – 1997, Surowce metaliczne. Miedź, srebro – 1997, Surowce chemiczne. Siarka – 2000.
[5] Kozłowski S.; Surowce skalne Polski, Wyd. Geol., Warszawa, 1986.
[6] Paulo A., Strzelska-Smakowska B.; Rudy metali nieżelaznych i szlachetnych. AGH Uczelniane Wydawnictwa Naukowo-Dydaktyczne. Kraków, 2000.
[7] Gabzdyl W.; Geologia złóż, Wyd. Polit. Śl, Gliwice, 1999.
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[9] Nieć M.; Geologia kopalniana, Wyd. Geol., 1990.
[10] Praca zbiorowa; Bilans zasobów kopalin i wód podziemnych w Polsce (rocznik), PIG, Warszawa.
[11] http://www.pgi.gov.pl/ – witryna internetowa Państwowego Instytutu Geologicznego

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.
[3] Kociszewska-Musiał G.; Surowce mineralne czwartorzędu. Wyd. Geol., Warszawa, 1988.
[4] Przegląd Geologiczny, Przegląd Górniczy, Szejk, Nowy Kamieniarz, Świat Kamienia, Rudy i metale, Gospodarka Surowcami Mineralnymi /SPR. !!!!!!!!/
[5] Bolewski A., [red.]; Metody badań minerałów i skał, Wyd. Geol., 1988.
[6] Chodyniecka L., Gabzdyl W., Kapuściński T.; Mineralogia i petrografia dla górników, Śląskie Wyd. Techniczne, Katowice, 1993.

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

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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 EFFECTS	Correlation between subject educational outcomes and educational outcome defined for the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W20	C1	Lec 1-Lec 2	N1
PEK_W02	K_W20	C2	Lec 2-Lec 8	N1
PEK_W03	K_W20	C3	Lec 2 Lec 9-Lec 10	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 2-Lec 8	N1

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, part-time
Kind of subject: obligatory
Subject code : ING3201
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)			20		
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, 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.

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.

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	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 10	Assessing the reports of performed laboratory research	2
	Total hours	**20**

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_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
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)
dr hab. inż. Radoslaw Zimroz, radoslaw.zimroz@pwr.wroc.pl

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 9	N1-N3
PEK_K01	K_K01	C1	Lab 5, Lab 6, Lab 8, Lab 9	N3

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, part-time
Kind of subject: obligatory
Subject code: GGG4203
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		10	10	
Number of hours of total student workload (CNPS)	90		30	60	
Form of crediting	Examination		crediting with grade	crediting with grade	
For group of courses mark (X) final course					
Number of ECTS points	3		1	2	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	3		0,5	1	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has the ability to perform simple statistical calculations of rod systems (beams, frames, arches) occurring in underground and above-ground construction of mining facilities
2. The student has basic knowledge of the elements of the theory of elasticity and its usage in mechanical hypotheses that are useful while designing the basic engineering and geoengineering constructions
3. The student can use Microsoft Office to prepare documents in Word, can prepare multimedia presentations in Power Point and can also work with Excel spreadsheet.

SUBJECT OBJECTIVES

C1 -Familiarizing students with the role and tasks of rock mass mechanics as a fundamental tool to explain the phenomena that occur in underground mining and forecast and fight against natural dangers that results in the loss of rock mass stability after the underground mining excavation.

C2 -Learning the methods of research and the strength of the rock mass as a medium in which excavations are carried out and the use of laboratory geomechanical classification of rocks and rock masses and the criteria for the construction of theoretical strength - elastic-plastic - rock mass model simulating the behaviour of a rock mass and the strength of actual centre.

C3 -Understanding the laws and principles of geomechanics as science necessary to solve issues concerning the stability of the rock mass condition disturbed by mining excavations.

Presentation, based on the theory of elasticity, plasticity and limit states, mathematical description of changes to the original state of stress in the rock mass under the influence of underground mining operations.

C4 -Presentation and explanation of the issues concerning the determination of stresses and displacements in a rock mass in the vicinity of tunnel excavations and using as a solution elastic or elastic-plastic with weakness models of rock mass.

C5 -Acquisition and understanding methods of forecasting the loss of rock mass stability around mining excavations which are carried out, and creating accurate skills of loads assessment on mining tunnels support with taking into consideration its cooperation with the surrounding rock mass.

C6 -Acquainting students with the problems of shocks and bumps as the phenomenon of sudden loss of rock mass stability and presentation of hypotheses and theories describing bumps as geo-mechanical phenomenon.

C7 -Learning theories concerning the causes of excavation pressure occurrence and presenting the state of stress in a rock mass in the vicinity of underground exploitations.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has knowledge concerning the theory of elasticity elements and uses it for mathematical description of phenomena that occur in a rock mass after underground mining. The student can make the analysis of changes of primary stress, understands the essence of these changes and can present it as a chart. To solve these issues the student applies elastic and elastic-plastic models using the criteria of Coulomb-Mohr, Hoek-Brown and Saint-Venant. The student understands and can present relationships between stress and displacement in the rock mass around tunnel excavations.

PEK_W02 The student has basic knowledge to properly assess the condition of natural hazards in underground mining, forecast and secure excavations against losing their stability. The student can design a method of determining and evaluating the load on the tunnel excavation heading. The student understands the role of housing in the transmission of these loads and will explain heading cooperation with the surrounding rock mass support. The student can also design a method of determining a load on a shaft support and their progress will be demonstrated on a graph along the geological profile.

PEK_W03 The student has general knowledge and understands what is and what reasons cause in a sudden loss of rock mass stability. The student will present energetic criteria of bumps occurrence and will characterize theories describing it as geo-mechanical phenomenon.

PEK_W04 The student has general knowledge of the theory of formation of the operating pressure in the vicinity of underground exploitations - provides a solution and the distribution of stresses in the rock mass along with the analysis of the course of operating pressure.

relating to skills:

PEK_U01 The student can apply his knowledge concerning geotechnical materials science and use laboratory testing methods of rocks physical and mechanical and deformation properties for the assessment of strength and stability of a rock mass surrounding mining excavations. The student will perform the analysis of the rock sample stress-strain characteristics and will set its parameters needed to build a theoretical model of the rock as elastic-plastic object with weakness and the student also knows how to use the results of rocks research in triaxial state of compression parameters to determine the strength criteria useful in geomechanics.

PEK_U02 The student can use geomechanical classifications of rock masses to assess quality and strength of a particular rock mass, in which mining or tunnel excavations are carried out, including according to: RMR (Rock Mass Rating) and GSI (Geological Strength Index) and will use them to determine the parameters of strength criteria of Hoek - Brown and Coulomb-Mohr and to make this procedure easier the student uses a computer program RocLab.

PEK_U03 The student can develop and present the results of their project work as a complete project

	on "Evaluation of the loads on tunnel excavations heading" presented in the form of paper report. The student acquired the necessary insight needed in assessing the rock mass stability surrounding the mine excavations by doing design work on actual data concerning mining and geological conditions.
PEK_U04	The student can together as a team, prepare and perform laboratory testing to determine the basic parameters of the physical and mechanical properties of rocks. Develops and interprets the results and presents the results of the result in the paper form. Knows the basic equipment and apparatus for laboratory testing of mechanical properties and deformation of rocks, including those needed for testing materials in after damage condition and for testing rocks triaxial state of compression.

PROGRAMME CONTENT		
Form of classes - lectures		**Number of hours**
Lec 1	Subject's programme, conditions of crediting, literature Role and tasks of rock mass mechanics as a fundamental tool to explain the phenomena that occur in underground mining and forecast and fight against natural dangers that results in the loss of rock mass stability after the underground mining excavations.	1
Lec 2	Testing methods of physical-mechanical properties of rocks in order to assess the stability of a rock mass. Stress-strain characteristics of the rocks before and after damage condition and equipment and the necessary conditions for the test. Process parameters and construction of elastic-plastic rock model with weakness.	2
Lec 3	Practical meaning of rock strength criteria: Coulomb-Mohr Hoeka-Brown and de Saint-Venant. Rock mass geomechanical classifications and their usefulness in assessing the quality and strength of rock (rock mass): RQD (Rock Quality Designation), Bieniawski (RMR - Rock Mass Rating) and Hoek (GSI - Geological Strength Index).	2
Lec 4	Rock mass models: elastic and elastic-plastic with weakness. Strength characteristics of rock mass using the criteria and classification of geomechanical rock masses.	2
Lec 5	The initial state of stress in an intact rock mass, ground massif (non-rock) and rock, the course of stresses along the geological profile.	2
Lec 6	The distributions of stresses in the surrounding tunnel excavations, solutions according to the theory of elasticity. Presentation and solutions analysis for the circular excavation, elliptical and rectangular, the use of Kirsch's solutions. State of stress and strain in the vicinity of tunnel excavations made in the initial hydrostatic stress state - presenting Lame's solutions. Rock mass and heading cooperation; rock mass and heading characteristics.	3
Lec 7	Determination of stresses and displacements in a rock mass in the vicinity of tunnel excavations situated at great depth. Distributions of stresses in the calculation zones separated around the mine. Characteristics of heading load - deformation and static impact as load components. Establishing a link between damaged zone coverage and tightening the excavation. The analysis of the load characteristics on the excavation floor heading, taking into consideration heading's cooperation.	2
Lec 8	Load assessment on vaulted support or tunnel excavations coating according to the standards PN-G/05020 and PN-G/05600. Load assessment on shaft support according to PN-G/05016 standard, obtaining the graph of loading along the geological profile.	2
Lec 9	Dynamic phenomena in the rock mass - bumps as geomechanical phenomenon associated with a sudden loss of rock mass stability around the mine excavations. Presentation of the energetic criterion of rock bump formation, identifying determinants influencing a bumps danger and giving the theory and hypotheses that	2

	describe this phenomenon.	
Lec 10	State of stress in a rock mass in the vicinity of underground exploitations, theories concerning the causes of the operating pressure; Budryk pressure wave theory and its modifications.	2
	Total hours	**20**

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 of rock mass mechanics and getting known the research positions. Students division on research teams and giving them tasks to prepare in teams and to conduct it. Getting known devices used for rocks treatment, preparation of rock samples for laboratory tests.	1
Lab 2	Overview of test methods for checking strength of rock R_c stretching R_r and bending R_g. Conducting the research of rocks strength on the uniaxial compression “form trial method" taking into consideration rock’s watering condition. Research of rocks strength on stretching “Brazilian method" (transverse compression). Research of rocks strength on bending “ring method”.	2
Lab 3	Measurement, graph and description of the characteristics of stress-strain state of rocks in before and after damage condition. Determining parameters of a process; - for before damage condition: resistance to strain R_c, strain module $E_{o,}$ elasticity module E_s, transverse expansibility Poisson coefficient ν and energetic indicator of rocks tendency to bump Wet, - for after damage condition: rock’s residual resistance R_{cr} and after damage deformation model M. Getting known the equipment necessary for researches.	2
Lab 4	Understanding and analysing the process of cutting a rock - the parameters of the process: internal friction angle ϕ and cohesion c and their physical interpretation. Discussion and strain study of rock shearing using methods for "simple shear" and "holder". Discussion concerning methods and knowledge of the apparatus for tests in triaxial state of compression - a study in Karman apparatus and description of rocks destructive process Using test results to determine the parameters of strength criteria: Coulomb-Mohr and Hoek-Brown The method of the study in terms of "real" triaxial compressive stress state.	3
Lab 5	Reports grade of performed laboratory research. Test from knowledge concerning basic research methods of strength parameters and deformation of rocks. Crediting the laboratory	2
	Total hours	**10**

Form of classes - project		**Number of hours**
Proj 1	Scope of project, conditions of crediting, literature. Giving students individual project tasks. Analysing tips to the project regarding: "Determination of loads on a tunnel excavation heading at great depth" in selected mining and geological conditions.	1
Proj 2	Geological and mining conditions and geotechnical at excavation site; determining measurement geotechnical parameters of a rock mass according to existing mining	2

	standard. Determination of the initial state of stress in the layers of rock mass at excavation site, illustration of vertical and horizontal stress in a chart.	
Proj 3	Discussion and analysis of changes in the initial stress state and forecast of local loss of stability after the underground mine excavations - static load of the support as a result of the local loss of stability. Discussion and analysis of the provisions of mining standards: standards: PN-G/05020 and PN-G/05600. Introduction to the discussed issues of the new rock mass model according to Protodiakonow; the apparent angle of internal friction, the rate of conciseness and rocks classification by Protodiakonow.	2
Proj 4	Discussion and approximation of methods determining the load on the excavations heading situated at great depth. Determining characteristics of rock mass load and analysis of its course, taking into consideration the deformation static impact as load components.	3
Proj 5	Projects presentation by students. Handing back ready-made projects, test, credit	2
	Total hours	**10**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem solving lecture. N2. Multimedia presentations. N3. Didactic discussion considering the lecture and the project. N4. Projects preparation in a report form. N5. Projects presentation and test concerning issues covered by the project N6. Preparation and a report of conducted laboratory research. N7. Test - knowledge of laboratory research methods and apparatus. N8. Duty hours

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 PEK_U01, PEK_U02	P1. Final grade of written test
F, P	PEK_U03	F1 Grade from performance and merits of the project F2 - Grade from a presentation or a test covering issues from the project P2 - Final grade from a laboratory (weighted average of F1 - 70% and F2 - 30%)
F, P	PEK_U04	F3- Grade from preparation and laboratory research performance F4 - Grade from a written report and a test from laboratory research methods and knowledge concerning equipment used for research P3 - Final grade from a laboratory (weighted average of F3 - 40% and F4 - 60%).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] CHUDEK M., Geomechanika z podstawami ochrony środowiska górniczego i powierzchni terenu, Pol. Śląska Publishing, Gliwice 2002,
[2] CHUDEK M., Obudowa wyrobisk górniczych, część I, Obudowa wyrobisk korytarzowych i komorowych. "Śląsk", Katowice 1986.
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[4] GERGOWICZ Z., Geotechnika górnicza. Skrypt PWr., Wrocław 1974.
[5] GOSZCZ A., Elementy mechaniki skał oraz tąpania w polskich kopalniach węgla i miedzi, Biblioteka Szkoły Eksploatacji Podziemnej, Inst. Gospodarki Surowcami Min. i Energią PAN Publishing, Kraków 1999.
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[9] PINIŃSKA J., Właściwości wytrzymałościowe i odkształceniowe skał, Zakład Geomechaniki, Instytut Hydrogeologii i Geologii Inżynierskiej, Wydział Geologii Uniwersytetu Warszawskiego, Warszawa 1994.
[10] RYNCARZ T. Zarys fizyki górotworu, Śląska Techn. Publishing, Katowice 1993.
[11] SAŁUSTOWICZ A., Zarys mechaniki górotworu, "Śląsk", Katowice 1968.
[12] WIŁUN Z., Zarys geotechniki, Komunikacji i Łączności, Warszawa 1987.

LITERATURA UZUPEŁNIAJĄCA:

[1] BIENIAWSKI Z. T., Engineering Rock Mass Clasifications.Wilej et Sons,Intersc.publication. NY 1989
[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.
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[12] Praca zbiorowa: Materiały konferencyjne Zimowych Szkół Mechaniki Górotworu i Geoinżynierii,: PWr, i AGH Publishing
[13] 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

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MATRIX OF 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 main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_U01	K_U20	C1, C2	Lec 1, Lec 2, Lab 3, Lab 4	N1-N3, N8
PEK_U02	K_U20	C2	Lec 3, Lec 4	N1-N3, N8
PEK_W01	K_W23	C3, C4	Lec 5, Lec 6	N1-N3, N8
PEK_W02	K_W23	C4, C5	Lec 7,Lec 8	N1-N3, N8
PEK_W03	K_W23	C1, C6	Lec 2, Lec 9, Lab 3	N1-N3, N8
PEK_W04	K_W23	C7	Lec 10	N1-N3, N8
PEK_U03	K_U20	C1, C3, C4, C5	Proj 1-Proj 5	N4, N5, N8
PEK_U04	K_U20, K_K04	C2	Lab 1-Lab 5	N6-N8

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, part- time
Kind of subject: obligatory
Subject code: GGG4204
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			10	
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		0	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 recognitions 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 well (borehole).
C6 Introducing 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.
C8 Acquiring 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 seismic refraction 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_U03 Is 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.	1
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.	1
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.	1
	Total hours	**10**

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 gravimetric anomalies. Explaining how to solve simple and reverse geophysical task.	4
Poj r3	Written test on discussed concepts of gravimetric methods. Students' individual work on a project.	1
Proj 4	Discussing the guidelines for the Project: Refractive seismic. The interpretation with the convergent time travel graphs (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).	3
Proj 5	Written test on discussed issues of refractive seismic. Students' individual work on a project.	1
	Total hours	**10**

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.

[3] Drzęźla B., Dubiński J., Fajklewicz Z., Goszcz A., Marcak H., Pilecki Z., Zuberek W.M. (red.), 1995. Poradnik geofizyka górniczego. Tom 2. Wydawnictwo CPPGSMiE PAN. Kraków.

[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.

[5] Fajklewicz Z., 2007. Grawimetria stosowana. Wydawnictwa AGH. Kraków.

[6] Fajklewicz Z. 1980, Mikrograwimetria górnicza. Wydawnictwo Śląsk. Katowice.

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[8] Jarzyna J., Bała M., Zorski T., 1999. Metody geofizyki otworowej pomiary i interpretacja. Wydawnictwa AGH. Kraków.

[9] Kasina Z., 1998. Przetwarzanie sejsmiczne. Wydawnictwo Centrum PPGSMiE PAN. Kraków.

[10] Kasina Z., 1998. Metodyka badań sejsmicznych. Wydawnictwo Instytutu GSMiE PAN. Kraków.

[11] Lowrie W., 2007. Fundamentals of Geophysics. Cambridge University Press.

[12] Marcak H., 1994. Geofizyka górnicza. Śląskie Wydawnictwo Techniczne. Katowice.

[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 OD 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	Lec 7	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

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, part-time
Kind of subject: obligatory
Subject code: MMG5201
Group of courses: YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20			10	
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				1	
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.

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.

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.) 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.	1
Lec 5	Planetary gears applied in power transmission systems of mining machinery, schemes, kinematics, and sample calculations of basic kinematic features.	2
Lec 6	Describing components of mechanical system, determining parameters.	1
Lec 7	Mechanical vibration: key terminology, vibration analysis in linear and rotational motion.	2
Lec 8	Dynamics models in single-stage and multi-stage transmission gear.	2
Lec 9	Dynamics models of a compound dynamic system.	2
Lec 10	Comprehension check, written works.	4
	Total hours	**20**

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.	5
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.	5
	Total hours	**10**

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
F1	PEK_U01, PEK_U02 PEK_K01	Inquiring and discussion during project work, discussion and presentation of projects.
P	PEK_W01-PEK_W02 PEK_U01	Written test in accordance to the lecture contents.

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 10	N1 N2
PEK_U01 PEK_U02	K_U21	C1, C2	Lec1-Lec 10 Proj 1-Proj 2	N1 N3
PEK_K01	K_K07	C1, C2		N1 N2 N3

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, part-time
Kind of subject: obligatory
Subject code: GGG5201
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
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 basics of different types of processing methods and characteristic features of mineral processing including its description, analysis, evaluation 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 the 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. Separation described as enrichment. Separation described as classification.	2
Lec 3	Comminution (size reduction). Screening.	2
Lec 4	Hydraulic and pneumatic classification.	2
Lec 5	Separation in thin layer of medium (film separation). Gravity separation (heavy medium separation).	2
Lec 6	Magnetic separation.	2
Lec 7	Electrical separation. Separation with the use of rotational field.	2
Lec 8	Principles of flotation. Flotation of mineral materials.	2
Lec 9	Coagulation. Floculation.	2
Lec 10	Oil agglomeration and final test.	2
	Total hours	**20**

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 K_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
[4] Drzymala J., Podstawy mineralurgii. Oficyna Wydawnicza Politechniki Wrocławskiej, 2001; 2004
[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 10	N1, N2
PEK_U01 PEK_U02	K_U19	C1	Lec 1-Lec 10	N1, N2
PEK_K01	K_K07	C1		

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Eksploatacja Odkrywkowa
Name in English: Surface Mining Technology
Main field of study: mining and geology
Level and form of studies: 1st level, part-time
Kind of subject: obligatory
Subject code: GEG5204
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			20	
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					
including number of ECTS points for direct teacher-student contact (BK) classes	3			2	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses fundamental knowledge of widely concerned mining, as one of the most important fields of technology and human activity, knows problems related to minerals search, sharing and mining.
2. Possesses knowledge of basic concepts of geology and systematized knowledge regarding resources and minerals mining in Poland.
3. Is able to use Microsoft Office to prepare Word documents and work with the spreadsheet Excel.

SUBJECT OBJECTIVES

C1. Introduction to the deposit open pit exploitation.
C2. Introduction and explanation of problems related to technology of mechanized mining machines of different types and size used in open pit mining.
C3. Becoming familiar with the relationships between parameters characterising the geometry of the workplace and the process of digging, controlling machine work process in order to achieve the proper efficiency level and forecasting the efficacy in different geological - mining conditions.
C4. Preparing students to particular tasks completion in the area of work technology and the choice of technological system for the project of excavation and carrying out technological analysis of bucket-wheel excavator work.

SUBJECT OBJECTIVES

relating to knowledge:

PEK_W01 Introducing to students basic issues of deposits mining with the use of the open pit method and its importance in the country scale.

PEK_W02 Introducing problems related to technology of machine work in open pit mines (sharing, exploitation, transport, placement) .

PEK_ W03 – Acquiring fundamental knowledge to optimize the choice of machines in order to achieve the proper efficiency level in different geological-mining conditions.

PEK_W04 Being able to explain the basic systems of exploitation and the ways of performing mining works

PEK_W05 Being able to propose the choice of technological system and the schedule of activities for the excavation project – beginning with getting access to the deposit and stock deposit and ending with mineral exploitation.

PEK_W06 Acquiring general knowledge related to bucket-wheel excavator work technology

relating to skills :

PEK_U01 Is able to apply knowledge of open pit exploitation of deposits while performing project tasks and to present the results of work in the form of a completed project titled: "The excavation project, bulldozer and bucket-wheel excavator work technology."

PEK_U02Is able to apply knowledge of open pit exploitation of deposits while performing project tasks and to present the results of work in the form of a completed project titled: "Technological analysis of bucket-wheel excavator SRs…"

PEK_U03 Is able to choose the proper technological system in the conditions of mining exploitation beginning with getting access to the deposit and ending with the completing exploitation.

relating to social competences:

PEK_K01 Understands the importance of open pit excavation of deposits as well as their worth for the economy of the country.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	The scope of the course. The aim of the course, conditions of crediting, literature, contact with the teacher. Basic concepts, definitions related to open pit exploitation of deposits, basic technological systems.	2
Lec 2	Basic technologies of open pit exploitation (continuous, cycle, mixed), the ways off dredging and exploitation.	2
Lec 3	Bulldozers work technologies, the range of applications, divisions.	2
Lec 4	Efficiency work forecasting of bulldozers, the resistance movement, cooperation with the base.	2
Lec 5	Bucket-wheel excavator work technologies, the range of applications, divisions according to different criteria.	2
Lec 6	Efficiency work forecasting of a bucket-wheel excavator using chosen methods, the resistance movement, cooperation with the base.	2
Lec 7	Scraper work technologies, basic parameters, the range of applications, division, and efficacy.	2
Lec 8	Ripper work technologies basic parameters, the range of applications, division, and efficacy	2
Lec 9	Loader spoon work technologies the range of applications, division, and efficacy.	2

Lec 10	Multi-bucket-wheel excavator work technologies, basic parameters, the range of applications, division, and work principles.	2
Lec 11	Multi-bucket-wheel excavator work technologies, types of shortwalls.	2
Lec 12	Efficiency work forecasting of multi-bucket-wheel excavators, digging resistance, cooperation with the base.	2
Lec 13	Multi-bucket-chain excavators work technologies.	2
Lec 14	Efficiency work forecasting of a multi-bucket-chain excavators, digging resistance, cooperation with a base.	2
Lec 15	Heaping in open pit mining, types of heaps, KTZ, Heaping with the method of direct tossing.	2
	Total hours	**30**

Form of classes - project		**Number of hours**
Proj 1	Organization of classes. The scope of the Project, conditions of crediting, literature. Distribution of topics among students. Discussing the guidelines for the project titled: "The excavation project, bulldozer and bucket-wheel excavator work technology." Discussing the first stage of the project task, determining mining area and also the issue of the multilevel excavation embankment design on the slope.	2
Proj 2	Discussing the guidelines to the choice of a bulldozer as a machine which enables an access to the deposit. Discussing issues related to an overburden indirect heaping in the excavation neighbourhood and the bulldozer work efficiency forecast.	2
Proj 3	Discussing the choice of a bucket-wheel excavator as a basic machine used for mineral dredging, designing the division of an excavation into floors. Discussing the problem of bucket-wheel excavator work forecasting using JLC method and its cooperation with car transport.	2
Proj 4	Students hand over projects- assessment and defence. Discussing the scope of project 2. Distribution of individual topics among students. Discussing the guidelines for the project: "Technological analysis of bucket-wheel excavator SRs…"	2
Proj 5	The core of shortwall system, discussing Basic parameters of a shortwall, defining the dredging radius and the angle of inclination of dredging jib in the function of dredging height and limit angles of the inclination of the side embankment of a shortwall in the function of its height. Determining maximum distance of an axis of an excavator route from internal side embankment in the function of shortwall height and presumed inclination of a side embankment, determining the minimum inclination of a side embankment in the function of a shortwall height and the distance of an axis of an excavator route from internal side embankment	2
Proj 6	Discussing the outer bottom width of a shortwall in the function of bottom outer angle of rotation of a dredging jib; the outer top width of a shortwall in the function of top outer angle of rotation of a dredging jib, the inclination of a side embankment and the height of a shortwall. Determining the outer top width of a shortwall in the function of the outer bottom angle of rotation of a dredging jib, the inclination of a side embankment of a shortwall when the inner top angle of rotation of a dredging jib equals 90^0.	2
Proj 7	Determining the width of a shortwall in the function of the outer bottom angle of rotation of a dredging jib, with the limiting slope of a side embankment depending on the height of a dredging floor together with the limiting slope of a	2

	forehead embankment of a shortwall in the function of its height.	
Proj 8	Determining two maximum values of a take: considering the slope of the forehead embankment because of the ability to drive to the forehead of shortwall and because of the possibility of the contact of a dredging jib structure with the upper edge of the second level in a shortwall. Determining the angle of inclination of the jib structure axis in the function of the height of a bucket wheel axis and also the angle describing the dimension of a lower piece of a dredging jib structure.	2
Proj 9	Forecasting the SRs efficacy considering particular groups of factors, determining the individual digging resistance and digging force in given geological-mining conditions. The final calculations concerning side and forehead shortwalls, discussing the graphic form of a project.	2
Proj 10	Student hand over Project – assessment and defence.	2
	Total hours	**20**

TEACHING TOOLS USED
N1. Form of lectures –traditional, illustrated by multimedia presentations with the use of audio-visual equipment, with short educational films in the area of machine work technology. N2. Discussion during lectures and project classes N3. Preparing Project in the paper form. N4. Defence of projects – written or oral 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
F1, P1	PEK_U01, PEK_U03	F1.1 The grade for completing and proper merit of a project F1.2 The grade for the project 1 defence –written or oral P1 The final grade for the project (the weighted average of F1.1 – 50% and F1.2 - 50%)
F2, P2	PEK_U02, PEK_U03	F2.1 The grade for completing and proper merit of a project F2.2 The grade for the project defence –written or oral P2 The final grade for the project 2 defence (the weighted average of F1.1 – 50% and F1.2 - 50%)
P3	PEK_W01-PEK_W06	P3 The final grade for the exam in a form of a test

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Hawrylak H., Jarząbek M., Sieczyński A., Sobolski R. MASZYNY I PRACE POMOCNICZE W GÓRNICTWIE ODKRYWKOWYM

[2] Kołkiewicz W., ZASTOSOWANIE MASZYN PODSTAWOWYCH W GÓRNICTWIE ODKRYWKOWYM

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[6] Kasztelewicz Z.: WĘGIEL BRUNATNY – OPTYMALNA OFERTA ENERGETYCZNA DLA POLSKI. Redakcja „Górnictwo Odkrywkowe". PPWB, Bogatynia-Wrocław 2007

[7] Korzeniowski J.I.: GÓRNICTWO ODKRYWKOWE : RUCH ZAKŁADÓW EKSPLOATUJĄCYCH ZŁOŻA KOPALIN, 2010

[8] Kasztelewicz Z.: REKULTYWACJA TERENÓW POGÓRNICZYCH W POLSKICH KOPALNIACH ODKRYWKOWYCH. Fundacja Nauka i Tradycje Górnicze z siedzibą Wydział Górnictwa i Geoinżynierii Akademii Górniczo-Hutniczej im. Stanisława Staszica w Krakowie. Kraków 2010

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[11] Czasopisma: Węgiel brunatny, Górnictwo Odkrywkowe

SECONDARY LITERATURE:

[1] Kasztelewicz Z.: POLSKIE GÓRNICTWO WĘGLA BRUNATNEGO. Związek Pracodawców "Porozumienie Producentów Węgla Brunatnego" w Bełchatowie ; red. "Górnictwa Odkrywkowego", 2004

[2] Górnictwo i Geologia, Prace Naukowe Instytutu Górnictwa Politechniki Wrocławskiej. Studia i Materiały

[3] Interdyscyplinarne zagadnienie w górnictwie i geologii pod red. J. Drzymały i W. Ciężkowskiego, Oficyna Wydawnicza Politechniki Wrocławskiej

[4] Kasztelewicz Z.: REKULTYWACJA TERENÓW POGÓRNICZYCH W POLSKICH KOPALNIACH ODKRYWKOWYCH [monografia]. Fundacja Nauka i Tradycje Górnicze z siedzibą Wydział Górnictwa i Geoinżynierii Akademii Górniczo-Hutniczej im. Stanisława Staszica w Krakowie, 2010

[5] Czasopisma: Przegląd Górniczy, Polityka Energetyczna

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

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MATRIX OD CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Surface 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 the main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W07	C1	Lec 1, Proj 1	N1, N2
PEK_W02	K_W07, K_W19	C1, C2	Lec 2-Lec 15, Proj 1, Proj 4	N1, N2, N5
PEK_W03	K_W07, K_W19	C2,C3	Lec 4-Lec 14, Proj 3-Proj 5	N1, N2, N5
PEK_W04	K_W07, K_W08, K_W19	C2, C3	Lec 2, Lec 15, Proj 1-Proj 3	N1, N2, N5
PEK_W05	K_W07, K_W08, K_W19	C3, C4	Lec 2, Lec 3-Lec 7, Proj 1-Proj 4	N1, N2, N3, N5
PEK_W06	K_W07, K_W19	C3, C4	Lec 10-Lec 12, Proj 4-Proj 9	N1, N2, N3, N5
PEK_U01	K_U05, K_U17	C4	Lec 3-Lec 6, Proj 1-Proj 4	N1-N5
PEK_U02	K_U05, K_U17	C4	Lec 2, Lec 10-Lec 12, Proj 4-Proj 10	N1-N5
PEK_U03	K_U17	C2, C3, C4	Lec 2-Lec 15, Proj 2-Proj 3, Proj 6-Proj 9	N1, N2, N5
PEK_K01	K_K01, K_K02	C1	Lec 1-Lec 2	N1, N2, 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, part-time
Kind of subject: obligatory
Subject code: GKG5201
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		20	10	
Number of hours of total student workload (CNPS)	60		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	2		2	1	
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	2		1	1	

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. Horizontal control points and vertical control network in underground and surface mining.	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	Vertical and horizontal orientation of underground mining sites	2
Lec 5	Countershaft issues, management of excavation works, special surveying.	3
Lec 6	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 7	Digital Maps Systems: methods of data capturing, updating, storing and sharing. Analytic and digital photogrammetry. Digital terrain models (DTM)	2
Lec 8	Data bases. Basic information, structure, integration with spatial data.	2
Lec 9	Structure of raster and vector images. Structure of integrated geo-information systems	2
Lec 10	Standardization in GIS systems. Further development and application in mining. Examples of implementation.	2
	Total hours	**20**

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 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 2	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 3	Work on raster data, key issues: geo-referencing, map projection, spatial coverage	2
Lab 4	Spatial data. Object digitalisation and modification, concerning coordinate system. Importance of topology in GIS and its principles.	2
Lab 5	Maps editing. Crating a map layout with captions. Presenting and assessing map layouts. Creating a three-dimension model of a mining area. Presenting and assessing structure of a 3D mining area.	2
Lab 6	Forecasting and analysing conditions for GPS and GLONASS satellite research.	2
Lab 7	GPS surveying in land inventory. Digital object data base. Object and attribute. Functioning of GPS code receivers (object positioning and navigating).	2
Lab 8	Land surveying, single-point positioning, differential GPS, object surveying with the use of object data base.	2
Lab 9	Processing and post-processing of GPS measurements.	2
Lab 10	Converting geostationary coordinates (B, L, h) into Cartesian coordinates (X, Y, Z) and inverse converting.	2
	Total hours	**20**

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. Calculating the amount of removed waste, excavated coal and uncovered coal, ready for excavation in general and in reporting period.	2
Proj 3	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 4	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 5	Assigning individual project titled 'Developing a countershaft plan – simple and complex countershaft. Determining angles and lengths for excavation work in a simple countershaft. Technical drawing of the countershaft. Developing basic trig data.	2
	Total hours	**10**

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),

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[7] Januszewski J., 2006: Systemy satelitarne GPS, Galileo i inne, Wydawnictwo Naukowe PWN, Warszawa.

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[9] Materiały z wykładów i instrukcje laboratoryjne.

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(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 10	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 10 Proj 1-Proj 5	N3, N 4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Technika Strzelnicza
Name in English: Blasting Technique I
Main field of study: mining and geology
Level and form of studies: 1st level, part-time
Kind of subject: obligatory
Subject code: GGG5205
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
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	1				
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 mining 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 the 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 device use 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.	1
Lec 2	Blasting materials, detonation and other stages of explosion, properties.	2
Lec 3	Physical impact of the explosive charge in the rock mass.	1
Lec 4	Properties of rocks and their characteristic features with relevance to a blasting technique	1
Lec 5	Blasting excavations – classification and construction.	1
Lec 6	Blasting devices in mining– classification, characterization, requirements, symbols and use.	2
Lec 7	Primary and secondary explosives – classification, characterization, requirements, symbols and use	2
Lec 8	Blasting equipment and its use.	1
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.	1
Lec 11	Blasting technique in underground mining – blasting works in shafts, direct exploitation sites; special blasting	1
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:	1
Lec 14	Blasting in engineering works	1
Lec 15	Dangers connected with blasting techniques adopted in mining	1
	Total hours	**20**

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 crediting grade a for 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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[7] Korzeniowski J., Onderka Z., Roboty strzelnicze w górnictwie odkrywkowym, Wyd. i Szkolenia Górnicze Burnat & Korzeniowski, Wrocław, 2006.
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SECONDARY LITERATURE:

[1] Bieniawski Z. T., Engineering Rock Mass Clasifications.Wilej et Sons,Intersc.publication.NY 1989
[2] Cybulski W., Krzysztolik P: Strzelanie elektryczne w górnictwie. Wyd. „Śląsk". 1970.
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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.
[8] Rozporządzenie MGPiPS z dnia 01.04.2003 r.. w sprawie przechowywania i używania środków strzałowych i sprzętu strzałowego w zakładach górniczych (Dz.U. Nr 03.72.655).
[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

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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 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, part-time
Kind of subject: obligatory
Subject code: GGG6205
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20			10	
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 knows basics of hydrogeology
2. The student can read topographical maps concerning land hypsometry
3. The student can use EXCEL

SUBJECT OBJECTIVES

C1 The aim of the course is to prepare students to solve specific tasks related to mine dewatering and to protect them from the dangers of water

C2 The aim of the course is to familiarize students with the impact of mine dewatering process on the environment and ways to minimize it

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has knowledge concerning watering of deposits and mines

PEK_W02 The student knows how to determine the impact of mine dewatering on the environment

PEK_W03 The student knows the methods of mine dewatering and knows how to protect them from the dangers of water

PEK_W04 The student knows how to protect the environment against the negative effects of mine dewatering

relating to skills:

PEK_U01 The student can calculate the flow of rain water into a mine and design surface dewatering system

PEK_U02 The student can calculate the flow of underwater into a mine and design well barrier system

PEK_U03 The student can design a surface and underground pump station in mine dewatering system

relating to social competences:

PEK_K01 The student is aware of the importance of non-technical impact of mining activities, connected with its impact on the environment and responsibility for decisions which are undertaken while these activities

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Deposits watering and water problems in mining.	2
Lec 2	Underground water appearance and hydrogeological properties of a rock mass	1
Lec 3	Recognition and documentation of hydrogeological conditions	1
Lec 4	Basic rules of underwater filtration and water balance in depression cone	1
Lec 5	Methods for determining the size of water inflows into mines	1
Lec 6	Computer modelling of geofiltration processes concerning dewatering	2
Lec 7	Mines dewatering by the usage of mine method	2
Lec 8	Mines dewatering by the usage of well method	1
Lec 9	Hydraulic calculation of well systems	2
Lec 10	Mines dewatering by the usage of open method and surface dewatering	2
Lec 11	Bings dewatering and special methods of mines dewatering	1
Lec 12	Water endangers - recognition and counter action.	1
Lec 13	Water mine damages	1
Lec 14	Water problems concerning open-cast mines liquidation	1
Lec 15	Water problems concerning underground mines liquidation	1
	Total hours	**20**

Form of classes - project		Number of hours
Proj 1	Transfer of output data to sub-projects of an exemplary open-cast mines dewatering and their preliminary treatment	2
Proj 2	Development of design system concerning ditches sheathing which protect a mine from the rain inflow	2
Proj 3	Counting underwater inflows to an open-cast mine	2
Proj 4	Design of dewatering well barriers	2
Proj 5	Designing a surface and underground pump station	2
	Total hours	**10**

TEACHING TOOLS USED
N1. Type of lectures - traditional, illustrated with multimedia presentations, with the usage of audiovisual equipment N2. calculations were performed with Excel program and specialized software HYDRON 1

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 according to the given scope of material
F, P	PEK_U01-PEK_U03	F2 grades from four projects performance P1.Final grade from the project - mean of constituent grades

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Bieniewski J. – Odwadnianie kopalń. Politechnika Wrocławska Publishing Wrocław 1983 r.
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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.

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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: Eksploatacja Podziemna
Name in English: Underground Mining Technology
Main field of study: mining and geology
Level and form of studies: 1st level, part-time
Kind of subject: obligatory
Subject code: GGG6206
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			20	
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					
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 has an elementary knowledge concerning mining in a wider aspect, as one of the most important areas of technical and human economic activity
2. The student has mastered the basic concepts of geology and has systematic knowledge of resources and production of mineral raw materials in Poland.
3. The student can use Microsoft Office to prepare documents in Word and can also work with Excel programme.

SUBJECT OBJECTIVES

C1. Familiarizing students with the issues of underground mining.
C2. Presenting and explaining the issues related to deposits development, design and performance of shafts and roadways and chamber excavations.
C3. Presenting and explaining the issues related to the division of excavating systems for different types of deposits and analysis of excavation systems used in coal, salt and metal ores mines.
C4. Preparing students for performance of specific tasks in concerning work technology and selection of mining equipment for the project of coal mine excavation wall implementation, and a preparatory department in copper ore mine along with the economic analysis.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student knows the issues concerning underground deposits excavations of coal, ores, rock salt and other mineral resources in Poland.

PEK_W02 The student has knowledge concerning: provision and deposits preparation for underground excavation, design and construction of shafts, wenzes, headings, pits and chamber excavations.

PEK_W03 The student knows the issues concerning underground mining systems and ways of performing work in difficult geological and mining conditions.

PEK_W04 The student has knowledge concerning hydraulic roof support used in underground mines and protecting the stability of underground mine excavations.

PEK_W05 The student knows the issues concerning natural hazards in underground mining and ways to combat them.

PEK_W06 The student has general knowledge of the technology of working and optimal selection of machines and equipment in underground mines.

relating to skills:

PEK_U01 The student can apply knowledge concerning deposits provisioning realising of design tasks and present the results of work in the form of a complete project under the title: „Project of shaft drilling".

PEK_U02 The student can apply knowledge concerning deposits provisioning realising of design tasks and present the results of work in the form of a complete project under the title: „ Project of an excavation wall in coal mine".

PEK_U03 The student can apply knowledge concerning deposits provisioning realising of design tasks and present the results of work in the form of a complete project under the title: „ Project of a preparatory department in a copper ore mine".

PEK_U04 The student can choose a proper technology of mine excavations performance and protecting their stability in various geological and mining conditions.

relating to social competences:

PEK_K01 The student understands the meaning of underground deposits excavation and its value for the national economy.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Scope of the course, teaching purpose, crediting conditions, literature, contact with the teacher. Basic notions, definitions connected to underground deposit excavation. Division of geological resources. General information on deposits providing. Outline of underground deposits excavations of coal, ores, rock salt and other mineral resources in Poland.	3
Lec 2	Types of providing and preparatory excavations. Mines models General information on shafts, shafts division.	3
Lec 3	Machines and equipment for shafts drilling. Excavation shafts heading. Technology of shafts and winzes drilling.	3
Lec 4	Division of pits and chamber excavations. Technology of chamber excavations drilling.	3
Lec 5	Machines and equipment used for drilling excavations in underground mines. Methods of excavation drilling in difficult geological-mining conditions.	3
Lec 6	Mine heading - types of headings, technology of performance.	3
Lec 7	General information on deposits excavation and division of excavation systems. Systems of coal deposits excavations.	3

Lec 8	Systems of copper ore deposits excavations.	3
Lec 9	System of zinc and lead excavations and also rock salt and other mineral resources. Natural dangers and their fighting in underground mines.	3
Lec 10	Perspectives of underground mine excavations development in the country and abroad and its meaning for the national economy.	3
	Total hours	**30**

Form of classes - project		**Number of hours**
Proj 1	Organizational matters. Scope of project, conditions of crediting, literature Discussion on the scope of project No. 1 on: „Project of shaft driling". Assigning students to individual subjects and analysis of project's guidelines Presentation of determining the initial state of stress in the ground issues, in which a shaft will be drilled.	2
Proj 2	Analysis of shaft drilling issues and issues concerning the choice of heading.	2
Proj 3	Discussion on the scope of project No. 2 on: „ Project of an excavation wall in coal mine". Assigning students to individual subjects and analysis of project's guidelines Analysis of natural dangers and geological-mining conditions of a region in which the excavation wall will be performed.	2
Proj 4	Analysis of technology used for main gates performance and starting inclined drift for the excavation wall.	2
Proj 5	Analysis of issues concerning selection of mechanized complex wall for the designed excavated wall.	2
Proj 6	Discussion on the scope of project No. 3 on: „ Project of a preparatory department in a copper ore mine". Assigning students to individual subjects and analysis of project's guidelines Presentation of algorithms which are used for determination of excavation area geometry.	2
Proj 7	Analysis of issues concerning determination of resources and the time of excavation and issues concerning the parameters of mining excavation face.	2
Proj 8	Analysis of issues concerning mining, excavated material delivery and performing a heading in the preparatory department.	2
Proj 9	Analysis of issues concerning economic analysis of preparatory excavations drilling.	2
Proj 10	Handing back ready projects by the students, grade form performance and projects' defence to achieve a grade (oral or written form).	2
	Total hours	**20**

TEACHING TOOLS USED
N1. N1. Type of lectures - traditional, illustrated with multimedia presentations with the usage of audio-visual equipment, enriched with short educational films concerning technological machine working in underground mining N2. Discussion concerning lectures and projects. N3. Projects preparation in a paper form N4. Projects defence - oral or written form. 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
F1	PEK_U01, PEK_U04	F1 Grade from performing project no. 1 and its merits F1.2 Projects no. 1 oral or written defence. F1 - Final grade from a laboratory (weighted average of F1.1 - 50% and F1.2 - 50%).
F2	PEK_U02, PEK_U04	F2.1 Grade from performing project no. 2 and its merits F1.2 Grade from oral or written defence of project no. 2 F2 - Final grade from the project no. 2 (weighted average of F1.1 - 50% and F1.2 - 50%).
F3	PEK_U02, PEK_U04	F3.1 Grade from performing project no. 3 and its merits F3.2 Grade from oral or written defence of project no. 3 F3 - Final grade from the project no. 3 (weighted average of F3.1 - 50% and F3.2 - 50%).
P1		P1.Final grade from the project as mean of F1, F2, F3.
P2	PEK_W01 – PEK_W06	P2 Final grade from a written test.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Butra J.: Eksploatacja złoża rud miedzi w warunkach zagrożenia tąpaniami i zawałami, KGHM Cuprum sp. z o.o. CBR, Wrocław 2010
[2] Butra J., Kicki J: Ewolucja technologii eksploatacji złóż rud miedzi w polskich kopalniach, Biblioteka Szkoły Eksploatacji Podziemnej, Kraków 2003
[3] Gwiazda J.: Górnicza obudowa hydrauliczna odporna na tąpania, „Śląsk" Publishing, Katowice 1997
[4] Piechota S.: Technika podziemnej eksploatacji złóż, Skrypt AGH, Kraków 2003
[5] Piechota S.: Technika podziemnej eksploatacji złóż i likwidacji kopalń, Uczelniane Naukowo-Dydaktyczne AGH Publishing, Kraków 2008
[6] Siewierski S., Wojno L.: Udostępnianie złóż, cz. I: Sposoby udostępniania złóż, Skrypt Politechniki Wrocławskiej, Wrocław 1980
[7] Siewierski S., Wojno L.: Udostępnianie złóż, cz. II: Szyby, Skrypt Politechniki Wrocławskiej, Wrocław 1982
[8] Siewierski S., Fisher A.: Udostępnianie złóż, cz. III: Wyrobiska komorowe, Skrypt Politechniki Wrocławskiej, Wrocław 1984
[9] Strzałkowski P.: Zarys rozwoju technologii górnictwa podziemnego, Politechnika Śląska Publishing, Gliwice 2011

SECONDARY LITERATURE

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

[2] Goszcz A: Elementy mechaniki skał oraz tąpania w polskich kopalniach węgla i miedzi, Biblioteka Szkoły Eksploatacji Podziemnej, Kraków 1999
[3] Goszcz A.: Wybrane problemy zagrożenia sejsmicznego i zagrożenia tąpaniami w kopalniach podziemnych, Biblioteka Szkoły Eksploatacji Podziemnej, Kraków 2004
[4] Kidybiński A., Podstawy geotechniki kopalnianej, „Śląsk" Publishing, Katowice 1982
[5] Kłeczek Z., Geomechanika górnicza, Śląskie Techniczne Publishing, Katowice 1994
[6] Monografia KGHM „Polska Miedź" S.A., Praca zbiorowa, Lubin 1996
[7] Rozporządzenie Ministra Gospodarki z dnia 28 czerwca 2002 r., Załącznik nr 3: Projektowanie, wykonywanie i kontrola obudowy kotwowej w zakładach górniczych wydobywających węgiel kamienny oraz zakładach wydobywających rudy miedzi, cynku i ołowiu (Dz.U.02.139.1169 - zał.)
[8] Sałustowicz A., Zarys mechaniki górotworu, „Śląsk" Publishing, Katowice 1965
[9] Szlązak J., Szlązak N.: Ratownictwo górnicze, Uczelniane Naukowo-Dydaktyczne AGH Publishing, Kraków 2010

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
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, Proj 1, Proj 3, Proj 6, Proj 10	N1, N2, N5
PEK_W02	K_W07, K_W26, K_W32	C1, C2, C4	Lec 2-Lec 6 Proj 1, Proj 2, Proj 10	N1, N2, N3, N5
PEK_W03	K_W07, K_W26, K_W32	C4	Lec 5-Lec 10, Proj 3-Proj 10	N1, N2, N3, N5
PEK_W04	K_W07, K_W26	C2, C3, C4	Lec 3-Lec 6, Proj 2, Proj 4, Proj 5, Proj 7-Proj 10	N1, N2, N3, N5
PEK_W05	K_W07, K_W26, K_W30	C1, C2, C3	Lec 3-Lec 5, Lec 7-Lec 9, Proj 2, Proj 3, Proj 5, Proj 7, Proj 8, Proj 10	N1, N2, N5
PEK_W06	K_W07, K_W26, K_W32	C2, C3, C4	Lec 3, Lec 5, Proj 2, Proj 4, Proj 5, Proj 7-Proj 10	N1, N2, N5
PEK_U01	K_U05, K_U23, K_U32	C2, C4	Lec 2-Lec 6 Pr1, Pr2, Pr10	N1-N5
PEK_U02	K_U05, K_U23, K_U32	C3, C4	Lec 5-Lec 7 Proj 3-Proj 5, Proj 10	N1-N5
PEK_U03	K_U05, K_U23, K_U32	C3, C4	Lec 6, Lec 8, Lec 9, Proj 6-Proj 10	N1-N5
PEK_U04	K_U23, K_U32	C2, C3, C4	Lec 3-Lec 6, Lec 9, Proj 2, Proj 4, Proj 5, Proj 7, Proj 8, Proj 10	N1, N2, N5
PEK_K01	K_K01, K_K02	C1	Lec 1, Lec 7, Lec 10	N1, N2, N5

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, part-time
Kind of subject: obligatory
Subject code: MMG6202
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		10	10	10
Number of hours of total student workload (CNPS)	60		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	2		1	1	1
including number of ECTS points for practical (P) classes			1		
including number of ECTS points for direct teacher-student contact (BK) classes	2		1	0,5	0,5

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 regulations 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.	2
Lec 4	Conveyor belts and their systems.	1
Lec 5	Hoisting and its devices (rope and rail hoisting equipment, cranes).	2
Lec 6	Rail transport/haulage, unloading. Characteristic features and the range of applications.	1
Lec 7	Rubber-tired, hydraulic and pneumatic transport.	1
Lec 8	Primary power sources, power transmission systems in mining machinery. Examples of different solutions and their use.	2
Lec 9	Basic calculations on power engine efficiency.	3
Lec 10	Bucket wheel excavators and belt-type stackers. Technological systems with supplementary devices.	3
Lec 11	Single-bucket excavators and loaders, cooperation with transportation systems.	3
Lec 12	Self-propelled comminution units – technological solutions and range of applications.	2

Lec 13	Self-propelled milling machines – technological solutions and range of applications.	2
Lec 14	Long wall mining systems – machinery and restrictions of their use.	3
Lec 15	Selection of machinery based on efficiency considerations.	2
	Total hours	**30**

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.	1
Lab 2	Examining the dynamic resistance of pulleys rotation and defining their circular oscillation.	2
Lab 3	Assessing rollers dynamic imbalance.	1
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.	1
Lab 6	Rating rubber extensibility resistance.	1
Lab 7	Rating conveyor belt resistance to operating damages resulting from punching.	1
Lab 8	Evaluation of students' reports on laboratory research.	1
	Total hours	**10**

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.	1
Proj 2	Defining key technological parameters of a conveyor belt. Calculation the efficiency of conveyor belts.	1
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	2
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.	1
Proj 7	Delivering completed projects and their evaluation.	1
	Total hours	**10**

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 discussions.	9
	Total hours	**10**

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 Nauk-Techniczne, Warszawa 1999.
[2] Żur T., Hardygóra M.: „Przenośniki taśmowe w górnictwie". Wyd. Śląsk, Katowice 1996.
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[4] Uberman R. Technologia i organizacja transportu w górnictwie odkrywkowym.
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SECONDARY LITERATURE:

[1] Antoniak J.: Przenośniki. taśmowe w górnictwie podziemnym i odkrywkowym. Wydawnictwo Politechniki Śląskiej. Gliwice 2006.
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[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: Technika Strzelnicza II
Name in English: Blasting Technique II
Main field of study: mining and geology
Level and form of studies: 1st level, part-time
Kind of subject: obligatory
Subject code: GGG6207
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)				20	
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				1	
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.	1
Proj 3	Matching blasting media with the given works conditions, considering also probable mining hazards.	1
Proj 4	Calculating parameters of blasting works.	1
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.	1
Proj 7	Preparing descriptive and graphical blasting documentation/certificate, according to the given scheme.	1
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.	1
Proj 11	Calculating parameters of blasting works.	1
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	1

	descriptive and graphical blasting documentation/certificate, according to the given scheme.	
Proj 14	Measuring the impact of blasting works on the surrounding of a surface mining site.	2
Proj 15	Delivery and defence of the completed projects.	1
	Total hours	**20**

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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[5] Hobler M: Badania fizykomechanicznych własności skał. Wyd. PWN. 1977.
[6] Hobler M: Projektowanie i wykonywanie robót strzelniczych w górnictwie podziemnym. Wyd. „Śląsk". 1982.
[7] Korzeniowski J., Onderka Z., Roboty strzelnicze w górnictwie odkrywkowym, Wyd. i Szkolenia Górnicze Burnat & Korzeniowski, Wrocław, 2006.
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[9] Pinińska J., Właściwości wytrzymałościowe i odkształceniowe skał, Zakład Geomechaniki, Instytut Hydrogeologii i Geologii Inżynierskiej, Wydział Geologii Uniwersytetu Warszawskiego, Warszawa 1994.
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[12] Sztuk H., Śnieżek J., Wojtkiewicz H: Technika urabiania skał. Wyd. PWr. 1980

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[1] Bieniawski Z. T., Engineering Rock Mass Clasifications.Wilej et Sons,Intersc.publication.NY 1989
[2] Cybulski W., Krzysztolik P: Strzelanie elektryczne w górnictwie. Wyd. „Śląsk". 1970.
[3] Gustafsson R., Swedish blasting technik, SPI, Gothenburg, Sweden, 1976.
[4] Hemphill G.B., Blasting operation, McGraw-Hill Book Company, New York, 1981.
[5] Hoek E., Brown E. T., Underground Excavations in Rock.Institution of Mining and Met.. London 1980.
[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.
[8] Rozporządzenie MGPiPS z dnia 01.04.2003 r.. w sprawie przechowywania i używania środków strzałowych i sprzętu strzałowego w zakładach górniczych (Dz.U. Nr 03.72.655).
[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

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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 conten	Teaching tool number
PEK_U01- PEK_U05	K_U23 K_K04	C1-C2	Proj 1-Proj 8	N1 – N5
PEK_K01	K_U32 K_K04	C1, C3-C4	Proj 8-Proj 15	N1 – N5

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, part-time
Kind of subject: obligatory
Subject code: GGG6208
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		20		
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			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 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 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 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	Assessing the efficiency of processing and balancing mineral suspension flow. Construction of technological schemes.	2
Lec 3	Technologies for comminution and components release. Methods, machinery and technological systems.	2
Lec 4	Grain classification technologies.	2
Lec 5	Principles and practical approach to flotation, flotation machinery, technological systems.	2
Lec 6	Physical methods of upgrading. Technology and practical approach to gravitation upgrading.	2
Lec 7	Physical methods of upgrading. Magnetic, electrical and optical separation.	2
Lec 8	Processing technologies of selected mineral resources.	2
Lec 9	Water management in processing enterprises. Water circulation. Methods and devices for suspensions dewatering.	2
Lec 10	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	Comminution technology. Function of comminution efficiency.	2
Lab 4	Grain classification technologies. Screening and sieving.	2
Lab 5	Bituminous coal flotation.	2
Lab 6	Copper ore flotation.	4
Lab 7	Gravitation upgrading by thin layer of medium.	2
Lab 8	Magnetic upgrading.	2
Lab 9	Foculation.	2
Lab 10	Assessment of laboratory work research. Test on familiarity with basics and technologies of mineral resources processing. Crediting of laboratory work.	2
	Total hours	**20**

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 preparing 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
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[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)

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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 10	N1, N3
PEK_U01 PEK_U02	K_U19	C1	Lab 1-Lab 10	N2, N3
PEK_K01	K_K07	C1		

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, part-time
Kind of subject: obligatory
Subject code: GGG6209
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10		10		
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 has basic knowledge of the internal structure of minerals and its impact on their physical and chemical properties. The student knows the most important mineral-forming and rock-forming processes, with particular emphasis on the processes of formation of mineral deposits and their deposits. The student knows division and characteristics of minerals belonging to the most important classes
2. The student has mastered basic deposit and mining geology, with the division on basic types and knows how mineral, structure-texture and genetic characteristic of the most common occurring rock of all types look like
3. The student has basic knowledge concerning machines and machine systems used in any mining branches and their construction steaming from mining tasks specification

SUBJECT OBJECTIVES

C1-Familiarizing students with the meaning, type, occurrence and usage of rock mines in the economy in construction, road construction and architecture.
C2-Presenting problems concerning preparation for excavation access, choice of the system of mining a mineral deposit rock.
C3-Familiarizing students with the issues concerning the mining of rock mineral for aggregates.
C4-Familiarizing students with the technology of rock mineral mining on blocks intended for stone elements and trends in the development of these technologies.
C5-Acquainting students with a type, use and processing steps in stone elements treatment
C6-Presenting issues related to quality requirements relating to products achieved from the processing and treatment rock raw materials.
C7-Familiarizing with the test methods of particular technological properties, physical and mechanical products derived from rock minerals and the criteria for their evaluation.
C8-Creating skills which allow for performing measurement, results calculation and preparation of test reports.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 - The student has knowledge concerning types and characteristics of rock minerals, can determine places of their occurrence and show the scope of their application.
PEK_W02 - The student can identify problems associated with deposit enabling and characterize system of mineral deposits rock mining.
PEK_W03 - The student can introduce technology and problems associated with rock mineral excavation for aggregates.
PEK_W04 - The student can demonstrate and choose the method of mining rock mineral blocks for characteristic features of a deposit and type of mineral deposits.
PEK_W05 - The student can define, select, and apply technology, equipment type depending on the stage of processing, type and shape of the processed stone element.

relating to skills:

PEK_U01 - The student has knowledge and awareness of the importance of quality requirements relating to products achieved while mining and processing of mineral rock.
PEK_U02 - The student has the ability to perform measurements, prepare reports and test results evaluation.

relating to social competences:

PEK_K01 - The student is able to identify the influence of excavation minerals effects onto land directly surrounding the excavation and the environment.
PEK_K02 - The student is aware of the importance of rational management of a deposit resulting from the technology because of the irreversible consequences of wrong decisions and loss of deposits which are in many cases, state-owned.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Excavation of mineral, rocks processing - introduction, introduction to the course, program requirements, literature Main raw rock materials - occurrence, usage. Preparatory works before rock mineral mining	2
Lec 2	Deposit development: purpose, conditions, ways of development. Deposits excavation systems, types of excavation, systems classification, systems schemes. Excavation of rock mineral for aggregates - technological systems, service level parameters, methods of shooting - effects and shooting parameters	2
Lec 3	Excavation of rock mineral for blocks - characteristics of deposits, basic rocks features, loosening surface, methods and steps to block excavation, mining systems Cracking method, wedging - wedges, crackers, drilling and shooting methods. Cutting out blocks from a deposit - mechanical methods, thermal and hydraulic methods	2
Lec 4	The use of stone elements and processes (creating shape, size and texture). Preliminary blocks machining - saw frames having swinging straight movements - circular frame saws, diamond rope saws of surface texture)	2
Lec 5	Accurate machining of stone elements, giving shape, dimensions - circular frame saws, milling machines, drilling machining, water jet machining. Process of stone elements surfaces, performing a surface texture - abrasive machining, drilling machining, flame, hydraulic analysis of economic of rock machining. Standard requirements concerning stone elements	2
	Total hours	**10**

Form of classes - laboratory		**Number of hours**
Lab 1	Introduction to classes, health and safety training. Determination of density and volume density (igneous and sedimentary rock). Determination of density, bulk density of aggregates	2
Lab 2	Determination of capillary water absorption coefficient	2
Lab 3	Determination of resistance to abrasion (micro-Deval), Determination of resistance to aggregate commination by means of Los Angeles method	2
Lab 4	Determination of strength for bending by pointed force submeasuring. Determination of strength for compression in air - dry condition and in saturated with water condition (igneous rock, sedimentary rock)	2
Lab 5	Determination of slip resistance using a pendulum device	2
	Total hours	**10**

TEACHING TOOLS USED

N1. Type of lectures - traditional, illustrated with multimedia presentations with the usage of audio-visual equipment

N2. Laboratory form - preparation of particular laboratory exercises in accordance with the instructions received before the classes, measurement performance preparing a report which contains the measurement results, their analysis and conclusions laboratory group discussion concerning the results they obtained.

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	P1.Final grade of written test.
F	PEK_U01-PEK_U02 PEK_K01-PEK_K02	F1 - evaluation of laboratory exercises knowledge gained by oral answer to the questions asked by the teacher
		F2 - Grade from a report.
		Final grade is a mean of answers and 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 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] Górnictwo Odkrywkowe – czasopismo

[3] Świat Kamienia – czasopismo - www.swiat-kamienia.pl/pl/

[4] Nowy Kamieniarz – czasopismo - http://nowykamieniarz.pl/

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

dr inż. Wiesław Frankiewicz, wieslaw.frankiewicz@pwr.wroc.pl

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_W05	K_W19, K_W22	C1-C6	Lec 1-Lec 5	N 1
PEK_U01-PEK_U02	K_U4, K_U19	C6-C8	Lab 1-Lab 5	N 2
PEK_K01-PEK_K02	K_K02	C1-C5	Lec 1- Lec 5	N1

SEMESTER 7

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, part-time
Kind of subject: obligatory
Subject code: GGG7202
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	20	10	10		
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 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 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 prepare and carry out an investigation of the circumstances regarding accidents at work, occupational diseases and work environment factors and also analyse results and present effects of research in the form of a team paper report. Knows basic devices and apparatus used for testing harmful factors in the working environment.

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). Basic duties of employees and employers in the area of OHS.	2
Lec 2	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. Occupational diseases, jurisdiction in the field of occupational diseases.	2
Lec 3	Works OHS services, Occupational Health and Safety committee, social labour inspection.	2
Lec 4	National Labour Inspectorate. National Sanitary Inspectorate, The Department of Technical Inspection, Mining Authority.	2
Lec 5	Ergonomics, training in the area of OHS. Measurement strategy of the work environment.	2
Lec 6	Dust and vibration in workplaces.	2
Lec 7	Noise in the work environment.	2
Lec 8	Microclimate, artificial lighting.	
Lec 9	Chemical and biological factors in the work environment.	2
Lec 10	Mechanical hazards. Hygienic and sanitary requirements regarding work premises.	2
	Total hours	**20**

Form of classes - classes		**Number of hours**
Cl 1	AFTER ACCIDENT PROCEDURES. INVESTIGATION OF ACCIDENTS AT WORK AND COMPLETION OF AFTER ACCIDENT DOCUMENTATION. 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. Rules of preparation and approval of after accident documentation. Example of after accident documentation. Assignment of topics to prepare an after accident documentation for student teams.	2
Cl 2	LEGAL ASPECTS OF ACCIDENTS AT WORK. Legal definitions of various accidents and their examples. Elements of the definition of an 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. ANALYSIS OF ACCIDENT RATE. Accident rates, scope and structure analysis. 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.	2
Cl 3	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. PRESENTATION of a selected after accident protocol developed by students.	2
Cl 4	OCCUPATIONAL DISEASES. Relation between occupational diseases and	2

	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.	
Cl 5	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. Summary of classes and final test.	2
	Total hours	**10**

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 post and timing of work time, research plans of harmful factors). Frequency of research, rules of sampling in the workplace. Rules of preparing research reports and an assessment of the working environment due to harmful factors (an example of a report made by the accredited laboratory, sample form of student report).	2
Lab 2	DUST and 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. Methodology of dust analysis according to the standard, measurement set, measurement strategy, the principles of conducting measurements. Practical conducting of dust measurements. Exposure assessment and interpretation – compliance with regulations, assessment of occupational risk, date of next research. Report from research of dust carried out by individual students and discussion of results during consultation hours. Fast reading devices of chemicals in the mining environment. Assessment of cumulative exposure on chemical factors.	2
Lab 3	NOISE and 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 4	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 5	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 classes. Summary of classes and test.	2
	Total hours	**10**

TEACHING TOOLS USED
N1 Informative lecture with elements of problematic lectures. N2 Multimedia presentations. N3 Didactic discussions during lectures. N4 Completion of laboratory classes in the form of a report. N5 Presentation of a report. N6 Consultation.

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_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, F1	PEK_U01-PEK_U05 PEK_K01	Completion of classes and laboratories in the form of reports, presentation of reports, consultations, the final grade of the classes and laboratory classes (25% from the report, 75% from 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
Mining Safety and Rescue 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_W01	K _W33	C1	Lec 1	N1 – N3, N6
PEK_W02	K_ W33	C2	Lec 3	N1 – N3, N6
PEK_W03	K _W33	C2	Lec 4	N1 – N3, N6
PEK_W04	K_ W33	C4	Lec 2, Lec 5	N1 – N3, N6
PEK_W05	K_ W33	C4	Lec 5	N1 – N3, N6
PEK_W06	K_ W33	C3	Lec 2, Lec 5-Lec 10	N1 – N3, N6
PEK_W07	K_ W33	C4	Lec 5-Lec 9	N1- N6
PEK_W08	K_ W33	C3	Lec 2, Lec 5-Lec 9	N1- N6
PEK_W09	K _W33	C3	Lec 2, Lec 5 Cl 1-Cl 5	N1- N6
PEK_U01	K_ U34	C3, C4, C5	Lab 1-Lab a5	N1- N6
PEK_U02	K_ U33	C4	Lab 1-Lab 5	N1- N6
PEK_U03	K _U33	C3, C4, C5, C6	Cl 1-Cl 5	N1- N6
PEK_U04	K _U33	C3, C4	Cl 1-Cl 5 Lab 1-Lab 5	N1- N6
PEK_U05	K_ U33	C5, C6	Cl 1-Cl 5 Lab 1-Lab 5	N1- N6
PEK_K01	K_ K04	C5, C6	Cl 1-Cl 5 Lab 1-Lab 5	N1- N6

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, part-time
Kind of subject: obligatory
Subject code: OSG7204
Group of courses: YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			10	10
Number of hours of total student workload (CNPS)	30			60	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			2	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			1	0,5

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

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 setting 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 settling 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. Formal and legal aspects of post mining land reclamation and development.	2
Lec 2	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 3 Lec 4	Reclamation stages Stage I – preparatory reclamation, Stage II – primary reclamation (technical), Stage III – detailed/secondary reclamation (biological)	4
Lec 5	Rating the effects of reclamation and development, costs and funds for post mining land reclamation and development. Examples of specific solutions adapted during reclamation and development of post mining land both in Poland and worldwide.	2
	Total hours	**10**

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	Discussing and acquainting project related issues. Students' individual project work.	7
Proj 5	Students' delivery of completed projects.	1
	Total hours	**10**

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	Speeches if individual students (20-25 minute presentations) and follow-up discussions.	8
	Total hours	**10**

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-K_W05, PEK_U01, PEK_U02, 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-K_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:

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[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 5	N1, N2, N3,N6
PEK_W03		C4	Lec 2	N1, N2, N3,N6
PEK_W04		C1-C6	Lec 1-Lec 5	N1, N2, N3,N6
PEK_W05		C6	Proj 1-Proj 5 Sem 1-Sem 5	N2, N3,N4,N5, N6
PEK_U01	K_W29 K_U01 K_U05 K_U26 K_U34	C1, C3, C4	Lec 2	N1, N2, N3,N6
PEK_U02	K_W29 K_U01 K_U05 K_U26 K_U34 K_K02 K_K06	C6	Proj 1-Proj 5	N1, N2, N3, N4, N6
PEK_U03	K_W29 K_U01 K_U05	C6	Sem 1-Sem 5	N2, N3, N6
PEK_K01	K_W29 K_U01 K_K02	C2, C3, C4	Lec 1, Lec 2, Lec 5	N1,N6
PEK_K02	K_W29 K_U01 K_K02 K_K06	C6	Proj 1-Proj 5 Sem 1-Sem 5	N2, N3, N4, N5, 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, part-time
Kind of subject: obligatory
Subject code: EKG7202
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		20	10	
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 has basic knowledge of mining systems, technological and organizational systems in mining
2. The student has basic knowledge concerning mathematical analysis necessary to understand mathematical issues in science having engineering and economic character.
3. The student has basic knowledge and skills of using probability theory models and mathematical statistics
4. The student has knowledge concerning free market economy
5. The student can use Excel spreadsheet
6. The student understands the need and knows the possibilities of lifelong learning, improving professional, personal and social skills

SUBJECT OBJECTIVES

C1 Acquiring basic knowledge, taking into consideration its application aspects concerning projects management:

- C1.1 The essence of the project approach
- C1.2 Preparation and project initiating
- C1.3 Project planning
- C1.4 Project monitoring

C2 Acquiring basic knowledge concerning cost accounting, management accounting and corporate financial reporting

C3 Acquiring knowledge concerning basic methods of economic evaluation of investment projects to enable their correct usage.
C4 Acquiring knowledge concerning methods necessary to assess the profitability of investments, including the risks of using the following methods:
- C4.1 basic,
- C4.2 advanced (Monte Carlo simulation VaR and CFAR, property options)
- C4.3 specific for geological-mining investments,
- C4.4 taking into consideration dishonest actions and frauds,
- C4.5 specific for bilateral monopol of coal open-cast mines and power stations.

C5. Acquiring basic skills of preliminary projects planning (Project's card, Basic project's assumptions)
C6. Acquiring skills of using from basic information included in financial reports of companies and in financial management system
C7 Acquiring skills concerning preparation of a simple financial model of an investment and conducting a profitability assessment
C8. Acquiring basic skills of practical appliance of analysis techniques of investment's profitability with taking into consideration a risk including:
- C8.1 appliance of basic techniques,
- C8.2 selection of the discount rate which takes into consideration the risk,
- C8.3 identification of the risk in a chain value in mining production,
- C4.4 predicting dishonest actions and frauds,

C9 Creating skills of functioning analysis of bilateral monopoly and a power station and understanding profits of its vertical integration.
C10. Acquiring and consolidating the competencies of thinking and acting in a project way.
C11 Development and consolidation the economic attitudes of action and undertaking decisions with regard to economic criteria in engineering projects.
C12 Competence development to perceive the omnipresence of risk in business, especially in the mining sector and the need to predict the consequences of action and economic evaluation of their effects.
C13 Competence development of recognizing a need and the necessity of fair and ethical action and transparent procedures concerning deposits resources information, risks of investments and their cost-effectiveness.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has knowledge concerning the genesis and the basic features of project approach
PEK_W02 The student has knowledge concerning leading classical project management methodologies
PEK_W03 The student has knowledge concerning the main processes of project management
PEK_W04 The student has knowledge concerning techniques and tools in project planning
PEK_W05 The student has knowledge concerning techniques and tools in project monitoring
PEK_W06 The student has knowledge concerning content and mutual balance relations, profit and loss account and cash flow statement
PEK_W07 The student knows the basic concepts of cost account
PEK_W08 The student knows the notions of future value and the present value of cash flows
PEK_W09 The student knows basic methods of investement's effectiveness (NPV, IRR, payback time) and scope of their implementation
PEK_W10 The student knows the basic principles how to create a financial model of investment
PEK_W11 The student has knowledge concerning the basic techniques of cost-benefit analysis with quantification of uncertainties and risks.
PEK_W12 The student has knowledge concerning open-cast mine optimization.
PEK_W11 The student has knowledge concerning the advanced techniques of cost-benefit analysis

with quantification of uncertainties and risks.
PEK_W14 The student understands how the flexibility of decisions affect creation of optional value increasing the value of investment
PEK_W15 The student understands what kind of risks are connected with a mining investment at every stage of the value chain
PEK_W16 The student understands the consequences of dishonest activity for all market participants
PEK_W17 The student understands specification of mine bilateral monopoly and a power station and has knowledge concerning profits of its vertical integration.

relating to skills:
PEK_U01 The student can environment analysis of a simple project
PEK_U02 The student can define the goals and the life cycle of a simple project
PEK_U03 The student can define an organisation and scope of a simple design
PEK_U04 The student can define business justification of a project and analyse project risks
PEK_U05 The student can develop and present a Card of a simple project
PEK_U06 The student can interpret and use the basic information included in a balance sheet, profit and loss statement and in a cash flow statement
PEK_U07 The student knows how to distinguish between fixed and variable costs, can calculate the break-even sales
PEK_U08 The student can calculate the future and present value of money and solve simple accounting tasks concerning value of money in time
PEK_U09 The student can create a simple financial model of investment (using a spreadsheet) and assess its cost-effectiveness using IRR, NPV and PBP methods
PEK_U10 The student can correctly interpret the results of the cost-effectiveness analysis for project which mutually preclude themselves and those which do not preclude
PEK_U11 The student can apply basic functions of a spreadsheet
PEK_U12 The student can adopt basic techniques of investment's profitability analysis with taking into consideration a risk
PEK_U13 The student can calculate the cost of capital in a company and choose the risk premium
PEK_U14 The student is aware of the risks which are connected with geological-mining investments and knows what risk quantification techniques can be used and how to interpret the results
PEK_U15 The student knows how to appreciate the benefits of fair and transparent knowledge reporting concerning a deposit and company's activities to investors, customers and market credibility
PEK_U16 The student can explain the specifics of a mine and a power plant, and indicate the benefits of vertical integration
PEK_U17 The student can make optimal decisions in the selection of mining equipment for a particular way of excavation, taking into consideration technological parameters and purchase costs and maintenance of the equipment

relating to social competences:
PEK_K01 The student can think and act in a system, creative and enterprising way
PEK_K01 The student can work in a team
PEK_K03 The student has a fixed attitude of economic action and of udertaking decisions in engineering projects.
PEK_K04 The student is aware that the activity in business, particularly in the mining sector requires udertaking decisions in the conditions of risk and uncertainty and that is why the consequences of actions and their effects should be predicted in advance
PEK_K05 The student is aware of the negative consequences of dishonesty and appreciates the importance of ethical and transparent action

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Introduction to project management	1
Lec 2	Analysis of project environment, preparation and initiating the project	1
Lec 3	Aim and project life cycle planning	1
Lec 4	Organization and scope of a project planning	1
Lec 5	Planning of actions, deposits and costs of a project	2
Lec 6	Planning of communication, risks and quality	1
Lec 7	Project monitoring	2
Lec 8	Introduction to accounting Elements of investment's financial statement	1
Lec 9	Investement's balance - component elements and thir links	2
Lec 10	Profit and loss account, cash flow account - basic elements, mutual relations of both reports	1
Lec 11	The concept of costs in financial accounting and in management accounting. Costs classification. Sales break-even	1
Lec 12	Time value of money. Counting the future and present value	1
Lec 13	Basic methods of investement's effectiveness assessment (NPV, IRR, payback time) Advantages and disadvantages of each method Scope of their appliance.	1
Lec 14	Forecasting cash flows of the investment's cash flows. Development and replacement investments	1
Lec 15	Examples of mine investment projects and the analysis of their profitability	1
Lec 16	The risk of investments	1
Lec 17	Techniques used to analyse the risk of the investment project	1
Lec 18	Discount rate, the cost of capital and the risk premium - KGHM investment in Congo.	1
Lec 19	Sensitivity and scenarios analysis and the decision tree method	1
Lec 20	Optimization of coal mines according to Lerchs and Grossman algorithm as a special case of sensitivity analysis	1
Lec 21	Monte Carlo simulation method - Crystal Ball and @ Risk software	1
Lec 22	Joke Sęk Va and CFaR	1
Lec 23	Property options - creating an optional value thanks to a flexible operation	1
Lec 24	Risk in a chain of value creation in geological-mining investments	1
Lec 25	Case analysis - BreX, Enron - the mining business ethics and more	1
Lec 26	Bilateral monopoly of coal open-cast mines and power stations	1
Lec 27	Benefits of mines and power stations vertical integration	1
	Total hours	**30**

Form of classes - laboratory		**Number of hours**
Lab 1	Exercise: project - process - task	1
Lab 2	Presentation of the individual reports "My idea for a project"	2
Lab 3	Exercises: Environment analysis, investors analysis for a case study, setting up projects, teams appointing	1
Lab 4	Exercises: Aims of the project, realization formula, presentation of own project by a team	2
Lab 5	Exercises: Life cycle, organizational structure of a project, scope of a project, presentation by a team their own Card's project elements	2
Lab 6	Exercises: Preliminary project's risk assessment; presentation by a team their own Card's project elements	1

Lab 7	Exercises: Presentation by a team their own project Card	1
Lab 8	Accounting tasks - the difference between sales income and revenue and cost and expense	1
Lab 9	Accounting tasks - definition of business assets and their value, and sources of funding	1
Lab 10	Accounting tasks - preparation of simplified financial statements in a spreadsheet. Analysis of the selected changes impact on the elements of these reports.	1
Lab 11	Counting the future and present value of money. Solving tasks using spreadsheet functions	1
Lab 12	Calculating investment's profitability indexes with the usage of a spreadsheet. Results interpretation - discussion.	2
Lab 13-14	Creating investments financial models -solving tasks using spreadsheet functions.	2
Lab 15	Crediting test -solving tasks using spreadsheet functions.	2
	Total hours	**20**

Form of classes - project		**Number of hours**
Proj 1	Determining the scope of a project and crediting conditions of the course. Giving individual tips to the project regarding: Analysis of mining excavation profitability for a deposit of a chosen raw material.	1
Proj 2	Determining customers demand for a particular mineral. Determination of production volume and basic technical parameters of the designed mine. The choice of machines and other elements of mine technical equipment for the need of investment. Identification and value determination of necessary investment costs.	1
Proj 3	Types of costs in mine investments. Counting the project's costs in the coming years, taking into consideration changes in the value of money over time. Presenting costs accounting by type and function of expenditure.	1
Proj 4	Determination of the final selling price of raw material and the income in the future periods of the project.	1
Proj 5	Determination of mining project profitability using simple and discount methods for assessing the profitability of the investment.	2
Proj 6	Sensitivity analysis of the project's profitability for a change of selected financial and technological parameters of the project.	2
Proj 7	Project's presentation and the correctness assessment. Group's discussion concerning the project.	2
	Total hours	**10**

TEACHING TOOLS USED
N1. Interactive lecture with slides and discussion N2. Laboratory tasks: team work concerning the definition of an exemplary project's elements N3. Laboratory tasks: presentations of elements of project's Card developed by the team within own work N4. Duty hours N5. Own work - development of project's Card by the team N6. Own work - own literature studies. N7 Laboratory tasks: - individual tasks solved using spreadsheet functions. N8 Laboratory tasks: - discussion, joint tasks solving

N9 Own work -solving homeworks using a spreadsheet N10. Analysis of causes and a discussion N11. Taking knowledge from a folk wisdom N12. Exam with negative points and zero expected value “of bank shoot" N10 Project - joint solving of an exemplary investment project in mine N11 Project - own work to solve the project

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluations (F – forming (during semester), P – concluding (at the end of semester)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01-PEK_04	Presentation of elements of project’s Card
F2	PEK_U06-PEK_U11	Current assessment of individual tasks solutions obtained by students in the course of the laboratory and at home
F3	PEK_W06-PEK_W10 PEK_K03	Discussion in the laboratory group and oral asking
F4	PEK_W11-PEK_W16 PEK_U14-PEK_U16	Free discussion during the lecture, the ability to ask the students out from the previous lectures by the teacher
F5	PEK_U12-PEK_U13	Asking students to solve simple exercises on a board.
F6	PEK_U06-PEK_U12	Current assessment of work progress during realisation of the following stages of the project.
P1	PEK_U01-PEK_U04, PEK_K01-PEK_U02	Presentation of the project’s Card
P2	PEK_W01-PEK_U05	written exam (knowledge test)
P3	PEK_W06-PEK_W10 PEK_U06-PEK_U11 PEK_K03	Crediting test in the computer laboratory - individual tasks solving using spreadsheet.
P4	PEK_W06-PEK_W10 PEK_K03	Written exam in a form of a test
P5	PEK_W11-PEK_W16 PEK_U12-PEK_U16	Written exam in a form of a test with negative points The test requires simple calculations to achieve correct solutions for a few questions.
P6	PEK_K04	Encourage students to analyse a choice strategy of the number of responses with taking into consideration a point threshold to pass and negative points which ensure zero expected value of “a blank shoot".
P7	PEK_K05	Punishments, among the others as lack of credit for dishonest behaviour during the exam.
P8	PEK_U06-PEK_U12	Report in a written form and oral asking of students from the project’s content

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PRIMARY LITERATURE:

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SECONDARY LITERATURE:

[1] A Guide to Project Management Body of Knowledge (PMBOK®Guide Fourth Edition), Project Management Institute, 2008 (2004). wydanie polskie, MT&DC Warszawa, 2009 (2006)

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
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_W08	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-Lb a3	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	Proj 2	N10,N11
PEK_K01-02	K_K04 - 06	C10	Lec 1-Lec 7, Lab 1-Lab 7	N2, N3, N5
PEK_K03	K_K05 - 06	C11	Lec 10-Lec 15 Lab 8, Lab 10-Lab 14	N1, N4, N8-N10
PEK_K04	K_W31	C12	Lec 16-Lec 24	N1, N4, N6, N10
PEK_K05	K_W06	C13	Lec 25	N1, N10, N12

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, part-time
Kind of subject: obligatory
Subject code: GGG7204
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		10		
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 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 spread 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 a 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 efficient 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 – The student is able to describe characteristic features of fans, basing on the taken measurements.
PEK_U03 – The student is able to design ventilation pipes system/ air-duct system for a blind drift.
PEK_U04 – The student is able to interpret and assess the condition of the air regarding the safety of workers.

relating to social competences:

PEK_K01 – The student 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.
PEK_K02 – The student is aware of negative influence of gas and dust pollution produced by mining works on natural environment.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Mines ventilation – historic trait. Objectives of Mining Aerology. Atmospheric air. Mine air (toxic and explosive substances in mine air, tolerable amounts of toxic and explosive substances in mine air).	2
Lec 2	Characteristic features of mine air (thermodynamic variables, balancing, gaseous solutions, physical feature of air, the Mollier diagram (h-x chart), moist air changes, enthalpy, mixing of air streams.	2
Lec 3	Thermal comfort in excavation sites, heat balance of a human body, comfort index, climatic standards.	2
Lec 4	Components of a mine ventilation network. Mapping of ventilation network (ventilation maps and schemes, different air currents.	2
Lec 5	Type of air flow in air split system, equation of continuity of airflow, equation of airflow in excavation site, energy dissipation in an air split system and endemic resistance. Air potential and its decrease. Potential scheme of a ventilation network.	2
Lec 6	Resistance in air splits. Endemic resistance. Sample hole air flow. Serial and parallel resistance connections. Laws for nodes and loops in ventilation system	2
Lec 7	Calculating forced air distribution. Air distribution controllers. Natural ventilation, natural depression.	2
Lec 8	Principles of air distribution in a mine. Air distribution in ventilation areas.	2
Lec 9	Mining ventilation devices, cooperation of fans and their operation in a ventilation network.	2
Lec 10	Ventilating devices. Air loss. Ventilation of separate mining working, ventilation pipes system. Designing ventilation pipes system.	2
	Total hours	**20**

	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. Parameters survey. Determining volume flow and mass of the air in a pipeline and a drift mine. Calibration of instruments for air speed measurements.	2
Lab 2	Describing types of an airflow, examining transition from laminar movement into turbulent movement. Analysing factors that influence the airflow in pipelines. Taking measurements essential for determining linear resistance in a pipeline and endemic resistance. 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 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 ventilation network (pipeline).	2
Lab 4	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 5	Describing principles of air-duct systems, necessary measurements for defining pipeline parameters (resistance in a leaking pipeline, leakproofness factor). Assessing reports on the conducted laboratory research. Test on principles and methods applied in ventilation surveying.	2
	Total hours	**10**

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.

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

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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	PEK_W30	C1, C2	Lec 1, Lec 2	N1, N4
PEK_W02	PEK_W30	C2, C5	Lec 7, Lec 8	N1, N4
PEK_W03	PEK_W30	C7	Lec 4, Lec 5	N1, N4
PEK_W04	PEK_W30	C2, C3	Lec 6, Lec 8	N1, N4
PEK_W05	PEK_W30	C2	Lec 6, Lab 2	N1, N2, N4
PEK_W06	PEK_W30	C4	Lec 9, Lab 3	N1, N2, N4
PEK_U01	PEK_U27	C2, C8	Lec 2, Lb a1	N1, N2, N4
PEK_U02	PEK_U27	C4	Lec 5, Lab 3	N1, N2, N4
PEK_U03	PEK_U27	C6	Lec 10, Lab 5	N1, N2, N4
PEK_U04	PEK_U27	C1	Lec 1, Lec 3, Lab 4	N1, N2, N4
PEK_K01	PEK_K04	C8	Lab 1-La 5	N1, N2, N3, N4, N5

SEMSTER 8

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, part-time
Kind of subject: Obligatory
Subject code: GGG8204
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in the University (ZZU)	20	10			
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	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, and courses), improving professional, personal and social skills.

SUBJECT OBJECTIVES

C1 - To familiarize students with the organization and functioning of mine rescue in Poland and 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 for creating a culture of safety in the mining industry and responsibility for the health and lives of others 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.	2
Lec 2	General principles of rescue operations. Plan of rescue and mutual aid.	2
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.	2
Lec 4	Methane hazards, methane content, methane-bearing capacity, hazard categories, methane emission into mines, ceiling accumulations of methane,	2
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)	2
Lec 6	Coal dust (explosiveness of coal dust, anti-explosion protection). Organization and tactics of rescue action during gas and coal dust explosions.	2
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.	2
Lec 8	Roof falling hazards (rock bursts, roof falling, rock slides), organization and tactics of rescue action during roof falling.	2
Lec 9	Water hazards, organization and tactics of rescue actions during a sudden water irruption into a mine.	2
Lec 10	Organization and rescue tactics during energy and machinery failure. Basics of first aid.	2
	Total hours	**20**

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.	2
Cl 2	Open circuit apparatus (hose breathing apparatus, compressed air breathing apparatus). Isolating devices used in the mining industry.	2
Cl 3	Escape breathing apparatus (isolating and filtrating) used in mining and industry.	2
Cl 4	Rescue clothing, personal protective equipment, communications equipment, lighting equipment, equipment for first aid.	2
Cl 5	Equipment for rescue actions used with roof falling, water, energy and mechanical hazards. Test of possessed knowledge.	2
	Total hours	**10**

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 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_W03	Final grade from exam in the form of a test.
P2	PEK_U01- PEK_U03 PEK_K01- PEK_U02	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 5	N1, N2, N3, N4
PEK_K01	K_K02	C3	Lec 10	N1, N3, N4
PEK_K02	K_K02	C3	Lec 10	N1, N3, N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Gospodarka Złożami 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, part-time
Kind of subject: obligatory
Subject code: GGG8203
Group of courses: YES

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			20	
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				1	
including number of ECTS points for direct teacher-student contact (BK) classes	2			1	

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.	3
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.	3
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.	3
Lec 4	Final test (test, personalised set of tasks) of student competence.	1
	Total hours	**10**

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.	3
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.	3
Proj 3	Quality and quantity calculations: progress control, discussion, additional information, explanations, individual consulting.	3
Proj 4	Selection of basic devices and machinery to production scheme: progress control, discussion, additional information, explanations, catalogues, individual consulting.	3
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.	3
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 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
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
[3] Katalogi firmowe maszyn Metso Minerls, Sandvik, DSP,Mifama,ŁZG i inne

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

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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_W1	K_W35	C3	Lec 1-Lec 2	N1-N3, N6
PEK_W2	K_W35	C4	Lec 2	N1-N3, N6
PEK_W3	K_W35	C5	Lec 3	N1-N3, N6
PEK_W4	K_W35	C5-C6	Lec 3-Lec 4	N1-N3, N6
PEK_U1	K_U32	C1-C3	Proj 1-Proj 4	N1-N3, N6
PEK_U2	K_U32	C5	Proj 5-Proj 7	N4, N6
PEK_U3	K_U32	C6	Proj 8	N4, N6
PEK_U4	K_U32	C6	Proj 9-Proj 10	N4-N6
PEK_K1	K_K07	C5	Lec 1-Lec 2	
PEK_K2	K_K07	C5	Lec 3-Lec 4	

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, part-time
Kind of subject: obligatory
Subject code: GGG8206
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		10	10	
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. 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 fire 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 – 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.

PEK_K02 – Is aware of the negative impact on the environment caused by noise produced by main fans and emission of gases and dusts resulting from ventilation of mines.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Digital imagining of ventilation networks, examining the structure of ventilation networks. Calculating natural air flow in simple and compound ventilation networks.	2
Lec 2	Threat of underground fire, burning process, fir gases, fire depression. Causes on underground fires and its stages. Coal and its pyrophoric properties as contributing factor.	2
Lec 3	Assessing fire threat. Early detection of exogenous and endogenous fires. Preventing exogenous and endogenous fires.	2
Lec 4	Active and passive participation in underground fire extinguishing. Securing of a mine site during fire. Methods of extinguishing underground fires. Reversion in ventilating during fire. Additional securements of descending air currents.	2
Lec 5	Malfunctions of ventilation network during underground fire. Stabilization of air flow directions and distribution in methane mines. Eliminating smoke. Rules and regulation of fire fighting action. Crew evacuation.	2
Lec 6	Assessing fire stage in a dammed area. Quick extinguishing of fire areas. Opening and terminating underground fire areas.	2
Lec 7	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.	2
Lec 8	Forecasting of air threats in mining sites.	2
Lec 9	Operation of compressing and absorbing HVOC devices. Air conditioning machinery applied in mining.	2
Lec 10	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.	2
	Total hours	**20**

	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.	1
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.	1
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. Calculating air distribution in ventilation networks for different ventilation stages.	3
	Total hours	**10**

	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. Calculating demand for air in flats and chambers; assuming air distribution in whole ventilation network. Determining air splits resistance and energy dissipation.	2
Proj 3	Regulating air distribution, selecting proper controllers and parameters of main fans. Selecting main fans for ventilation network. Security and efficiency analysis.	2
Proj 4	Analysis of probable starting points for fire outbreak. Determining fire depression.	2
Proj 5	Analysis of possible malfunctions in ventilation network; finding seat of fire, eliminating smoke, smoke prevention, distribution of fire fighting devices in ventilation network.	3
	Total hours	**10**

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
P	PEK_W01-PEK_W05	Final exam grade for a written test.
F,P	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%)
P	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	Lec1, Lab 4, Lab 5 Proj 2, Proj 3	N1, N2, N4, N5
PEK_W02	K_W30	C2	Lec 1, Lab 4, Lab 5, Proj 2, Proj 3	N1, N2, N4, N5
PEK_W03	K_W30	C3	Lec 2, Lec 3, Lab 1	N1, N2, N4, N5
PEK_W04	K_W30	C5	Lec 10	N1, N4, N5
PEK_W05	K_W30	C6, C7	Lec 7, Lec 8	N1, N4, N5
PEK_U01	K_U27	C1	Lec 1, Lab 5, Proj 2	N1, N2, N4, N5
PEK_U02	K_U27	C1	Lab 1	N1, N2, N4, N5
PEK_U03	K_U27	C2	Proj 2	N1, N4, N5
PEK_U04	K_U27	C3	Lec 3, Lab 2	N1, N2, N4, N5
PEK_U05	K_U27	C3	Lec 3, Lab 2, Proj 4	N1, N2, N4, N5
PEK_U06	K_U27	C4	Lec 5	N1, N4, N5
PEK_U07	K_U27	C4	Lec 6	N1, N4, N5
PEK_U08	K_U27	C4	Lec 4, Proj 5	N1, N4, N5
PEK_U09	K_U27	C6, C7	Lec 7, Lec 8, Lec 9	N1, N4, N5
PEK_K01	K_K04	C1, C2, C4, C6	Lab 1-Lab 5	N1, N2, N3, N4, N5
PEK_K02	K_K02	C2	Proj 3	N1, N4, N5

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, part-time
Kind of subject: obligatory
Subject code: PRG8201
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10				10
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 has knowledge concerning the basis of national and EU law
2. The student has knowledge concerning the basis of geology and mining

SUBJECT OBJECTIVES

C1 The aim of the course is to have basic knowledge of Geological and Mining Law to the extent that it is possible to work in a regulated professions - geological and mining

C2 The aim of the course is to use knowledge of the Geological and Mining Law provisions to analyse specific legal situations associated with conducting mining plant traffic

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has knowledge of Geological and Mining Law to the extent that it is possible to work in mining professions

relating to skills:

PEK_U01 The student can use the Geological and Mining Law provisions to analyse specific legal situations associated with conducting mining plant traffic

relating to social competences:

PEK_K01The student is aware of the importance and understanding of non-technical aspects and effects of an engineer-miner, including its impact on the environment and related to this responsibility for decisions, is aware of the value and need to create a culture of safety in mining

PROGRAMME CONTENT

Form of classes - lecture		Number of hours
Lec 1	Basics of Polish legal system -geological and mining law in the legal system of the Republic of Poland and the European Union, subject of geological and mining law.	2
Lec 2	Mining property, mining usage and other mining powers. Concession	2
Lec 3	Professional qualifications, experts and professional liability. Geological works.	2
Lec 4	Mine facility, its movement, mine rescue	2
Lec 5	Fees, liability for damages, administration, state geological survey and monitoring.	2
	Total hours	**10**

Form of classes - laboratory		Number of hours
Sem 1	Introduction to the seminar, handing out topics of speeches for individual students. The speeches deal with the current PGiG problems discussed during the lectures, and the legal issues arising from the regulatory provisions of the PGiG Act in terms of their ability to apply to situations involving the movement of ZG	1
Sem 2-5	Presentations of the seminar participants in the form of 20-25 minute presentations and groups discussion on the content and form of speeches.	9
	Total hours	**10**

TEACHING TOOLS USED

N1. Type of lectures - traditional, illustrated with multimedia presentations with the usage of audio-visual equipment

N2. Presentations of the seminars participants should be illustrated with multimedia presentations, using the digital documentation

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
P1	PEK_W01	grade from a written test from the material covered at the lecture
P2	PEK_U01 PEK_K01	student's presentation in analysed by the group, the result of the discussion are transferred into grades. Grades are concerning 1. merits of presentations, 2. formal side of presentations 3. discussion activity It is taken into consideration in the final grade of the seminar. Final grade is a weighted average of these three grades, accordingly with 0,6, 0,2 and 0,2.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Lipiński – Prawo geologiczne i górnicze – komentarz. Amber Publishing, 2003
[2] Prawo geologiczne i górnicze – SITG Publishing, 2011
[3] Radecki - Ochrona środowiska w prawie geologicznym i górniczym
[4] Dzienniki Ustaw 2011, 2012
[5] Internetowy System Informacji Prawnej Sejmu RP

SECONDARY LITERATURE:

[1] Strony internetowe: 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 and specialization	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W34	C1	Lec 1-Lec 5	N1
PEK_U01	K_U31	C2	Sem 2-Sem 5	N2
PEK_K01	K_K02	C2	Lec 1-Lec 5 Sem 2-Sem 5	N1, N2