SEMESTER 1

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Podstawy Geodezji
Name in English: Basics of Surveying and Geodesy
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG1037
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1.The student has basic knowledge on mathematics and physics at the secondary school level.

SUBJECT OBJECTIVES

C1 familiarizing students with the basic functions and tasks of geodesy at every stage of engineering design, including the essence of inventory, execution and control measurements
C2 Learning methods of linear, angles and heights measurements, basic surveying equipment and data processing and visualization of measurement results
C3 Learning and understanding the coordinate calculus and evaluation of the measurements accuracy and calculations and how to calculate the plane area and volume

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has basic knowledge of the structure and tasks of surveying engineering works at the stages of design, execution and control

PEK_W02 The student has a general knowledge concerning basic types of surveys, methods of processing and graphic presentation as maps. The student defines units of linear, angular, and plane measures.

PEK_W03 The student defines the concept of coordinate systems and describes the main concepts of calculus coordinate, the student has the knowledge concerning methods which determine plane and volume

PEK_W04 The student knows and understands the essence of assessing the accuracy of measurements and calculations, can define the concept of deviations and corrections, and the preliminary alignment of measurements results

relating to skills:

PEK_U01 The student can perform situational field and heights measurements and perform basic surveying calculations and prepare an analogue map

PEK_U02 The student can count the Cartesian coordinates in the current state spatial reference system, based on the results of surveys

PEK_U03 The student can interpret economic and topographic maps, determine planes and volumes

PEK_U04 The student can level situational and hights measurements and prepare an analysis of the accuracy of measurements and determinations,

relating to social competences:

PEK_K01 The student can work in measurement teams and in multi-disciplinary teams

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Meaning of geodesy in engineering surveying works, an analysis of the main geodesy divisions	2
Lec 2	Types of surveying, elements of spatial reference system	2
Lec 3	Units of measurement: length, plane and angles, angular measurement conversions	2
Lec 4	Bradis-Krylov rules, functions of small angles	2
Lec 5	Types of maps: geometric interpretation, metadata, scales and divisions	2
Lec 6	Direct and indirect measurements of distances and stakeout of straights and angles	2
Lec 7	Measurements of field details: methods, technical manuals, pre-treatment of results	2
Lec 8	Theodolite: structure, function, checking and rectification	2
Lec 9	measurement of horizontal and vertical directions, angles counting	2
Lec 10	Calculus coordinate on a plane: counting coordinates of traverse, variations, amendments	2
Lec 11	Angular forward and backward intersection	2
Lec 12	Methods of plane and volume calculation	2
Lec 13	Elements of mistakes calculus: types of mistakes, observations equally and unequally accurate, average mistake, mistake of monitoring function	2

Lec 14	Heights measurements: geometric levelling, alignment of levelling sequences, checking and adjusting and rectification of levelling instruments,	2
Lec 15	Trigonometric levelling	2
	Total hours	**30**

Form of classes - laboratory		**Number of hours**
Lab 1	Regulation of classes, health and safety training	2
Lab 2	Situational measurements : basic measuring equipment, stakeout and measurement of straights, stakeout of right angles	2
Lab 3	Measurement of field details by means of orthogonal method, field sketch	2
Lab 4	Measurement of field details by means of polar method	2
Lab 5	Mapping of an analogue map	2
Lab 6	Angle measurements: theodolite, optical and digital total station, verification and rectification,	2
Lab 7	Measurement of horizontal and vertical directions,	2
Lab 8	Heights measurements - geometric levelling: digital and optical levels, construction, operation, rectification	2
Lab 9	Heights measurements, geometric levelling of levelling sequence,	2
Lab 10	Plane levelling	2
Lab 11	Calculus coordinate: counting coordinates of traverse	2
Lab 12	Spatial forward intersection	2
Lab 13	Layers interpolation, terrain cross-sections	2
Lab 14	Plane and volume counting	2
Lab 15	Preliminary assessment of the accuracy and assignments - error function	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Lecture - traditional with multimedia presentations N2. Laboratory classes - preparing reports as basic trig data with counting results and visualisation N3. Own work - continuing laboratory tasks N4. Own work - individual studies and preparation for the exam 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	Oral answers, written tests
F2	PEK_U01-PEK_U04 K_K01	Reports grade, P1 (mean F1 and F2 grade)
P2	PEK_W01-PEK_W04	Written-oral exam

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Beluch J., Ćwiczenia z geodezji I, AGH Publishing, Kraków 2007
[2] Beluch J., Ćwiczenia z geodezji II, AGH Publishing, Kraków 2008
[3] Kurczyński Z.: Lotnicze i satelitarne obrazowanie Ziemi (volume 1 i 2). PW Publishing House, Warszawa 2006.
[4] Kurczyński Z.: Podstawy Fotogrametrii. PW Publishing House, Warszawa 2004.
[5] Łyszkowicz S., „Podstawy Geodezji", Politechnika Warszawska Publishing, Warszawa 2008
[6] Jagielski A. Geodezja I. P.W.STABILL, II edition, Kraków 2005.
[7] Jagielski A. Przewodnik do ćwiczeń z geodezji. I. P.W.STABILL, Kraków 2004.
[8] Łyszkowicz A., Geodezja czyli sztuka mierzenia Ziemi. Uniw. Warm.-Mazurskie Publishing, 2006.
[9] Osada E. Wykłady z geodezji i geoinformatyki. Niwelacja. Science Publishing of Dolnośląska Szkoła Wyższa. Wrocław 2009.
[10] Osada E. Geodezja. Publishing House Politechnika Wrocławska Publishing II edition extended (mathcad verion on CD) Wrocław 2002.
[11] Przewłocki St., Geodezja dla Inżynierii Środowiska, PWN, 2000

SECONDARY LITERATURE:

[1] Instructions and technical principles of Główny Urzęd Geodezji i Kartografii 2011 r.
[2] Geodeta - geo-informatics magazine. Geodeta Publishing Sp. z o.o., Warszawa
[3] Przegląd Geodezyjny – Stowarzyszenie Geodetów Polskich magazine Sigma NOT Publishing

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Basics of Surveying and Geodesy
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W02	C1	Lec 1-Lec 3	N1,N4,N5
PEK_W02	K_W02	C2	Lec 5-Lec 9	N1,N4,N5
PEK_W03	K_W02	C3	Lec 10-Lec 12	N1,N4,N5
PEK_W04	K_W02	C3	Lec 4, Lec 13	N1,N4,N5
PEK_U01	K_U01	C1, C2	Lab 1-Lab 10	N2, N3, N5
PEK_U02	K_U01	C3	Lab 11	N2, N3, N5
PEK_U03	K_U01	C3	Lab 12-Lab 14	N2, N3, N5
PEK_U04	K_U01	C1, C3	Lab 15	N2, N3, N5
PEK_K01	K_K01	C1	Lec 1-Lec 15 Lab 1-Lab 15	N1-N5

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Grafika Inżynierska i Rysunek Techniczny
Name in English: Engineering Graphics and Technical Drawing
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG1033
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15			45	
Number of hours of total student workload (CNPS)	30			90	
Form of crediting	crediting with grade			crediting with grade	
For a group of courses mark (X) for the final course					
Number of ECTS points	1			3	
including number of ECTS points for practical (P) classes	0			0	
including number of ECTS points for direct teacher-student contact (BK) classes	1			2	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has basic knowledge of Euclidean space that is necessary to understand the methods of spatial objects mapping in the plane.
2. The student has basic knowledge of geometric figures.
3. The student has elementary knowledge of using drawing instruments in pencil technique.
4. The student has elementary knowledge of using a computer.

SUBJECT OBJECTIVES

C1 Getting to know the theoretical basis of spatial objects recording on a plane of central and parallel projection and familiarizing with the principles of the following methods of representation used in the engineering graphic: perspective, isometric, Monge's projections, projection with elevation
C2. Familiarising with the general principles of technical drawing, dimensioning, use of different forms of drawing.
C3. Gaining the ability to perform technical drawings and read geometric objects from a drawing and solving skills using known methods of spatial issues mapping in the field of writing design, topography and design of mining facilities and other earthworks.
C4. Gaining skills in computer-aided design systems (AutoCAD) at the beginner level.
C5. Developing spatial imagination necessary to solve engineering tasks.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 - the student knows the rules for determining projective space and principles of mapping points and figures and also invariants in central and parallel projection

PEK_W02 - the student knows the method of vertical perspective and basic geometrical dependence

PEK_W03 - the student knows the method of Monge's projections and basic structures defining relations and appurtenance of space elements

PEK_W04 - the student knows the axonometric projection method - isometry, oblique and rectangular dimetrics, the student knows basic geometrical dependence

PEK_W05 - the student knows the method of , projection with elevation, basic structures defining relations and appurtenance of space elements and basic structures defining parameters of topographical surfaces

PEK_W06 - the student has basic knowledge concerning technical documentation of planned or existing facilities

relating to skills:

PEK_U01 - the student can prepare a technical drawing representing an engineering project documentation in accordance with current technical drawing rules.

PEK_U02 - the student can perform drawings of the known methods of mapping and can describe them in a handwritten way or using appliances.

PEK_U03 - the student can write and read geometric objects form in Monge's projections

PEK_U04 - the student can apply different forms of drawing - view, cross section, revolved section, half-view-half-section, breaking detail.

PEK_U05 - the student can resize objects according to the rules of dimensioning technical drawings

PEK_U06 - the student can interpret the writings used on drawings and signs concerning dimensional tolerances, surface roughness and separable and inseparable connections.

PEK_U07 - the student can, in Monge's projections, determine relations and appurtenance of space elements - point, line, plane - with the use of specific planes and datum transformation.

PEK_U08 - the student can determine in Monge's projections a plane intersection and polyhedron interpenetration

PEK_U08 - the student can determine in Monge's projections a plane intersection and interpenetration of rotational solids

PEK_U03 - the student can write and read geometric objects of polyhedron in cavalier and military perspective

PEK_U11 - the student can determine the intersection of polyhedron with a plane in axonometric projections

PEK_U12 - the student can present spatial objects in projection with elevation and appoint the appurtenance of space elements

PEK_U13 - the student can adopt a projection with elevation in the design of earthworks connected with mining and road construction

PEK_U14 - the student is capable of using a central projection to write a geometric form of objects in vertical perspective

PEK_U15 - the student is able to move around in the AutoCAD work environment using two-dimensional space, is able to create layers and assign attributes to them, use tools: line, line chain, polygon, circle, ellipse, arc. The student can accurately enter the coordinates of objects using global and local coordinate systems hook up to existing facilities, modify and change the attributes of graphical objects, group objects (create blocks), dimension drawings and describe them.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Organizational matters. Principles of spatial objects projection onto the plane. Central and parallel projection -application in the graphical mapping.	2
Lec 2	Monge's projections. Spatial elements and relations between them. Corresponding elements - straight line and plane and plane Intersection of plane figures. Datum transformation - transformation	2
Lec 3	Monge's projections. Hole-through of a polyhedron with a straight line. Crossing of a polyhedron with a plane. Polyhedrons' transmissivity	2
Lec 4	Monge's projections. Interpenetration of rotational solids. Interpenetration of rotational solids with non-rotational	2
Lec 5	Spatial elements in central projection. Applied perspective.	2
Lec 6	Axonometric projections. Cavalier and military perspective Crossing of a polyhedron with a plane.	2
Lec 7	Projection with elevation. Spatial elements and relations between them. Projection with elevation in mapping topographical planes. Adoption of a projection with elevation in the design of earthworks connected with mining and road construction Introducing to computer systems aided design CAD	2
Lec 8	Crediting test	1
	Total hours	**15**

Form of classes - project		**Number of hours**
Proj 1	Organizational matters. General principles of technical drawing: sheet formats, drawing lines and their adoption, scales, title blocks, drawings planning, technical writing exercises - Latin alphabet, numbers, characters, Greek letters.	3
Proj 2	Rectangular projection, hand drawing exercises.	3
Proj 3	Rectangular parallel projection. Corresponding elements - straight line and plane and plane (transformation and characteristic planes).	3
Proj 4	Rectangular parallel projection. Straight line and a solid, crossing of a polyhedron with a plane. Polyhedrons' transmissivity	3
Proj 5	Rectangular parallel projection. Interpenetration of rotational solids. Interpenetration of rotational solids with non-rotational.	3
Proj 6	Central projection and perspective.	3
Proj 7	Axonometric projections. Cavalier and military perspective. Intersection of polyhedron with a plane in axonometric projections	3
Proj 8	Terrain profile. Projection with elevation in the design of earthworks connected with mining and road construction	3
Proj 9	Technical drawing. cross section, revolved section, half-view, half-view-half-section.	3
Proj 10	Technical drawing. Dimensions system, dimensioning principles. Surface roughness.	3
Proj 11	Technical drawing. Graphical representation of threads and bolt connections. Graphical representation of welded joints.	3
Proj 12	Crediting test. AutoCAD work environment, layers(creating, attributes, switching on and off, filters), line, line chain, polygon, circle, ellipse, arc, objects selection.	3
Proj 13	AutoCAD - coordinate systems, precise entering coordinates for objects, hooking up to existing facilities, modification or change of graphical objects attributes, hatch, plane area and perimeter.	3

Proj 14	AutoCAD - grouping objects, creating blocks, text, basics of dimensioning.	3
Proj 15	AutoCAD - crediting project, classes with AutoCAD.	3
	Total hours	**45**

TEACHING TOOLS USED
N1. Traditional lecture with elements of interactive lecture, conducted with adoption, above the all, hand-drawings and computer presentations prepared using PowerPoint, AutoCAD and Data Mine. N2. Project - interactive classes, using the problem methods, students solve spatial graphic problems in mapping the image on a plane using hand-drawing, drawing with instruments for pencil techniques and AutoCAD. N3. Project - a geometric interpretation of three-dimensional objects from projections - the multiple choice answers test, graphic riddles. N4. Students own work - performing and crediting about 10 theme drawings. N5. Students own work - own literature studies. N6. 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
P1	PEK_W01-PEK_W05	Crediting with grade of written exam
F1	PEK_U01-PEK_U14	The average of the current credits - current credits the student can obtain for handing in themed drawings, short, written tests and oral answers
F2	PEK_U01-PEK_U06 PEK_W06	Crediting with grade of written exam
F3	PEK_U01-PEK_U15	Grade for the project summarising the classes from AutoCad
P2 = 0,4*F1 + 0,4*F2 + 0,2*F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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

[2] Grochowski B., Geometria wykreślna z perspektywą stosowaną, Science Publishing PWN, Warszawa 2007

[3] Dobrzański T., Rysunek techniczny maszynowy, Science-Technical Publishing, 24th edition, Warszawa 2010

[4] Pikoń A., AutoCAD 2011 - pierwsze kroki, Helion Publishing 2011

SECONDARY LITERATURE:

[1] Lewandowski Z., Geometria wykreślna, PWN , Warszawa 1984 (or any other item of literature containing basis of descriptive geometry)
[2] Przewłocki S., Geometria wykreślna z perspektywą stosowaną, Wyższa Szkoła Gospodarki Krajowej Publishing, 2002
[3] Dyba K., Geometria rzutów, PWr script, Wrocław 1982
[4] Rydzanicz I., Rysunek techniczny jako zapis konstrukcji. Exercises, WNT, Warszawa 2004
[5] Rydzanicz I., Zapis konstrukcji, PWr script, Wrocław
[6] Rydzanicz I., Zapis konstrukcji, exercises, PWr script, Wrocław
[7] PN, PN-EN, PN-ISO, PN EN-ISO norms concerning technical drawings

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Engineering Graphics and Technical Drawing
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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, C5	Lec 1	N1, N5, N6
PEK_W02	K_W28	C1.1	Lec 5	N1, N5, N6
PEK_W03	K_W28	C1.3	Lec 2, Lec 3, Lec 4	N1, N5, N6
PEK_W04	K_W28	C1.2	Lec 6	N1, N5, N6
PEK_W05	K_W28	C1.4	Lec 7	N1, N5, N6
PEK_W06	K_W28	C2	Proj1	N1, N2, N6
PEK_U01-PEK_U02	K_U31	C2, C3	Proj 1-Proj 11	N2, N4, N6
PEK_U03	K_U31	C3, C5	Proj 2-Proj 5	N2, N3, N4, N6
PEK_U04-PEK_U06	K_U31	C2, C3	Proj 9-Proj 11	N2, N4, N6
PEK_U07-PEK_U09	K_U31	C3, C5	Proj 3-Proj 5	N2, N3, N4, N6
PEK_U10-PEK_U11	K_U31	C3, C5	Proj 7	2, 4, 6
PEK_U12-PEK_U13	K_U31	C3, C5	Proj 8	N2, N3, N4, N6
PEK_U14	K_U31	C3, C5	Proj 6	N2, N3, N4, N6
PEK_U01-PEK_U15	K_U31	C4	Proj12-Proj15	N2, N6

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Technologie Informacyjne
Name in English: Information Technologies
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: INZ0534
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

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

SUBJECT OBJECTIVES

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

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has knowledge of basic computers functions and architecture

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

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

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

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

relating to social competences:

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

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

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

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at the end of semester)	Educational effect number	Way of evaluating educational effect achievement
P	W01-W05	Crediting on the basis of a written test.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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

SECONDARY LITERATURE:

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

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
geodesy and cartography

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

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geomatyka
Name in English: Geomatics
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG1031
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30				
Number of hours of total student workload (CNPS)	60				
Form of crediting	crediting with grade				
For a group of courses mark (X) for the 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.Possesses basic knowledge concerning mathematical analysis necessary to understand mathematical issues in engineering types of studies.

SUBJECT OBJECTIVES

C1 Understanding the fundamentals of analytical description of the Earth and understanding the usage of these fundamentals in various fields of geodesy and cartography.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Possesses general knowledge regarding the positioning of points in 3D, 2D, 1D spaces.
PEK_W02 Possesses general knowledge regarding gravitational field, vertical direction, map projections and the methods of retrieving geological data.
PEK_W03 Knows the coordinate systems on an ellipsoid, a sphere and a plane.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Space description. One-, two- and three - dimensional space.	2
Lec 2	The role of the coordinate systems.	2
Lec 3	Geometrical problems of the definition and the orientation of the systems.	2
Lec 4	Gravitational field, vertical direction. Earth's rotation.	2
Lec 5	Map projections.	2
Lec 6	The coordinate systems in Poland.	2
Lec 7	The classical and satellite methods of points positioning on the Earth's surface.	2
Lec 8	The measurement of detailed terrain units.	2
Lec 9	Photogrammetric and teledetection methods.	2
Lec 10	The accuracy of measurement and measuring errors.	2
Lec 11	The estimation of the reliability of the surveying results.	2
Lec 12	Analogue maps.	2
Lec 13	Digital maps.	2
Lec 14	The role of cartography in geomatics.	2
Lec 15	The role of data bases in geomatics.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Informational lecture with problem-based elements. N2. Multimedia presentations. N3. Office 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_W03	P1 Final grade from the written and oral test.

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Płatek A., 1995, Elektroniczna technika pomiarowa w Geodezji, Wydawnictwo AGH, Kraków. [2] Czarnecki K., 2010, Geodezja współczesna w zarysie, Wydawnictwo Gall.
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)
Prof. dr hab. inż. Stefan Cacoń, stefan.cacon@pwr.wroc.pl

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Geomatics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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	Lec 1-Lec 2	N1-N3
PEK_W02	K_W01	C1	Lec 3-Lec 15	N1-N3
PEK_W03	K_W01	C1	Lec 5-Lec 6	N1-N3

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Informatyka I
Name in English: Computer Science I
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: ING1032
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)			30		
Number of hours of total student workload (CNPS)			60		
Form of crediting			crediting with grade		
For a group of courses mark (X) for the 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 can adapt office package tools for gathering, processing and data sharing

SUBJECT OBJECTIVES

C1 The aim of the course is to prepare students to solve engineering problems using science computer tools available in the office package

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_U01 the student can design and perform an application in design environment for procedural and object-oriented approach

PEK_U02 the student has basic skills in the field of database and data exchange formats used in geo informatics and programming algorithms

relating to social competences:

PEK_ K01 the student understands the need to facilitate the work of professional engineers using available software tools

PEK_K02 the student is able to formulate and to share knowledge on the software development

PROGRAMME CONTENT		
Form of classes - laboratory		**Number of hours**
Lab 1	Introduction to subject, conditions of crediting, health and safety regulations, literature. Introduction to MS Excel packet and Developer VBA application	2
Lab 2	Stages of design process	2
Lab 3	Data formation in MS Excel	2
Lab 4	Inserted functions and conditional instructions in MS Excel	2
Lab 5	Introduction to VBA (Visual Basic for Applications) Type of data	2
Lab 6	VBA procedures	2
Lab 7	VBA functions	2
Lab 8	Conditional instructions and VBA repeating instructions	2
Lab 9	Data structure, operators, variables, constants	2
Lab 10	Tables and operations on files	2
Lab 11	VBA forms	2
Lab 12	Creating dialog fields	2
Lab 13	Creating applications in VBS	2
Lab 14	Creating applications in VBS	2
Lab 15	Reports grade of performed laboratory research	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Multimedia presentations with the usage of audio-visual equipment N2 Laboratory instructions with examples N3 Design and preparation of reports on laboratory tasks using the tools available in the office package

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_U01-PEK_U02 PEK_K01, PEK_K02	P1 Crediting with grade for written programme according to given assumptions

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Bill Jelen, Tracy Syrstad, Microsoft Excel 2010 PL. VBA language and macros Akademia Excela, Helion, 2011

[2] Charles E. Brown, Access. Programowanie w VBA, Helion, 2005

[3] John Walkenbach, Excel 2010 PL. Programowanie w VBA. Vademecum Walkenbacha, Helion, 2011

SECONDARY LITERATURE:

[1] Jinjer Simon, Excel. Profesjonalna analiza i prezentacja danych, Helion 2006

[2] Mary Jackson, Mike Staunton, Zaawansowane modele finansowe z wykorzystaniem Excela i VBA, Onepress 2004.

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Computer Science I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_U07	C1	Lab 2, Lab 13-Lab 14	N1-N3
PEK_U02	K_U07	C1	Lab 1, Lab 3-Lab 14	N1-N3
PEK_K01	K_K01	C1	Lab 13-Lab 15	N3
PEK_K02	K_K02	C1	Lab 13-Lab 15	N3

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

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

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

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

SUBJECT OBJECTIVES

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

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

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

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

PEK_W03 The student possesses basic knowledge of the indefinite integral.

relating to skills:

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

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

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

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

relating to social competences:

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

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

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

	rule de L'Hospital.	
Lec 10	Intervals of monotonicity of functions. Local extremes functions. Necessary and sufficient conditions of existence of local extremes. Convex functions and points of inflection in the graph of a function. Examination of a function.	3
Lec 11	Indefinite integrals and their basic properties. Integration by parts. Integration by substitution. Integration of rational functions. Integration of trigonometric functions.	4
	Total hours	**30**

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

TEACHING TOOLS USED
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. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2011. [3] W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, Cz. I, PWN, Warszawa 2006. **SECONDARY LITERATURE:** [1] G. M. Fichtenholz, Rachunek różniczkowy i całkowy, T. I-II, PWN, Warszawa 2007. [2] M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2011. [3] R. Leitner, Zarys matematyki wyższej dla studiów technicznych, Cz. 1-2 WNT, Warszawa 2006. [4] F. Leja, Rachunek różniczkowy i całkowy ze wstępem do równań różniczkowych, PWN, Warszawa 2008. [5] H. i J. Musielakowie, Analiza matematyczna, T. I, cz. 1 i 2, Wydawnictwo Naukowe UAM, Poznań 1993. [6] W. Stankiewicz, Zadania z matematyki dla wyższych uczelni technicznych, Cz. B, PWN, Warszawa 2003.
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)
dr inż. Jolanta Sulkowska, jolanta.sulkowska@pwr.wroc.pl **Komisja programowa Instytutu Matematyki i Informatyki**

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT **Mathematical Analysis I MAP1142** AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY **geodesy and cartography**

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

SEMESTER 2

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Technologie Map Numerycznych
Name in English: Numerical Mapping
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: ING2041
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possess basic knowledge about Computer Aided Design (CAD).
2. Possess knowledge concerning data retrieving techniques necessary to compile maps.
3. Possesses basic knowledge concerning the way of map compilation.

SUBJECT OBJECTIVES

C1 Familiarizing students with the possibilities of using CAD necessary to compile electronic maps.
C2 Presenting the rules of how to compile an electronic master map.
C3 Studying data retrieving techniques necessary to compile electronic maps.
C4 Presenting and explaining the techniques of a digital elevation model compilation.
C5 Presenting the classification criteria of maps.
C6 Presenting the rules of the compilation of topographic and thematic maps.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01Possesses detailed knowledge concerning the application of Computer Aided Design during the process of the compilation of electronic maps.

PEK_W02 Can characterise the rules of the compilation of an electronic map according to the current norms.

PEK_W03 Possesses knowledge concerning the compilation and the usage of a Digital Elevation Model (DEM).

PEK_W04 Can characterise data retrieving techniques necessary to make electronic maps and NMT.

PEK_W05 Knows the main classification criteria of maps and is able to list the map types according to these criteria.

PEK_W06 Knows further stages of how to transform an analogue map into a vector map.

relating to skills:

PEK_U01 Knows the advanced techniques of technical drawing and editing using Computer Aided Design.

PEK_U02 Is able to do a raster calibration and evaluate its precision.

PEK_U03 Can create the program library of objects using the catalogue of the conventional signs.

PEK_U04 Can compile an electronic master map on the basis of the data from a raster map according to the current norms.

PEK_U05 Can verify an electronic map in the context of the topological correctness.

PEK_U06 Can compile a Digital Elevation Model using the data from the direct surveying.

PROGRAMME CONTENT

	Form of classes - lecture	**Number of hours**
Lec 1	The introduction to CAD.	1
Lec 2	The concept of an electronic map.	2
Lec 3	The construction of electronic maps in CAD.	2
Lec 4	Spatial data, retrieving data necessary to the construction and the update of electronic maps.	2
Lec 5	The electronic master map.	3
Lec 6	Digital Elevation Model, the structure, the data structure, compilation.	2
Lec 7	The electronic topographic and thematic maps.	3
	Total hours	**15**

Form of classes - laboratory		Number of hours
Lab 1	Familiarizing students with the laboratory regulation and informing about grading rules. The introduction to CAD on the example of the Microstation platform. The characteristics and application of the prototype files and the project settings.	3
Lab 2	Layers – work and management. View management. The characteristics of the main tool pallets. The creation of new objects.	3
Lab 3	Reference files management. The advanced drawing techniques. Section lining and filling. Surveying and dimensioning. Text pasting and editing.	3
Lab 4	Grouping elements. Creating and managing cells, line styles.	3
Lab 5	Raster calibration. The management of raster files.	3
Lab 6	Creating the connection between objects and a database. The electronic master map: the calibration of the master map raster.	3
Lab 7	The electronic master map: the compilation of building layers.	3
Lab 8	The electronic master map: the compilation of territorial development layers.	3
Lab 9	The electronic master map: the compilation of a land parcel layer.	3
Lab 10	A digital elevation model. The introduction to 3D in the Microstation platform.	3
	Total hours	**30**

TEACHING TOOLS USED
N1. Informational lecture and discussions. N2. Multimedia presentations. N3. Office hours. N4. Individual work - doing laboratory tasks. N5. Individual work - doing extra tasks.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_U01-PEK_U06	Written assignments (50%). Doing further tasks correctly (50%).
P2	PEK_W01-PEK_W06	Written and oral assignment.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Instrukcja techniczna K-1, Mapa zasadnicza, Wydanie III, Warszawa 1998.
[2] Instrukcja techniczna O-2, Ogólne zasady opracowania map do celów gospodarczych, Wydanie III, Warszawa 1999.
[3] Wytyczne techniczne K-1.1, System Informacji o Terenie, Podział treści podstawowej mapy kraju, Warszawa 1996.
[4] Instrukcja techniczna G-7, Geodezyjna ewidencja sieci uzbrojenia terenu, Wydanie III, Warszawa 1999.
[5] Wytyczne techniczne K-1.8, Prowadzenie i aktualizacja mapy zasadniczej, na terenach objętych wpływami eksploatacji górniczej, Warszawa 2007.

SECONDARY LITERATURE:

Konspekty z wykładów oraz instrukcje z ćwiczeń przygotowane przez prowadzącego.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Numerical Mapping
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W03	C1	Lec 1, Lab 1, Lab 2, Lab 3, Lab 4	N1, N2, N3, N4, N5
PEK_W02	K_W03	C1, C2	Lec 2, Lec 3, Lec 5	N1, N2, N3
PEK_W03	K_W03	C4	Lec 6	N1, N2, N3
PEK_W04	K_W03	C3, C4	Lec 4, Lec 6	N1, N2, N3
PEK_W05	K_W03	C5	Lec 2, Lec 5, Lec 7	N1, N2, N3
PEK_W06	K_W03	C1, C2, C3, C4, C6	Lec 3, Lec 4, Lec 5, Lec 7, Lab 2, Lab 3, Lab 4, Lab 5	N1, N2, N3, N4, N5
PEK_U01	K_U03	C1	Lec 1, Lab 1, Lab 2, Lab 3, Lab 4, Lab 10	N1, N2, N3, N4, N5
PEK_U02	K_U03	C2, C6	Lec 3, Lec 4, Lec 5, Lec 7, Lec 5	N1, N2, N3, N4, N5
PEK_U03	K_U03	C1	Lec 1, Lec 2, Lec 3, Lab 4	N1, N2, N3, N4, N5
PEK_U04	K_U03	C2	Lec 3, Lec 5, Lec 7, Lab 5, Lab 6, Lab 7, Lab 8, Lab 9	N1, N2, N3, N4, N5
PEK_U05	K_U03	C2, C6	Lec 5, Lec 7, Lab 7, Lab 8, Lab 9	N1, N2, N3, N4, N5
PEK_U06	K_U03	C4	Lec 6, Lab 10	N1, N2, N3

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geodezyjne Pomiary Szczegółowe I
Name in English: Surveying I
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG2037
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30	15	
Number of hours of total student workload (CNPS)	60		60	30	
Form of crediting	crediting with grade		crediting with grade	crediting with grade	
For a group of courses mark (X) for the final course					
Number of ECTS points	2		2	1	
including number of ECTS points for practical (P) classes			2	1,2	
including number of ECTS points for direct teacher-student contact (BK) classes	1,2		1,2	0,7	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has basic knowledge concerning geodesy role in the national economy and surveyor's job at every stage of the investment process.
2. The student has an elementary knowledge in the field of linear measurements, angles and heights.
3. The student has basic knowledge how to manage surveying instruments (theodolites and levelling instruments) and how to compile performance measurements.
4. The student can use a computer and knows how to manage Windows software.

SUBJECT OBJECTIVES

C1. Familiarizing students with the national spatial reference system and its linkage with the international spatial reference systems.
C2. Presenting types and classification rules of geodetic control network and the importance of the geodetic control network in the work of surveying.
C3. Understanding the principles of setting up high and horizontal measurement geodetic control networks and methods of their compaction.
C4. Presenting of the objective, scope and technology of measuring situational elevation, elevation and total station and inventory utilities.
C5. Learning and understanding rules of the cartographic measurements development of and the rules of updating the master map.

SUBJECT EDUCATIONAL EFFECTS	
relating to knowledge:	
PEK_W01	The student has knowledge on the binding national spatial reference system and its linkage with the international spatial reference systems.
PEK_W02	The student can describe types of geodetic control networks and their classification manner. The student understands the importance of geodetic engineering practice and the need for regular maintenance and upgrading of geodetic control network.
PEK_W03	The student can analyse the rules of setting up horizontal and elevation measurement geodetic control networks according to applicable regulations and technical instructions. The student knows the methods of feeding of situational and high geodetic control network.
PEK_W04	The student can analyse the objective, scope and technology of situational, elevation and total station measuring. The student can characterise inventory methods of a developed area.
PEK_W05	The student understands the need and the rules of updating the master map and knows the rules of the cartographic measurements development.
relating to skills:	
PEK_U01	The student can use materials from the state geodetic and cartographic stock, conduct terrain interview, compare the map to the area and seek out specific control network points.
PEK_U02	The student can design a geodetic measuring control network, stabilize points and to prepare topographic descriptions for them.
PEK_U03	The student can measure a geodetic control network - elevation and vertical and to develop the results of these measurements.
PEK_U03	The student can measure a geodetic control network - elevation and vertical and to develop the results of these measurements.
PEK_U05	The student can do the inventory of developed area elements: perform situational and elevation measurement of surface and underground elements, prepare appropriate documentation of the measurement.
PEK_U06	The student can perform situational-elevation measurement of terrain details and to prepare appropriate documentation of the measurement.
PEK_U07	The student can perform a situational-elevation map, update a master map by complementary measurement, edit analogue, hybrid and numerical maps.
PEK_U08	The student can design and measure the elevation control network of IV class in link to benchmarks of higher classes, knows how to develop a documentation of measurement.
relating to social competences:	
PEK_K01	The student can define the role of surveying and spatial information systems in coordination and optimization: engineering design, investment construction, and in public services.
PEK_K02	The student can work independently and in measurement teams and in multi-disciplinary teams, can develop the results and present them in the form of paper or in electronic way.
PEK_K03	The student develops the ability of self-esteem and self-control and awareness of personal liability for the results of his/her work.
PEK_K04	The student improves his/her competence by continuing professional self-education, including interdisciplinary.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Introduction. International blue and terrestrial systems and datum, European terrestrial reference system and the European system of elevation reference, EUREF, EUREF-POL, national spatial reference system. Coordinate systems on a sphere and ellipsoid, the outline of cartographic projections, current and archival flat rectangular coordinate systems, elevation systems.	4
Lec 2	Geodetic and cartography service. National geodetic and cartographic resource - types and degree of country's coverage by different materials, providing some information on the Internet, records of land and buildings (real estate cadastre) - examples of documents. Land Registers.	2
Lec 3	Vertical and elevation geodetic control network: classification - current condition and the design of changes, the methods of stabilization, inspection sketches, topographic descriptions, the protection of signs. Maps divided into spreadsheets, types of maps: sectional and individual.	2
Lec 4	Rules of preparing horizontal measurement control networks: methods of control network compaction (traverses, indentation, angular-linear networks, modular networks, and satellite technology). Instruments for measuring angles (theodolites and electronic total stations): classification, readout systems, axial conditions, software, recording the results. Methods and tools to measure distances: measuring tape, optical and electromagnetic rangefinders.	4
Lec 5	Rules of setting elevation measurement control networks: types of elevation measurement, levelling benchmarks, developing performance measurement, control calculations, evaluation of accuracy. Levels: classification, axial conditions, software, recording of the results.	4
Lec 6	Methods of situational measurement concerning terrain details: pole, spacing rectangular notches, cross-cuts, extensions.	2
Lec 7	Methods of elevation measurement concerning terrain details: plane levelling using scattered points, using the method of profiles and the method of mesh, trigonometric levelling.	2
Lec 8	Methods of situational-elevation measurement concerning terrain details: classic total station and precise, tachometric sketch, GNSS satellite measurements.	2
Lec 9	Master map updating, the inventory of developed area.	2
Lec 10	Cartographic study of situational measurements: out of frame descriptions, control points mapping and mapping measured terrain details, deleting the first sketch of situational map.	2
Lec 11	Cartographic development of high-elevation measurements: the first sketch terrain mapping, contour interpolation, performing longitudinal profile and cross sections.	2
Lec 12	Crediting test	2
	Total hours	**30**

Form of classes - laboratory		**Number of hours**
Lab 1	Organizational matters. Setting the measurement control network: a terrain interview, locating a detailed control network on the basis of review sketches and topographic descriptions, measurement control network stabilization and preparing topographic descriptions for it.	3
Lab 2	Levelling benchmarks measuring control network: checking a leveller, geometric levelling of measurement control network in the main and return direction, calculation of log measurement, accuracy control, setting-up elevations on a sketch.	3
Lab 3	Measurement of longitudinal profile in the form of broken composed of two	3

	sections, preparing three cross-sections. Situational measurement by means of orthogonal method, preparation of the route sketch. Elevation measurement by means of plane levelling, counting log levelling. Preparing a section drawing by hand.	
Lab 4	Geometric plane levelling of surface fittings of underground developed area: performing measurements in the main and return direction by bidirectionally coordinated sequences, counting the levelling logs, performing a field sketch, a list of the calculated wells elevations.	3
Lab 5	Measurement of control network polygonal sequence bidirectionally coordinated to the points of detail control network. Cantering revision, data entry for total station measurements, recording the results. Calculation of measuring horizontal angles logs, vertical, distance reduction on 2000 system, performing a sketch of a control network.	3
Lab 6	Total stations measurements to perform a numerical model of a selected section of the terrain. Counting coordinates of several points by hand, mapping an analogue map using transversal scale, contour interpolation, deletion of contour maps and terrain profile.	3
Lab 7	Total stations measurements to perform a numerical situational-elevation map. Performing measurements (with registration on an instrument) of a particular part of a terrain from a polygonal sequence, counting coordinates of several points by hand, mapping an analogue map using transversal scale, contour interpolation, deletion of contour maps and terrain profile.	3
Lab 8	Master map updating, measurements by means of underground cable locator. Terrain interview with indicating on the map the results of the interview. Inventory of a manhole. Measurements of developed area by means of underground cable locator. Measurement of angular-linear dents back to determine the position of an instrument, from which a measurement of found, by means of locator, developed network will be performed.	6
Lab 9	Measurement of levelling network consisting of three new benchmarks in IV class which are hooked up to at least four benchmarks of III class. Development of the measurement documentation: levelling logs, statement of elevations and network sketch, counting an error of 1 km network based on the difference of elevations in the main and return direction as well as on the basis of levelling ring closure, levelling line connection control.	3
	Total hours	**30**

Form of classes - project		**Number of hours**
Proj 1	Organizational matters. Introduction to the basics of working in the C-geo: project's objectives, a table, making a backup, computing and graphics tools. Counting the levelling benchmarks and plane levelling of fitting above-ground network of developed area.	2
Proj 2	Counting in the C-geo: orthogonal method, angles log, traverse, calculating an area including the allocation of land at a given plane.	2
Proj 3	Performing longitudinal profile and cross sections in the programme. C-geo. Counting slopes, print and export of the profile and cross-section to files format: pdf, dgn, dwg, dxf.	2
Proj 4	Performing a digital terrain model and situationional - elevation map in the C-geo: data transfer from the instrument, the construction of digital terrain model, the generation of contour maps and profile, preparing situationional-elevation map according to K-1, using the form, print and export of the map to files format: pdf, dgn, dwg, dxf.	2
Proj 5	Processing and update of analogue maps: calibration in the programme	2

	C-geo of scanned background map into a grid, updating the map by the measured elements of developed area (hybrid map), fragment's vectorization of a master map.	
Proj 6	Close alignment of levelling network in the C-geo in the following variants: at the minimum number of hook-up points (consistency of measurements results control), taking into account the errors of hook-up points and error-free hook-up points.	2
Proj 7	Technical documentation in preparation of master map: the development of basic trig data using own measurements complying with the transfer to the state geodetic and cartographic resource in accordance with the current regulations.	2
Proj 8	Crediting projecting classes.	1
	Total hours	**15**

TEACHING TOOLS USED
N1.Lecture - traditional with multimedia presentations N2.Crediting test. N3.Field measurements with the usage of surveying equipment. N4.In-house survey data development (counting and graphics). N5.Computer development and graphics and descriptive survey data processing. N6.Report or basic trig data of performed measurements and / or in-house survey data on paper. N7.Report in an electronic form as reports of counting and / or graphic files (raster and vector). N8.Reports and basic trig data's control. N9.Short written test. N10.Own work - in-house work continuation. N11.Duty hours.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation F – forming (during semester), P – concluding (at the end of semester)	Educational effect number	Way of evaluating educational effect achievement
P	PEK_W01-PEK_W05 PEK_K01, PEK_K04	P1. Final grade of written test. (N2)
F, P	PEK_U01-PEK_U08, PEK_K02, PEK_K03	F1. Grades from reports and basic trig data. (N3, N4, N6, N8, N10, N11) F2. Grades from written tests. (N9) P2. Final grade from laboratory classes as mean F1 and F2 grade
F, P	PEK_U01-PEK_U08, PEK_K02, PEK_K03	F3. Grades from reports and basic trig data. (N4, N5, N6, N7, N8, N10, N11) F4. Grades from written tests. (N9) P3. Final grade from project classes as mean F3 and F4 grade

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[1] Ćwiczenia z geodezji I, red. J. Beluch, Wydawnictwa AGH, Kraków 2007
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[5] Kosiński W., Geodezja, Wydfawnictwo Naukowe PWN, Warszawa 2012
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[8] Osada E., Wykłady z geodezji i geoinformatyki 1. Niwelacja, Pub. UxLan, Wrocław 2010
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[12] MIA Regulation of 9 November 2011 on the implementation of technical standards of geodetic and elevation-situational measurements, and the development and transmission of these measurements to the state geodetic and cartography resources
[13] Council of Ministers Regulation of 8 August 2000 on the national spatial reference system
[14] Ząbek J., Geodezja I, pub. 6, Oficyna Wydawnicza PW, Warszawa 2012

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[1] Czerw A., Durlik B., Hryniewicz M., Geo-English. Język angielski dla studentów geodezji i inżynierii środowiska, Wydawnictwa AGH, Kraków 2010
[2] Geodeta - Miesięcznik geoinformacyjny. Publishing Geodeta Sp. z o.o., Warszawa
[3] Hycner R., Dobrowolska-Wesołowska W., Geodesy, surveying and professional ethics, Publishing Gall, 2008
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[7] Przegląd Geodezyjny – Miesięcznik Stowarzyszenia Geodetów Polskich. Publishing Sigma NOT
[8] Przewłocki S., Geodezja inżynieryjno-drogowa, Publishing Naukowe PWN, Warszawa 2009
[9] Przewłocki S., Geomatyka, Publishing Naukowe PWN, Warszawa 2009
[10] Wolski B., Toś C., Geodezja inżynieryjno-budowlana, Publishing Politechniki Krakowskiej, Kraków 2008
[11] Wysocki J., Geodezja z fotogrametrią i geomatyką dla inżynierii i ochrony środowiska oraz budownictwa, Publishing SGGW, pub. VII, Warszawa 2008
[12] Polskie Normy i standardy techniczne z zakresu geodezji i kartografii
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[14] http://www.gugik.gov.pl

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Surveying I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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, K_W04	C1	Lec 1, Lec 2	N1, N2, N10, N11
PEK_W02	K_W01, K_W04, K_W06, K_W22,	C2	Lec 2-Lec 5	N1, N2, N10, N11
PEK_W03	K_W04, K_W06, K_W09, K_W15	C1-C3	Lec 3-Lec 5	N1, N2, N10, N11
PEK_W04	K_W01, K_W02, K_W04, K_W06, K_W09	C4	Lec 6-Lec 9	N1, N2, N10, N11
PEK_W05	K_W01, K_W03, K_W04, K_W07, K_W22	C4, C5	Lec 9-Lec 11	N1, N2, N10, N11
PEK_U01	K_U04, K_U21	C1, C2	Lec 1-Lec 3, Lec 9, Lab 1, Lab 8	N1, N3, N6, N8-N11
PEK_U02	K_U04, K_U10, K_U21	C2, C3	Lec 3-Lec 5, Lab 1, Proj 7	N1, N3, N4, N6, N8-N11
PEK_U03	K_U04, K_U05, K_U09, K_U12, K_U21	C3, C4	Lec 4, Lec 5 Lab 2, Lab 5, Proj 1, Proj 2, Proj 6, Proj 7	N1, N3-N11
PEK_U04	K_U01, K_U03-K_U05, K_U12, K_U21	C3, C4, C5	Lec 7, Lec 8, Lec 11, Lab 3, Lab 6, Proj 3, Pro j4	N1, N3-N11
PEK_U05	K_U01, K_U03-K_U05, K_U12, K_U21	C3, C4, C5	Lec 7, Lec 9, Lab 4, Lab 8, Proj 5	N1, N3-N11
PEK_U06	K_U01, K_U03-K_U05, K_U12, K_U21	C3, C4, C5	Lec 6-Lec 8, Lab 7, Lab 8, Proj 4, Proj 5, Proj 7	N1, N3-N11
PEK_U07	K_U01, K_U03-K_U05, K_U12, K_U21	C3, C4, C5	Lec 9-Lec 11, Lab 7, Lab 8, Proj 4, Proj 5, Proj 7	N1, N3-N11
PEK_U08	K_U04, K_U10, K_U12, K_U21	C2, C3	Lec 3, Lab 9, Proj 6, Proj 7	N1, N3-N11
PEK_K01	K_K03	C1-C5	Lec 1-Lec 11	N1-N11
PEK_K02	K_K03, K_K04	C1-C5	Lab 1-Lab 9, Proj 1-Proj 8	N1-N11
PEK_K03	K_K03-K_K05	C1-C5	Lab 1-Lab 9, Proj 1-Proj 8	N1-N11
PEK_K04	K_K01, K_K06	C1-C5	Lec 1-Lec 11 Lab 1-Lab 9, Proj 1-Proj 8	N1-N11

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Informatyka II
Name in English: Computer Science II
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: ING2044
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)			30		
Number of hours of total student workload (CNPS)			60		
Form of crediting			crediting with grade		
For a group of courses mark (X) for the 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. has knowledge concerning data and information gathering, processing and protection
2. The student can adapt office package tools for data and information gathering, processing and sharing

SUBJECT OBJECTIVES

C1 The aim of the course is to prepare students to solve engineering problems using science computer tools available in the office package

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_U01 The student can analyse and present in a synthetic form typical problems of algorithms coding

PEK_U02 The student can identify the problems associated with the process of software development

relating to social competences:

PEK_ K01 the student understands the need to facilitate the work of professional engineers using available software tools

PEK_K02 the student is able to formulate and to share knowledge on the software development

PROGRAMME CONTENT		
Form of classes - laboratory		**Number of hours**
Lab 1	Introduction to subject, conditions of crediting, literature Introduction to UserForms	2
Lab 2	Advanced techniques of using UserForm	2
Lab 3	Creating tools for Excel in VBA language	2
Lab 4	Graphs	2
Lab 5	Events service	2
Lab 6	Interaction with other applications	2
Lab 7	Creating applications, tool bars, menu, help systems	2
Lab 8	Operations on VBA language components	2
Lab 9	Class modules	2
Lab 10	Introduction to MS Access, rules of data base construction	2
Lab 11	Creating forms, reports, queries in MS Access	2
Lab 12	Using VBA for MS Access data base design	4
Lab 13	Design and data base performance in MS Access with the usage of VBA	4
	Total hours	**30**

TEACHING TOOLS USED
N1. Multimedia presentations with the usage of audio-visual equipment N2. N3 Conduct and preparation of reports on laboratory tasks using the tools available in the office package N3 Presentation on the written programme

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,F	PEK_U01-PEK_U02 PEK_K01-PEK_K02	F1 Crediting with grade for written program according to given assumptions F2 student's presentation, presenting student's own written programme P1 (mean F1 and F2 grade)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Bill Jelen, Tracy Syrstad, Microsoft Excel 2010 PL. VBA language and macros Akademia Excela, Helion, 2011

[2] Charles E. Brown, Access. Programowanie w VBA, Helion, 2005

[3] John Walkenbach, Excel 2010 PL. Programowanie w VBA. Vademecum Walkenbacha, Helion, 2011

SECONDARY LITERATURE:

[1] Jinjer Simon, Excel. Profesjonalna analiza i prezentacja danych, Helion 2006

[2] Mary Jackson, Mike Staunton, Zaawansowane modele finansowe z wykorzystaniem Excela i VBA, Onepress 2004.

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Computer Science II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_U07	C1	Lab 3, Lab 7, Lab 11-Lab 12	N1-N3
PEK_U02	K_U07	C1	Lab 3, Lab 7, Lab 11-Lab 12	N1-N3
PEK_K01	K_K04	C1	Lab 13	N3
PEK_K02	K_K06	C1	Lab 13	N3

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Podstawy Geologii
Name in English: Fundamentals of Geology
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GEG2045
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	90		30		
Form of crediting	Examination		crediting with grade		
For a group of courses mark (X) for the 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. The student knows geography including issues concerning astronomy at matura level.
2. The student knows Polish language at matura level.
3. The student knows the fundamentals of physics and chemistry at least 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 including the processes of mineral and rock formation.
C3 Teaching students how to present the geological structures on maps, stratigraphic sections and geological profiles.
C4 Enlightening students about the relationship between the geological processes and their effects such as the formation and metamorphism of minerals and rocks.
C5 Teaching students how to recognize and characterize the most important igneous rocks, sedimentary rocks and metamorphic rocks.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student knows and understands the processes leading to the creation of the Solar System and the Earth as well as the geological processes leading to the formation of the lithosphere. The student understands their interrelationship and is aware of their consequences and knows their causes.

PEK_W02 The student knows the structure of the Earth as well as 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_W03 The student knows the basic rock-forming minerals and deposit-forming minerals as well as the processes leading to this formation.

PEK_W04 The student knows the most important igneous rocks, sedimentary rocks and metamorphic rocks and understands the processes leading to their formation.

relating to skills:

PEK_U01 Acquiring abilities 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 the rocks.

PEK_U03 Learning how to characterise the processes and the effects of the deformations of rocks in the lithosphere and the geological processes responsible for the formation of certain rocks.

PEK_U04 The student is able to individually recognize and characterize mineral and chemical composition of the most important igneous, sedimentary and metamorphic rocks and can trace their origin taking into account the structure and the texture of these rocks.

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.

PEK_K04 The student is able to characterize the most important minerals and the most important rocks of all types on his own. The student is also able to pass on the knowledge about mineral-forming processes and rock-forming processes and about the most important minerals and rocks 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.	2
Lec 3	The Paleozoic Era.	2
Lec 4	The Mesozoic Era.	2
Lec 5	The Cenozoic Era.	2
Lec 6	The Earth's structure.	3
Lec 7	The egzogenic geological processes.	3
Lec 8	The endogenic geological processes.	3
Lec 9	The basic issues concerning Crystallography.	1
Lec 10	<u>The basic issues concerning mineralogy including:</u> The formation on minerals in the natural environment. The taxonomy of minerals. The characteristics of the selected chemical elements, sulfides, sulfosalt minerals, halides. The characteristics of the selected oxides, hydroxides, carbonates, nitrates, borates, sulphates, phosphates. The characteristics of the selected silicates, aluminosilicates.	6: 2 1 1 2
Lec 11	<u>The basic issues concerning petrology including:</u> The petrology of igneous rocks. The petrology of sedimentary rocks. The petrology of metamorphic rocks.	5: 2 2 1
	Total hours	**30**

Form of classes - laboratory		**Number of hours**
Lab 1	Basic issues concerning stratigraphy, tectonics, geological cartography, making measurements using a geological compass.	4
Lab 2	Making a stratigraphic section on the basis of a geological map.	2
Lab 3	Making a stratigraphic section on the basis of a borehole profile.	2
Lab 4	Making a geological map sheet with a proper lithological profile, a proper stratigraphic section and a proper legend.	4
Lab 5	Recognition and mineral, structural, textural and genetic characteristics of igneous rocks.	6
Lab 6	Recognition and mineral, structural, textural and genetic characteristics of sedimentary rocks.	6
Lab 7	Recognition and mineral, structural, textural and genetic characteristics of metamorphic rocks.	6
	Total hours	**30**

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

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U02, PEK_U03	Test on the basic issues concerning stratigraphy, tectonics, geological cartography.
F2-F4	PEK_W01, PEK_W02, PEK_W04, PEK_U01-PEK_U03, PEK_K03	Students will be graded on the basis of the individual completion of 3 projects and the ability to use a geological compass.
F5-F7	PEK_W03, PEK_W04, PEK_U03, PEK_U04, PEK_K02, PEK_K04	Three tests during the laboratory classes covering the whole material that the students came across during the self-study and during the laboratories concerning: 1. Rock-forming minerals and igneous rocks. 2. Rock-forming minerals and sedimentary rocks. 3. Rock-forming minerals and metamorphic rocks.
P1	PEK_W01-PEK_W04, PEK_U01-PEK_U04, PEK_K02-PEK_K04	Laboratory grade is an average grade of all grades F1-F7.
P2	PEK_W01-PEK_W04, PEK_U01-PEK_U04, PEK_K01-PEK_K04	Exam covering the whole material that the students came across during the self-study, lectures and in terms of the most difficult questions concerning the knowledge gained during the laboratory classes.

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.

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[7] CHODYNIECKA L., GABZDYL W., KAPUŚCIŃSKI T., 1988 – Mineralogia i petrografia dla górników. Wydawnictwo „Śląsk", Katowice.

[8] CZUBLA P., MIZERSKI W., ŚWIERCZEWSKA-GŁADYSZ E., 2005 – Przewodnik do ćwiczeń z geologii. Wydawnictwo Naukowe PWN, Warszawa.

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[10] HEFFERAN K., O'BRIEN J., 2010 – Earth Materials. Wiley-Blackwell, Chichester, UK.

[11] JAROSZEWSKI W. (red.), 1986 – Przewodnik do ćwiczeń z geologii dynamicznej. Wydawnictwa Geologiczne, Warszawa.

[12] KŁAPCIŃSKI J., NIEDŹWIEDZKI R., 1995 – Zarys geologii historycznej. Wydawnictwo Uniwersytetu Wrocławskiego, Wrocław.

[13] KSIĄŻKIEWICZ M., 1968 – Geologia dynamiczna. Wydawnictwa Geologiczne, Warszawa.

[14] LEHMANN U., HILLMER G., 1991 – Bezkręgowce kopalne. Wydawnictwa Geologiczne, Warszawa.

[15] LIBER-MADZIARZ E., TEISSEYRE B., 2000 – Mineralogia i petrografia. Skrypt Politechniki Wrocławskiej, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław.

[16] ŁYDKA K., 1985 – Petrologia skał osadowych. Wydawnictwa Geologiczne, Warszawa.

[17] MAJEROWICZ A., WIERZCHOŁOWSKI B., 1990 – Petrologia skał magmowych. Wydawnictwa Geologiczne, Warszawa.

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

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_W32, K_W41	C1, C2, C4	Lec 1, Lec 7, Lec 8, Lec 10, Lec 11, Lab 1, Lab 5-Lab 7	N1-N3
PEK_W02	K_W29, K_W32, K_W41	C1	Lec 1-Lec 6, Lab 1	N1-N3
PEK_W03	K_W29, K_W32, K_W41	C2, C4, C5	Lec 7-Lec 11, Lab 5-Lab 7	N1-N3
PEK_W04	K_W29, K_W32, K_W41	C4, C5	Lec 7, Lec 8, Lec 11, Lab 5-Lab 7	N1-N3
PEK_U01	K_U30, K_U32	C3	Lab 1-Lab 4	N2-N3
PEK_U02	K_U30, K_U32	C3, C4	Lab 1-Lab 4	N2-N3
PEK_U03	K_U30, K_U32	C2, C4	Lec 7-Lec 11, Lab 1-Lab 7	N1-N3
PEK_U04	K_U30, K_U32	C4, C5	Lec 7-Lec 11, Lab 5-Lab 7	N1-N3
PEK_K01	K_K01-K_K07	C1	Lec 1-Lec 6, Lab 1	N1-N3
PEK_K02	K_K01-K_K07	C2, C4	Lec 7-Lec 11, Lab 1-Lab 7	N1-N3
PEK_K03	K_K01-K_K07	C3, C4	Lab 1-Lab 4	N2-N3
PEK_K04	K_K01-K_K07	C2, C4, C5	Lec 7-Lec 11, Lab 5-Lab 7	N1-N3

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Podstawy Górnictwa
Name in English: Fundamentals of Mining
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG2050
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

[1] The student has a general knowledge (corresponding to the secondary education) necessary to understand engineering features, technical issues concerning the exploitation of mineral resources.

[2] The student has the necessary knowledge (corresponding to the secondary education) concerning issues of Earth's interior construction and the processes that shape it, and the types and origin of rocks and minerals.

[3] The student has an elementary knowledge (corresponding to the secondary education) concerning the wider range of global economy functioning, which is necessary to understand the role and importance of mining activities, which, supplying raw materials, has always been and continues to be a technical and economic basis of human activity.

SUBJECT OBJECTIVES

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

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

C3 - Acquainting students with the basic knowledge of the processes of mineral deposits formation and the form of existence and construction of mineral reserves - which determine the methods

of operation and the technology used in this field.

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

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

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

C7 - Learning and understanding the specialist mining nomenclature.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_ W01The student has an elementary knowledge of the wider issues of mining as one of the most important areas of technical and human economic activity

PEK_ W02 The student has knowledge of the role, tasks and importance of mining. The student will understand fundamental meaning of mineral exploitation as a basis for technical and economic human activity.

PEK_ W03 The student has a general knowledge of the history of mineral resources exploitation and the development of mineral deposits techniques throughout history. The student knows the origins and contemporary importance of customs and traditions in mining.

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

PEK_ W05 The student has a general knowledge and understands the basic technical problems of running an open-cast and underground mining of mineral resources - in terms of exploration and sharing of mineral deposits, reservoir geology, rock mining methods, rock mechanics, housing excavations, underground construction, drainage and ventilation of mines , mining transportation (vertical and horizontal), mechanization of mining, mining risks and ways to combat them, mine rescue, as well as elements of geological and mining.

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

PEK_W07 The student has a general knowledge and understands functioning of open-cast mining systems.

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

relating to social competences:

PEK_ K01 The student is aware of the social role of technical university graduate, especially understands the need for formulation and communication to the public - including the mass media - the information and opinions on the performance of mining and other aspects of engineer-miner, shall endeavour to provide such information and opinions in a widely understood manner;

PEK_ K02 The student has knowledge and promotes information concerning the importance of mineral raw materials exploitation.

PEK_ K03 The student has knowledge which enables him to conduct polemics with those who do not understand the role and importance of mining in the development of civilization and technology and culture, from the earliest times to the present.

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

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

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

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

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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

[1] RYNCARZ T. Zarys fizyki górotworu, Śląskie Pub. Techn., Katowice 1993.
[2] GOSZCZ A., Elementy mechaniki skał oraz tąpania w polskich kopalniach węgla i miedzi, Biblioteka Szkoły Eksploatacji Podziemnej, Pub. Inst. Gospodarki Surowcami Min. i Energią PAN, Kraków 1999.
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[4] BIENIAWSKI Z. T., Engineering Rock Mass Clasifications.Wilej et Sons,Intersc.publication. NY 1989
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[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
geodesy and cartography

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_W11	C1-C7	Lec 1-Lec 15	N1-N4
PEK_W02	K_W11	C3, C4	Lec 2	N1-N4
PEK_W03	K_W11	C3, C4	Lec 2	N1-N4
PEK_W04	K_W11	C4, C6	Lec 9-Lec 15	N1-N4
PEK_W05	K_W11	C3	Lec 2	N1-N4
PEK_W06	K_W11	C4	Lec 2-Lec 6	N1-N4
PEK_W07	K_W11	C4	Lec 3	N1-N4
PEK_W08	K_W11	C4	Lec 3-Lec 15	N1-N4
PEK_K01	K_K07	C4-C5	Lec 4-Lec 8	N1-N4
PEK_K02	K_K07	C4	Lec 8	N1-N4
PEK_K03	K_K07	C4-C6	Lec 5-Lec 15	N1-N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

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

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

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

SUBJECT OBJECTIVES

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

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

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

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

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

relating to skills:

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

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

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

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

relating to social competences:

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

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

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

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

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

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

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

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

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

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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

SECONDARY LITERATURE:

[1] G. M. Fichtenholz, Rachunek różniczkowy i całkowy, T. I-II, PWN, Warszawa 2007.
[2] M. Gewert, Z. Skoczylas, Analiza matematyczna 2, Definicje, twierdzenia, wzory. Oficyna Wydawnicza GiS, Wrocław 2012.

[3] F. Leja, Rachunek różniczkowy i całkowy ze wstępem do równań różniczkowych, PWN, Warszawa 2008.
[4] R. Leitner, Zarys matematyki wyższej dla studiów technicznych, Cz. 1-2, WNT, Warszawa 2006.
[5] H. i J. Musielakowie, Analiza matematyczna, T. I, Cz. 1-2 oraz T. II, Cz. 1, Wydawnictwo Naukowe UAM, Poznań 1993 oraz 2000.
[6] J. Pietraszko, Matematyka. Teoria, przykłady, zadania, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2000.
[7] W. Stankiewicz, Zadania z matematyki dla wyższych uczelni technicznych, Cz. B, PWN, Warszawa 2003.

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

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

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

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

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

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

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

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

SUBJECT OBJECTIVES

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

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

relating to skills:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

SUBJECT EDUCATIONAL EFFECTS of the person who completed the course

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

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

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

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

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

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

and consequences

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

motion, taking into account the initial conditions

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

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

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

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

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

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

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

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

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

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

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

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

Doppler effect), b) the frequency of the beat

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

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

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

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

PEK_K01 - search for information and its critical analysis,

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

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

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

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

PEK_K06 - independent and creative thinking,

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

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

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

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

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

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

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENTS

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

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[2] I.W. Sawieliew, Wykłady z fizyki, tom 1 i 2, Wydawnictwa Naukowe PWN, Warszawa, 2003.
[3] K. Jezierski, B. Kołodka, K. Sierański, Zadania z rozwiązaniami, cz. 1., i 2., Oficyna Wydawnicza SCRIPTA, Wrocław 1999-2003.

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

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

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

SEMESTER 3

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geodezyjne Pomiary Szczegółowe II
Name in English: Surveying II
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG3052
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		15	15	
Number of hours of total student workload (CNPS)	60		60	30	
Form of crediting	Examination		crediting with grade	crediting with grade	
For a group of courses mark (X) for the final course					
Number of ECTS points	2		2	1	
including number of ECTS points for practical (P) classes			1,5	1	
including number of ECTS points for direct teacher-student contact (BK) classes	0,7		0,7	0,7	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses basic knowledge about The National Reference Spatial System and the geodetic coordinate systems used in Poland.
2. Is able to discuss the rules of the classification of a geodetic control network and their importance in geodetic works.
3. Is able to describe the rules of the density of a geodetic control network (horizontal and vertical control network).
4. Is able to discuss the aim, the scope and the technology of mapping surveys (including those made for the purposes of the inventory of territorial development).
5. Is able to characterise the cartographic rules of survey results.
6. Is able to use a computer and Windows-compatible programs.

SUBJECT OBJECTIVES

C1 Familiarizing students with the design principles of detailed geodetic control networks (horizontal and vertical), with the available educational resources and the engineering documentation.

C2 Studying the measurement technology applied during the measurement process of detailed geodetic control networks, studying the methods of initial analysis of a design accuracy, the rules of measurement results compilation as well as the precise adjustment using the method of least squares programme.

C3 Familiarizing students with the satellite measurement technology using GNSS receivers and the kinematic measurement technique: RTK and RTN.

C4 Studying the rules of the transformation of coordinates and transformations between the geodetic coordinate systems used in Poland.

C5 Consolidating the rules of doing typical engineering works concerning geodesy and cartography at particular stages of a contract fulfilment: the analysis of the available materials and the required results, the selection of measurement technologies, the compilation of measurement results and providing the engineering documentation.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Knows the design principles of: detailed vertical control networks, accuracy evaluation, the compilation of measurement data and the preparation of the engineering documentation.

PEK_W02 Knows the design principles of: detailed horizontal control networks, accuracy evaluation, the compilation of measurement data and the preparation of the engineering documentation.

PEK_W03 Can characterise the measurement technologies used during the measurement of vertical and horizontal geodetic control networks (especially detailed control networks).

PEK_W04 Knows the satellite measurement principles GNSS using the kinematic measurement technique: RTK and RTN.

PEK_W05 Knows the principles of the coordinates transformations (the Helmert transformation and an affine transformation) as well as the principles of the transformations between geodetic coordinate systems used in Poland.

relating to skills:

PEK_U01 Can design a detailed vertical control network on a topographic base-map and can prepare the adequate engineering documentation.

PEK_U02 Can design a detailed horizontal control network on a topographic base-map and can prepare the adequate engineering documentation.

PEK_U03 Can make measurements and calculations applied while establishing geodetic control networks: angular measurement methods, the distance reduction into the 2000 system, eccentric measurements and the measurements of the coordinates network transfer.

PEK_U04 Can carry the initial analysis of the accuracy of the constructed control network using a geodetic measurement program. After that the student can precisely adjust a geodetic control network using the method of least squares.

PEK_U05 Can plan and carry out mapping surveys using GNSS receiver and the kinematic measurement technique: RTK and RTN.

PEK_U06 Can use the measurement data to do a digital elevation model in a geodetic program and can use it to calculate the volume.

PEK_U07 Can perform the transformation of the coordinates using the Helmert method (applying Hausbrandt's correction) and an affine transformation. The student can also recalculate the coordinates of points between the coordinate systems used in Poland.

PEK_U08 Can plan and make a measurement, can compile the obtained results, make necessary

calculations, prepare a map and engineering documentation required to make a map for legal and design purposes.

relating to social competences:

PEK_K01Can define the role of geodesy and the databases of spatial information systems in the coordination and optimization of: the engineering design, the investment construction and the public services.

PEK_K02 Can work individually and in a measurement and interdisciplinary team. The student can also compile the obtained results and presents them in a form of electronic and paper documentation.

PEK_K03 Develops the self-evaluation and self-control skills, is aware of legal responsibility of the effects of his work.

PEK_K04 Develops his skills and competence through constant professional self-education including interdisciplinary self-education.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Designing detailed vertical control networks: the measurement technology, the compilation of results, the engineering documentation.	2
Lec 2	Designing detailed horizontal control networks: the classical and satellite techniques of establishing geodetic control networks, the engineering documentation.	2
Lec 3	The measurement of detailed horizontal control networks: angular measurement methods, eccentric measurements, the transformation of the coordinates, the distance reduction into the map projection surface, and the methods of accuracy analysis.	4
Lec 4	Processing and updating analogue maps (scanning, calibration), supplementing the content of maps with the measured terrain details (a hybrid map), vectorization of a master map, electronic maps. Maps for design and legal purposes.	3
Lec 5	Methods of calculating the area and the volume, a digital elevation model, a 3D map, the geodetic control and measurement systems used to operate the construction equipment.	2
Lec 6	The transformation of the coordinates using the Helmert method (applying Hausbrandt's correction) and an affine transformation. Transformations between the geodetic coordinate systems used in Poland.	2
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Organizational issues. Horizontal angle measurement methods.	4
Lab 2	The measurement of a geodetic control network in a form of a linear-angular network.	2
Lab 3	Mapping surveys using GNSS receiver and the kinematic measurement technique: RTK and RTN.	4
Lab 4	Network coordinates transfer of an inaccessible point.	2
Lab 5	The transformation of the coordinates using the Helmert method (applying Hausbrandt's correction) and an affine transformation. The transformations of coordinates in C-geo program between the geodetic coordinate systems used in Poland.	2
Lab 6	Crediting.	1
	Total hours	**15**

Form of classes - project		Number of hours
Proj 1	Organizational issues. Designing a detailed vertical control network, class IV on topographic maps with a scale of 1:10000.	2
Proj 2	Designing a detailed horizontal control network, class IV on topographic maps with a scale of 1:10000.	2
Proj 3	The initial analysis of the designed detailed control network and the precise adjustment of a horizontal control network in C-geo program in a form of a linear-angular network.	4
Proj 4	Creating a digital elevation model and calculating the volume of the earth's mass in C-geo program.	1
Proj 5	The compilation of the measurement data, making calculations and preparing graphic documentation in order to make a map for legal and design purposes.	4
Proj 6	The compilation of data from eccentric measurements.	1
Proj 7	Crediting.	1
	Total hours	**15**

TEACHING TOOLS USED
N1.Traditional lecture with multimedia presentations. N2. Exam – theoretical part (written and oral). N3. Exam – practical part. N4. Land surveying using geodetic equipment. N5. Compilation of geodetic data (analytical and graphic). N6. Computerized compilation and processing of the graphic and descriptive geodetic data. N7. The report or basic trig data on the performed measurements or other group work activities in a paper form. N8. The electronic report on calculations and/or graphic files (raster or vector). N9. The evaluation of the reports and basic trig data. N10. A short written test. N11. Individual work – the continuation of group work. N12. Office 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
F, P	PEK_W01-PEK_W05, PEK_U01-PEK_U08, PEK_K01, PEK_K04	F1. Grades from the theoretical exam (N2). F2. Grades from the practical exam (N3). P1. Final grade from the exams – arithmetic mean F1 and F2.
F, P	PEK_U01-PEK_U08, PEK_K02, PEK_K03	F3. Grades from the reports and basic trig data (N5 – N9, N11, N12). F4. Grades from the written tests (N10). P2. Final grade from the laboratory classes – arithmetic mean F3 and F4.
F, P	PEK_U01-PEK_U08, PEK_K02, PEK_K03	F5.Grades from the reports and basic trig data (N5 – N9, N11, N12). F6. Grades from the written tests (N10). P3. Final grade form the projects - arithmetic mean F5 and F6.

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PRIMARY LITERATURE:

[1] Ćwiczenia z geodezji I, red. J. Beluch, Wydawnictwa AGH, Kraków 2007
[2] Ćwiczenia z geodezji II, red. J. Beluch, Wydawnictwa AGH, Kraków 2008
[3] Jagielski A., Geodezja I, Wydawnictwo Geodpis, Kraków 2005
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[5] Kosiński W., Geodezja, Wydawnictwo Naukowe PWN, Warszawa 2012
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[7] Osada E., Geodezja, Oficyna Wydawnicza PWr, Wrocław 2002
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[9] Osada E., Wykłady z geodezji i geoinformatyki 2. Tachimetria, Wyd. UxLan, Wrocław 2010
[10] Osada E., Wykłady z geodezji i geoinformatyki 3. Osnowy geodezyjne, Wyd. UxLan, Wrocław 2010
[11] Rozporządzenie MSWiA z dnia 15 kwietnia 1999 r. w sprawie ochrony znaków geodezyjnych, grawimetrycznych i magnetycznych
[12] Rozporządzenie MSWiA z dnia 9 listopada 2011 r. w sprawie standardów technicznych wykonywania geodezyjnych pomiarów sytuacyjnych i wysokościowych oraz opracowywania i przekazywania wyników tych pomiarów do państwowego zasobu geodezyjnego i kartograficznego
[13] Rozporządzenie RM z dnia 8 sierpnia 2000 r. w sprawie państwowego systemu odniesień przestrzennych
[14] Ząbek J., Geodezja I, wyd. 6, Oficyna Wydawnicza PW, Warszawa 2012

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[1] Czerw A., Durlik B., Hryniewicz M., Geo-English. Język angielski dla studentów geodezji i inżynierii środowiska, Wydawnictwa AGH, Kraków 2010
[2] Geodeta - Miesięcznik geoinformacyjny. Wydawnictwo Geodeta Sp. z o.o., Warszawa
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Wydawnictwo Gall, 2008
[4] Jagielski A., Rysunki geodezyjne z elementami topografii i kartografii, Wydawnictwo GEODPIS, Kraków 2008
[5] Łyszkowicz A., Łyszkowicz S., Surveying, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2010
[6] Łyszkowicz S., Podstawy geodezji, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2011
[7] Przegląd Geodezyjny – Miesięcznik Stowarzyszenia Geodetów Polskich. Wydaw. Sigma NOT
[8] Przewłocki S., Geodezja inżynieryjno-drogowa, Wydaw.Naukowe PWN, Warszawa 2009
[9] Przewłocki S., Geomatyka, Wydawnictwo Naukowe PWN, Warszawa 2009
[10] Wolski B., Toś C., Geodezja inżynieryjno-budowlana, Wydawnictwo Politechniki Krakowskiej, Kraków 2008
[11] Wysocki J., Geodezja z fotogrametrią i geomatyką dla inżynierii i ochrony środowiska oraz budownictwa, Wydawnictwo SGGW, wyd. VII, Warszawa 2008
[12] Polskie Normy i standardy techniczne z zakresu geodezji i kartografii
[13] http://www.geoforum.pl
[14] http://www.gugik.gov.pl

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Surveying II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W04, K_W07	C1, C5	Lec 1, Lab 3, Proj 1, Proj 3,	N1-N3, N11, N12
PEK_W02	K_W04, K_W07	C1, C5	Lec 2, Lec 3, Lab 1 – Lab 4, Proj 2, Proj 3, Proj 6	N1-N3, N11, N12
PEK_W03	K_W04, K_W06, K_W07, K_W09	C2, C5	Lec 3, Lab1-Lab 4, Proj 2, Proj 3, Proj 6	N1-N3, N11, N12
PEK_W04	K_W01, K_W04, K_W07,	C3, C5	Lec 2, Lec 4, Lec 5, Lab 3, Proj 4, Proj 5	N1-N3, N11, N12
PEK_W05	K_W01, K_W04, K_W07, K_W22	C4, C5	Lec 6, Lab 5	N1-N3, N11, N12
PEK_U01	K_U04, K_U10, K_U21	C1, C5	Lec 1, Proj 1	N1-N3, N5-N12
PEK_U02	K_U04, K_U10, K_U21	C1, C5	Lec 2, Proj 2	N1-N12
PEK_U03	K_U04, K_U05, K_U09, K_U10, K_U12, K_U21	C2, C5	Lec 3, Lab1, Lab 2, Lab 4, Proj 6	N1-N12
PEK_U04	K_U01, K_U08, K_U10	C2, C5	Lec 1-Lec 3, Proj 3, Proj 5	N1-N3, N5-N12
PEK_U05	K_U04, K_U09, K_U12, K_U21	C3, C5	Lec 2, Lec 6, Lab 3, Proj 5	N1-N12
PEK_U06	K_U01, K_U03, K_U10	C3, C5	Lec 5, Proj 4	N1-N3, N5-N12
PEK_U07	K_U05, K_U09	C4, C5	Lec 6, Lab 5, Proj 5	N1-N3, N5-N12
PEK_U08	K_U01, K_U03-K_U05, K_U10, K_U21	C3, C5	Lec 4, Proj 5	N1-N3, N5-N12
PEK_K01	K_K03	C1 – C5	Lec 1-Lec 6	N1-N12
PEK_K02	K_K03, K_K04	C1 – C5	Lab1-Lab 6, Proj 1-Proj 7	N1-N12
PEK_K03	K_K03-K_K05	C1 – C5	Lab 1-Lab 6, Proj 1-Proj 7	N1-N12
PEK_K04	K_K01, K_K06	C1 – C5	Lec 1-Lec 6, Lab 1-Lab 6, Proj 1-Proj 7	N1-N12

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Rachunek Wyrównawczy I
Name in English: Adjustment Calculations I
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG3053
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15	30			
Number of hours of total student workload (CNPS)	90	60			
Form of crediting	crediting with grade	crediting with grade			
For a group of courses mark (X) for the final course					
Number of ECTS points	3	2			
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 knowledge of differential and integral calculus
2. The student can adopt mathematical statistics in exercises (mean, median mode)

SUBJECT OBJECTIVES

C1 Learning principles of geodetic observations sets development
C2 Learning methods of observations adjustment
C3 Acquiring practical skills of horizontal and vertical networks levelling
C4 Understanding the principles of selection methods of surveying measurements for the complex accuracy

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student knows the theory of errors while surveying

PEK_W02 The student has basic knowledge concerning survey data development and the selection of measurement methods for complex accuracy measurement.

PEK_W03 The student knows the rules of adjustment of equally and unequally-accurate observations

PEK_W03 The student has knowledge concerning the usage of statistical inference in the equalization account

relating to skills:

PEK_U01 The student can equal equally and unequally-accurate measured data

PEK_U02 The student can select the method of measuring for the complex accuracy

relating to social competences:

PEK_K01 The student understands the principles of measurement errors formation and their elimination from surveying observations

PEK_K02 The student can formulate and share knowledge concerning equalization account in different aspects and fields of technical knowledge.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Matrix algebra, basic operations with matrices, inverse matrices, matrix systems of equations	1
Lec 2	Analysis of measurement error. Systematic errors of measurements: instrumental and environmental and random measurement errors. The average value.	2
Lec 3	Variances and covariances of the measurements results. Average error of arithmetic mean. Average errors of a deviation. Average error of a single measurement. Compliance test results. Histogram. Gaussian curve.	2
Lec 4	Confidence level. Normal distribution. Statistical compliance test of measurement results. Covariances of the observations. The correlation coefficients.	2
Lec 5	Error calculation of observational function. The right of random errors transferring. Gain in height error. Elevation error. Horizontal distance error. Coordinates errors and their covariance. Point position error. Error matrix of point position. Point position error in any direction	2
Lec 6	Curve and ellipse of the point position error. Graphic interpretation. Eclipse of point position confidence. Analysis of the point position error in the orthogonal and pole methods, and in the linear and angular intersection	2
Lec 7	Alignment of single point intersections: linear multiple backward intersection, angular-linear forward intersection, angular-linear backward intersection. Alignment of a sequence and polygonal network, alignment of high network	2
Lec 8	Alignment of horizontal and high network without error points coordination and taking into account errors of coordination points.	2
	Total hours	**15**

Form of classes - laboratory		Number of hours
Lab 1	Implementation of 20 distance measurements using total station and their development the histogram and Gaussian curve.	2
Lab 2	Implementation of 6 distance measurements, horizontal direction and horizontal angle using a total station and calculating their average errors.	2
Lab 3	Determination of covariance and correlation coefficients measuring the distance, direction, and the horizontal angle	2
Lab 4	Implementation of single distance measurement, horizontal direction and vertical angle together with recording of instrument height and reflector pole and the derivation of equations and calculation on this basis: gain of the error, the error in height, horizontal distance error,	2
Lab 5	Calculation of the measured point coordinate errors and their covariance	2
Lab 6	Calculation of the position error, the position error in azimuth of 60 degrees,	2
Lab 7	Calculation of the ellipse shaft error and plotting error ellipses.	2
Lab 8	Derivation of formulas and calculation coordinates errors and their covariance and the error in the position of the orthogonal method.	2
Lab 9	Derivation of formulas and calculation coordinates errors and their covariance and the error in the position of the pole method.	2
Lab 10	Alignment the measured point by multiple linear backward intersection.	2
Lab 11	Alignment the measured point by angular-linear backward intersection.	2
Lab 12	Alignment the measured point by angular-linear forward intersection.	2
Lab 13	Alignment of traverse. Horizontal network alignment (containing angles, directions and distances)	2
Lab 14	Striking out the error ellipse and the confidence ellipse of the aligned horizontal network	2
Lab 15	Accuracy surveying analysis, selecting the appropriate method to set up the measurement accuracy	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Type of lectures - traditional, illustrated with multimedia presentations with the usage of audio-visual equipment N2. Preparation of reports from laboratory tasks. N3. 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
P1	PEK_W01-PEK_W04	P1 passing final test from the given scope of material
F, P2	PEK_U01-PEK_U02	F1 grade from written tests concerning knowledge of particular laboratory groups of topics F2. Grade from reports concerning particular laboratories P2.Final grade (mean of F1 and F2)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Wiśniewski Z. Rachunek wyrównawczy w geodezji. Pub. UWM, Olsztyn 2005
[2] Osada E. Geodezja. Oficyna Pub. PWr., Wrocław 2002
[3] Adamczewski Z. Rachunek wyrównawczy w 15 wykładach. Oficyna Pub. PW, Warszawa 2007
[4] Osada E. Wykłady z geodezji i geoinformatyki. Osnowy geodezyjne. UxLan, Wrocław 2010
[5] Baran L. W. Teoretyczne podstawy opracowania wyników pomiarów geodezyjnych. PWN, Warszawa 1999

SECONDARY LITERATURE:

[1] Adamczewski Z. Teoria błędów dla geodetów. Oficyna Pub. PW, Warszawa 2005
[2] Osada E. Analiza, wyrównanie i modelowanie Geo-Danych. Podręcznik elektroniczny programu Mathcad dla Windows 98. Pub. AR, Wrocław 1998
[3] Materiały z wykładu

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Adjustment Calculations I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W06	C1, C4	Lec 1-Lec 4	N1, N3
PEK_W02	K_W06	C1, C2	Lec 5-Lec 6	N1, N3
PEK_W03	K_W06	C3	Lec 2-Lec 6	N1, N3
PEK_W04	K_W06	C4	Lec 2-Lec 6	N1, N3
PEK_U01	K_U08	C1, C2, C3	Lab 1-Lab 14	N2, N3
PEK_U02	K_U08	C4	Lab 15	N2, N3
PEK_K01	K_K01	C1-C4		
PEK_K02	K_K07	C1-C4		

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geodezja Inżynieryjna I
Name in English: Engineering Surveys I
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG3054
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		15		
Number of hours of total student workload (CNPS)	30		60		
Form of crediting	crediting with grade		crediting with grade		
For a group of courses mark (X) for the final course					
Number of ECTS points	1		2		
including number of ECTS points for practical (P) classes			1		
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 has a theoretical knowledge concerning coordinate systems used in geodesy.
2. The student has knowledge and skills concerning used units, their conversion and basic geodetic calculations.
3. The student has knowledge and skills concerning the usage of basic surveying instruments.
4. The student has knowledge and skills concerning detailed measurements and creation of a basic map.
5. The student has basic knowledge of measurement matrices.

SUBJECT OBJECTIVES

C1 Presentation of theoretical knowledge in the field of engineering objects displacement measurements
C2 Presentation of theoretical knowledge in the field of geodesic investment processes
C3 Presentation of theoretical knowledge in the field of inventory measurements for construction
C4 Acquisition of practical skills in the field of displacement measurements of engineering objects
C5 Acquisition of practical skills in the field of geodesic investment processes
C6 Acquisition of practical skills in the field of inventory measurements for construction

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student can characterise issues related to the displacement measurements of engineering objects

PEK_W01 The student can characterise issues related to geodesic investment processes

PEK_W01 The student can characterise issues related to inventory measurements for construction

relating to skills:

PEK_U01 The student can make precise periodic measurements and calculate the vertical and horizontal displacements

PEK_U02 The student can design and implement a construction-assembly matrices, and perform a locational stakeout

PEK_U03 The student can perform inventory measurements of ground engineering facilities

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Elements of construction. General characteristics and classification of construction facilities	2
Lec 2	Measurements of vertical and horizontal displacements, buildings safety assessment	2
Lec 3	Geodesic realisation of investment processes	2
Lec 4	Cartographic materials used in geodetic realisation of investment processes	2
Lec 5	Internal and external construction-assembly matrices. Analysis of the accuracy of setting out matrices and stakeout construction.	2
Lec 6	Locational stakeout, constructional geodetic service	2
Lec 7	Determination of design buildings deviations and industrial devices	2
Lec 8	Inventory measurements for construction	1
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Familiarizing with the equipment for precise levelling	1
Lab 2	Measurements of vertical displacements, output measurement, control measurements	2
Lab 3	Familiarizing with the equipment for precise angle-linear measurements. Measurement of horizontal displacements, output measurement, control measurements	2
Lab 4	The development of vertical displacement measurements. The development of horizontal displacement measurements.	2
Lab 5	Control measurements of elongated objects. Control measurements of slender objects.	2
Lab 6	Project of a setting out matrix. Preparation of documentation and staking out drawings. Development of a setting out matrix and facilities staking out.	2
Lab 7	Transferring structural indicators on repetitive floors. Transferring high on another floors.	2
Lab 8	Post-completion measurements.	2
	Total hours	**15**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem solving lecture. N2. Multimedia presentations. N3. Preparing own written semester work on a given topic. N4. Conduct and preparation of laboratory tasks reports. 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
F, P	PEK_W01- PEK_W03	F1- written exam grade F2 Grade from a semester written test. P1 Final grade from the lecture (weighted mean of F1 - 80% and F2 - 20%)
F, P	PEK_U01- PEK_U03	F3 Grade from performing a task and a written report F4- written test grade P2 - Final grade from a laboratory (weighted average of F3 - 50% and F4 - 50%)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Witold Prószyński, Mieczysław Kwaśniak, Podstawy geodezyjnego wyznaczania przemieszczeń. Pojęcia i elementy metodyki, Oficyna Wydawnicza Politechniki Warszawskiej, 2006.
[2] Jan Gocał, Geodezja inżynieryjno-przemysłowa cz. II, AGH Publishing, 2009.
[3] Praca zbiorowa – „Geodezja Inżynieryjna" t. 1, 2 i 3, Pub. PPWK, Warszawa 1993-1994.

SECONDARY LITERATURE:

[1] Praca zbiorowa pod redakcją F. Roli – „Geodezja inżynieryjno-przemysłowa", wykłady cz. I, II i III, skrypt AGH Kraków 1985.
[2] Praca zbiorowa pod redakcją J. Ponikowskiego – „Ćwiczenia z geodezji inżynieryjno-przemysłowej", cz. I, II i III, Pub. PPWK Warszawa 1972.
[3] K. Kamieńska-Czyż, M. Pekalski – „Wybrane działy geodezji inżynieryjnej", Pub. Politechniki Warszawskiej Warszawa 1982.
[4] T. Lazzarini – Geodezyjne pomiary przemieszczeń budowli i ich otoczenia", Pub. PPWK Warszawa 1979

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Engineering Surveys I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W08	C1	Lec 1,Lec 2	N1, N2
PEK_W02	K_W08	C2	Lec 3-Lec 6	N1, N2
PEK_W03	K_W08	C3	Lec 1,Lec 8	N1, N2, N3
PEK_U01	K_U11	C4	Lab 1-Lab 8	N2, N4
PEK_U02	K_U11	C5	Lab 9-Lab 12	N2, N4
PEK_U03	K_U11	C6	Lab 13	N2, N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Bazy danych
Name in English: Data Bases
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG3055
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		15		
Number of hours of total student workload (CNPS)	30		60		
Form of crediting	crediting with grade		crediting with grade		
For a group of courses mark (X) for the final course					
Number of ECTS points	1		2		
including number of ECTS points for practical (P) classes			1		
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 has knowledge of basic programming in language C, can independently write the calculation procedure which is unconditional and conditional
2. The student can describe a function, a loop and condition in any programming language

SUBJECT OBJECTIVES

C1 Giving knowledge necessary to solve specific tasks and learning the principles of operation and information exchange in a relational database.
C2 Understanding the construction methods of logical and physical database structure.
C3 Understanding the principles of communication with databases – SQL.
C4 Understanding the principles of remote database administration - PHP, CSS, HTML.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has basic knowledge of the construction, administration and database management, can recognize types of databases, knows the database structure elements

PEK_W02 The student knows the rules and syntax for constructing database query based on SQL

PEK_W03 The student has knowledge of relational database remote administration

relating to skills:

PEK_U01 The student can develop logical and physical structure of local and relational database, is able to construct a table, relationship, form and report.

PEK_U02 The student can enter information into the database

PEK_U03 The student can create simple or complex database query based on communication with the relational database SQL

PEK_U04 The student can remotely manage the database using PHP, HTML, CSS and JAVA

relating to social competences:

PEK_K01 The student understands the principles of database management and the value of databases for information management

PEK_K02 the student is able to formulate and to share knowledge concerning database usage in different aspects and fields of technical knowledge.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Database Management Systems - general introduction and definitions, basic database objects	1
Lec 2	Local and distributed databases, database structures, technology of relational database client-server	2
Lec 3	SQL - query language for database, basics, queries design, syntax, parts of inquiry mandatory and optional elements of query	2
Lec 4	Operations on the data in a database - adding, deleting, updating, viewing records using SQL	2
Lec 5	Simple and complex query for a database, user and administrative queries	2
Lec 6	Database administration - broadcasting, extending and deleting permissions	2
Lec 7	Remote communication with the usage of programming languages PHP, HTML, CSS scripts, Java and XML	2
Lec 8	using ready-made scripts to a database management, database generators and database queries generators	2
	Total hours	**15**

Form of classes - laboratory		Number of hours
Lab 1	MS Access Administration - setting up tables, primary key definitions, data types, data types limits	2
Lab 2	Input and output of data to MS Access database - forms, queries, reports	2
Lab 3	SQL queries in the local database - the structure of query, syntax, limits, conditions, grouping, sorting	2
Lab 4	Distributed databases - MySQL, access and administration, database structure management, setting up tables, definitions of primary and foreign keys, updating the structure of tables. SQL language in MySQL	2
Lab 5	HTML and PHP scripts to communicate with a relational database, writing and performing scripts, development of forms and reports for data exchange	2
Lab 6	Commercial and free packages to the Internet service of the databases based on PHP / HTML / MySQL / CSS / JAVA	2
Lab 7	CSS, Java as a tool to supporting the work with data in a database	2
Lab 8	XML in work with geoinformation data - basics of maps development based on data from a database	1
	Total hours	**15**

TEACHING TOOLS USED
N1. Type of lectures - traditional, illustrated with multimedia presentations with the usage of audio-visual equipment
N2. Performing an individual database project in local base, entering the date, information management, implementation to a distributed database
N3. Preparation of reports from laboratory tasks.
N4. Duty hours

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at the end of semester)	Educational effect number	Way of evaluating educational effect achievement
P1	PEK_W01-PEK_W03	P1 passing final test from the given scope of material
F, P2	PEK_U01-PEK_U04	F1. Grade from reports and data base project performance F2. Grade from reports concerning particular laboratories of data base management F3 Grade from implementation of data base to distributed data base F4 Grade from remote management of distributed data base P2.Final grade (mean of F1-F4)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] M. Groszek: „ABC Access 2007 PL" Helion, 2007
[2] M. Lis: „MySQL. Darmowa baza danych. Ćwiczenia praktyczne" Helion 2006.
[3] M. Wandschneider: „PHP i MySQL. Tworzenie aplikacji WWW" Helion 2006.

SECONDARY LITERATURE:

[1] W. Dudek: „Bazy danych SQL. Teoria i praktyka" Helion, 2006
[2] Materiały z wykładu
[3] Internet np. php.net, mysql.com, www,microsoft.com

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Data Bases
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W10	C1, C2	Lec 1-Lec 3	N1
PEK_W02	K_W10	C2, C3	Lec 3-Lec 6	N1
PEK_W03	K_W10	C4	Lec 7-Lec 8	N1
PEK_U01	K_U13	C2	Lab 1	N2-N4
PEK_U02	K_U13	C3	Lab 2-Lab 3	N2-N4
PEK_U03	K_U13	C3	Lab 3-Lab 4	N2-N4
PEK_U04	K_U13	C4	Lab 5-Lab 8	N2-N4
PEK_K01	K_K07			
PEK_K02	K_K07			

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Elektroniczne Techniki Pomiarowe
Name in English: Electronic Measuring Techniques
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG3048
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possess basic knowledge in the field of physics covering such areas as: optics. Electromagnetism, acoustics and electrodynamics.
2. Has basic knowledge in drawing up results from geodetic measurements.
3. Is able to use basic geodetic equipment.
4. Knows the rules of altitude, angular, and length measurements.

SUBJECT OBJECTIVES

C1 Overview of the rules of metrology in connection with geodetic measurements.
C2 Overview of the usage of electromagnetic waves and geodetic measurements.
C3 Introduction to the design, the rules of functioning of basic geodetic equipment. Drawing up the results.
C4 Mastering the rules of measuring of the basic geodetic equipment from the physical point of view.
C5 Mastering the structure, rules of functioning and measuring of a laser scanner. Drawing up the results.
C6 Mastering the design, usage, and rules of measuring of remote measuring geodetic systems.
C7 Overview and explanation of testing procedures for geodetic equipment.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student is able to characterize basic rules of metrology in connection with geodetic measurement.
PEK_W02 The student is able to explain principles of interpretation of the results from geodetic measurements.
PEK_W03 The student has a wide ranging knowledge of the design of basic geodetic equipment such as: range-finder, levelling instrument, theodolite, tacheograph and laser scanner.
PEK_W04 The student knows and is able to characterize the rules of working with range-finders, levelling instruments, theodolites, tacheographs and laser scanners.
PEK_W05 The student is able to characterize equipment used in remote measurements paying special attention to the design and use.
PEK_W06 The student has knowledge of up-to-date standards of testing geodetic equipment.

relating to skills:

PEK_U01 The student is able to evaluate the accuracy of reading the length with the use of range-finder.
PEK_U02 The student is able to conduct range-finder calibration.
PEK_U03 The student is able to perform an evaluation of a measured angle.
PEK_U04 The student is able to perform measurements with the use of laser scanner.
PEK_U05 The student is able to verify the results of measurements carried out with use of laser scanner.
PEK_U06 The student is acquainted with the procedures of field testing of geodetic equipment.
PEK_U07 The student is able to perform a data transmission from geodetic equipment onto a computer.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Meteorology basics. Electromagnetic waves. Propagation of electromagnetic waves. Atmospheric refraction.	2
Lec 2	Design, range-finder classification, range measurement, precision range measurement, range-finder calibration.	2
Lec 3	Lasers—basic information, using lasers in geodesy.	2
Lec 4	Design and function of levelling instruments (digital and laser)	2
Lec 5	Design and function of a tacheograph, digital angle levelling, the use and structure of refractors.	2
Lec 6	Remote measurement systems in geodesy.	2
Lec 7	Field procedures connected with testing geodetic equipment in accordance with the up-to-date norms.	2
Lec 8		1
	Total hours	**15**

Form of classes - laboratory		Number of hours
Lab 1	Introduction	1
Lab 2	Range-finders: measurement and calibration	2
Lab 3	Tacheographs – measurement, collimation and inclination, defining angle measurement	2
Lab 4	Ground based laser scanner – functioning, measurement planning, measurement	2
Lab 5	Ground based laser scanner – data transmission, drawing up the results.	2
Lab 6	Field procedures of testing equipment-levelling instrument/range-finder	2
Lab 7	Field procedures of testing geodetic equipment--tacheograph	2
Lab 8	Data transmission from geodetic instruments (levelling instrument, tacheograph), data format, data edition.	2
	Total hours	**15**

TEACHING TOOLS USED
N1. Lecture supported by a shared discussion N2. Multimedia presentations N3. Office hours N4. Self-study-individual student work on given exercises N5. Self-study – individual work outside the university.

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_U02-PEK_U08	F1 Written tasks evaluating students' knowledge (50%). F2 Correct answers from the exercises (50%).
P2	PEK_W01-PEK_W06	Oral and written form of evaluation

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Płatek A., 1995, Elektroniczna technika pomiarowa w Geodezji, Wydawnictwo AGH, Kraków.

[2] Wanic A., 2007, Instrumentoznawstwo geodezyjne i elementy technik pomiarowych, Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego, Olsztyn.

[3] Płatek A., 1991, Geodezyjne dalmierze elektromagnetyczne i tachymetry elektroniczne, cz. 1, PPWK Warszawa.

[4] Płatek A., 1992, Geodezyjne dalmierze elektromagnetyczne i tachymetry elektroniczne, cz. 2, PPWK Warszawa.

SECONDARY LITERATURE:

[1] Ratajczyk F., 2002**,** Instrumenty optyczne, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław.

[2] PN ISO 17123-1 2005.09.06
Optyka i instrumenty optyczne - Terenowe procedury testowania instrumentów geodezyjnych i pomiarowych Cz.1: Teoria.

[3] PN ISO 17123-2 2005.09.06
Optyka i instrumenty optyczne - Terenowe procedury testowania instrumentów geodezyjnych i pomiarowych Cz.1:Niwelatory.

[4] PN ISO 17123-3 2005.09.06
Optyka i instrumenty optyczne - Terenowe procedury testowania instrumentów geodezyjnych i pomiarowych Cz.1: Teodolity.

[5] PN ISO 17123-4 2005.09.06
Optyka i instrumenty optyczne - Terenowe procedury testowania instrumentów geodezyjnych i pomiarowych Cz.1: Dalmierze.

[6] PN-ISO 17123-5 -
Optyka i instrumenty optyczne - Terenowe procedury testowania instrumentów geodezyjnych i pomiarowych - Cz.5: Tachimetry elektroniczne.

[7] PN ISO 17123-6 2005.09.06
Optyka i instrumenty optyczne - Terenowe procedury testowania instrumentów geodezyjnych i pomiarowych Cz.1: Lasery wirujące.

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Electronic Measuring Techniques
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W09	C1	Lec 1	N1, N2, N3
PEK_W02	K_W09	C3, C5, C6	Lab 1, Lab 2, Lab 4, Lab 5, Lab 6	N1, N2, N3, N4, N5
PEK_W03	K_W09	C3, C5	Lec 2, Lec 4, Lab 1, Lab 2, Lab 3	N1, N2, N3, N4, N5
PEK_W04	K_W09	C3, C5	Lec 2, Lec 3, Lec 4, Lec 5, Lab 1, Lab 2, Lab 3	N1, N2, N3, N4, N5
PEK_W05	K_W09	C6	Lec 6	N1, N2, N3
PEK_W06	K_W09	C7	Lec 7 Lab 5, Lab 6	N1, N2, N3, N4, N5
PEK_U02	K_U12	C2, C3	Lec 2, Lab1	N1, N2, N3, N4, N5
PEK_U03	K_U12	C2, C3	Lec 2, Lab 1	N1, N2, N3, N4, N5
PEK_U04	K_U12	C3	Lec 5, Lab 2	N1, N2, N3, N4, N5
PEK_U05	K_U12	C5	Lec 3, Lab 3	N1, N2, N3, N4, N5
PEK_U06	K_U12	C5	Lec 3, Lab 4	N1, N2, N3, N4, N5
PEK_U07	K_U12	C7	Lec 7, Lab 5, Lab 6	N1, N2, N3, N4, N5
PEK_U08	K_U12	C3, C5	Lab 2, Lab 4, Lab 7	N1, N2, N3, N4, N5
PEK_K01				

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Statystyczna Analiza Danych
Name in English: Statistical Data Analysis
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG3051
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Credit from Statistical Analysis II.

SUBJECT OBJECTIVES

C1 Acquiring knowledge concerning the basic statistical concepts and statistical inference methods (real-valued random variable).
C2 Acquiring abilities concerning descriptive statistics, statistical hypothesis testing and estimating (selected tools).

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Knows the basic concepts of the theory of probability (the probability space, real-valued random variable and its distribution, selected probability distributions and their parameters, independence of random variables, the function of random variables, Central Limit Theorem).

PEK_W02 Knows the basic statistical concepts and statistical inference methods (population and sample, point and interval estimators, testing statistical hypothesis)

PEK_W03 Knows the basic statistical research methods of two characteristics (linear regression, the correlation of random variables).

relating to skills:

PEK_U01 Assigns probability events in a given probability space and defining the parameters of distribution on the basis of the cumulative distribution function or the distribution density function (the average, the variance, the quantile, the mode, the skewness, excess) using the elementary calculations, spreadsheets.

PEK_U02 Determines the probability distribution of the transformed random variable using a selected function.

PEK_U03 Does the analysis of the finite set of real numbers and obtains a basic statistical description; classifies the probability distribution; estimates the basic parameters of distribution.

PEK_U04 Can make and verify hypothesis concerning its distribution and parameters using a significance and goodness of fit test (in the context of the basic distributions using the selected tools).

PEK_U05 Determines the correlation of two population characteristics and determines linear regression equations.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	The probability space. The probability measure. The independence of events, the conditional probability.	2
Lec 2	The probability distribution of a real-valued random variable. The moments of probability distribution. The selected probability distributions.	2
Lec 3	Functions of random variables (chosen transformations).	2
Lec 4	Two-dimensional random variables. The marginal distribution, the conditional distribution. The independence of random variables. The moments of two – dimensional distribution, covariations.	2
Lec 5	Functions of two-dimensional random variables, sum and product distribution of random variables. Central Limit Theorem.	2
Lec 6	Population and a sample. Descriptive statistics.	2
Lec 7	Estimation. Point estimation (the selected estimators).	3
Lec 8	Interval estimation (the selected estimators).	3
Lec 9	The verification of statistic hypothesis. The parametric tests of significance (selected only).	3
Lec 10	The tests of significance (selected only).	3
Lec 11	Regression. The statistical research of two characteristics. The correlation of random variables.	4
Lec 12	Test.	2
	Total hours	**30**

Form of classes - laboratory		Number of hours
Lab 1	Setting the rules of laboratory work. Familiarizing students with the IT environment necessary to do the laboratory tasks. The distribution of the data sets. Studying certain probability distributions.	2
Lab 2	Assigning the probability of events. Assigning the probability distribution of the transformed random variables using particular functions.	2
Lab 3	Studying the properties of estimators and the rules of assigning point estimators.	2
Lab 4	Building the confidence intervals for the basic parameters of distribution.	2
Lab 5	The verification of statistic hypothesis concerning the parameters of probability distribution.	2
Lab 6	The verification of statistic hypothesis using the distribution test of goodness of fit.	2
Lab 7	Assigning the regression line. Assigning the linear correlation coefficient.	2
Lab 8	Test.	1
	Total hours	**15**

TEACHING TOOLS USED
N1. Informational lecture with problem-based elements and multimedia presentations. N2. Lecture - facilitated discussion. N3. Laboratory classes – the lecturer presents the exemplary usage of IT tools. N4. Laboratory classes - discussion about the methods necessary to do the tasks. N5. Laboratory classes – individual task completion in accordance with the instructions. N6. Laboratory classes – test on the methods of laboratory research. N7. Individual work – the preparation to laboratory classes. N8. Written report on the laboratory research. N9. Office hours. N10. Individual work – self-study and self-preparation for the tests.

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	PEK_W01-PEK_W03 PEK_U01-PEK_U05	F1: Written or oral test on the preparation of the laboratory research and the research itself. F2: Grade from the written laboratory reports.
P	PEK_W01-PEK_W03 PEK_U01-PEK_U03, PEK_U05	P1: Grade from a written test covering the material form lecture.
P	PEK_W01-PEK_W03 PEK_U01-PEK_U05	P2: Final grade (a weighted-average: F1x0,3+F2x0,7).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Feller W., Wstęp do rachunku prawdopodobieństwa, PWN 2006.
[2] Jokiel-Rokita A., Magiera R., Modele i metody statystyki matematycznej w zadaniach, GiS, Wrocław, 2005.
[3] Krysicki W. i in., Rachunek prawdopodobieństwa i statystyka matematyczna w zadaniach, część I i II, PWN 2010.
[4] Nowak R.N., Statystyka dla fizyków, PWN, 2002.
[5] Nowak R.N., Statystyka dla fizyków. Ćwiczenia, PWN, 2002.
[6] Hołodnik K., Materiały do ćwiczeń, Politechnika Wrocławska.

SECONDARY LITERATURE:

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[2] Fisz M., Rachunek prawdopodobieństwa i statystyka matematyczna, PWN, I wydanie 1958.
[3] Helwig Z., Elementy rachunku prawdopodobieństwa i statystyki matematycznej, PWN, I wydanie 1967.
[4] Kordecki W., Rachunek prawdopodobieństwa i statystyka matematyczna, GiS, Wrocław, 2002.
[5] Smogur Z., Excel w zastosowaniach inżynieryjnych, Helion, 2008.
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Statistical Data Analysis
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W03	K_W05	C1	Lec 1-Lec 12	N1, N2, N9, N10
PEK_U01-PEK_U05	K_U06	C2	Lab 1-Lab 8	N3-N9

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

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

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

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

SUBJECT OBJECTIVES

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

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

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

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

relating to skills:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

relating to social skills:

PEK_K01 - search for information and its critical analysis,

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

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

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

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

PEK_K06 - independent and creative thinking,

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

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

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

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

TEACHING TOOLS USED
N1. 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 N8 Self-study- preparation for tasks N9 Calculation tutorials – brief, 10 min. written tests N10 Calculation tutorials – discussion on tasks' solutions

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENTS

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

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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

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

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

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

SECONDARY LITERATURE IN POLISH:

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

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

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

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

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

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

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

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

SEMESTER 4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geodezja Inżynieryjna II
Name in English: Engineering Surveys II
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG4054
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has basic theoretical knowledge concerning rectangular coordinate systems
2. The student has knowledge and skills concerning the accuracy of surveying measurements.
3. The student has knowledge and skills concerning in the field of geodesic investment processes

SUBJECT OBJECTIVES

C1 Presentation of knowledge concerning as-built measurements and staking out elements of developed areas
C2 surveying characteristics of bridge structures service
C3 surveying characteristics of crane service
C4 Presentation of knowledge concerning surveying water engineering service
C5 Presentation of knowledge concerning surveying road and railways service
C6 Acquisition of skills concerning inventory measurements and staking out network elements of developed areas
C7 Acquisition of skills concerning surveying crane service
C8 Acquisition of skills concerning surveying road and railways service

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

C1 The student characterises issues related to as-built measurements and staking out elements of developed areas

PEK_W02 The student characterises issues related to surveying bridge engineering service

PEK_W03 The student characterises issues related to surveying crane service

PEK_W04 The student characterises issues related to surveying water engineering service

PEK_W05 The student characterises issues related to surveying road and railways service

relating to skills:

PEK_U01 The student can perform inventory measurements and stake out network elements of developed areas

PEK_U02 The student has skills of surveying crane service

PEK_U03 The student has skills of surveying road and railways service

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Network elements of developed area, technical infrastructure	2
Lec 2	Surveying bridge structures service	2
Lec 3	C3 surveying crane service	2
Lec 4	Numerical terrain models. Longitudinal and transverse intersections.	2
Lec 5	Surveying water engineering service - watercourses.	2
Lec 6	Surveying water engineering service - water basins.	2
Lec 7	Surveying road service.	2
Lec 8	Surveying railways service	1
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Inventory measurements and realization networks of developed area.	2
Lab 2	Project's development of after-crane road regulation	4
Lab 3	Longitudinal profile and cross sections measurements. Development of the results.	4
Lab 4	Creating a numerical terrain model for the needs of engineering projects.	2
Lab 5	Staking out straight parts of route through obstacles.	2
Lab 6	Staking out main points of circular curves.	2
Lab 7	Staking out intermediate points of circular curves.	4
Lab 8	Staking out points of transition curve.	2
Lab 9	Familiarizing with the rules of surveying track machines service.	2
Lab 10	Development of axis of the track regulation project in the horizontal plane.	2
Lab 11	Development of the track regulation project in the vertical plane.	2
Lab 12	Systems of monitoring and machinery steering for ground and road works.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem solving lecture. N2. Multimedia presentations. N3. Preparing own written semester work on a given topic. N4. Conduct and preparation of laboratory tasks reports. 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
F, P	PEK_W01-PEK_W05	F1- written exam grade F2 Grade from a semester written test. P1 Final grade from the lecture (weighted mean of F1 - 80% and F2 - 20%)
F, P	PEK_U01-PEK_U03	F3 Grade from performing a task and a written report F4- written test grade P2 - Final grade from a laboratory (weighted average of F3 - 50% and F4 - 50%)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Witold Prószyński, Mieczysław Kwaśniak, Podstawy geodezyjnego wyznaczania przemieszczeń. Pojęcia i elementy metodyki, Oficyna Wydawnicza Politechniki Warszawskiej, 2006

[2] Jan Gocał, Geodezja inżynieryjno-przemysłowa cz. II, AGH Publishing, 2009

[3] Praca zbiorowa – „Geodezja Inżynieryjna" t. 1, 2 i 3, Pub. PPWK, Warszawa 1993-1994

SECONDARY LITERATURE:

[1] Praca zbiorowa pod redakcją F. Roli – „Geodezja inżynieryjno-przemysłowa", wykłady cz. I, II i III, skrypt AGH Kraków 1985

[2] Praca zbiorowa pod redakcją J. Ponikowskiego – „Ćwiczenia z geodezji inżynieryjno-przemysłowej", cz. I, II i III, Pub. PPWK Warszawa 1972

[3] K. Kamieńska-Czyż, M. Pekalski – „Wybrane działy geodezji inżynieryjnej", Pub. Politechniki Warszawskiej Warszawa 1982

[4] T. Lazzarini – Geodezyjne pomiary przemieszczeń budowli i ich otoczenia", Pub. PPWK Warszawa 1979

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Engineering Surveys II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W12	C1	Lec 1	N1, N2
PEK_W02	K_W12	C2	Lec 2	N1, N2
PEK_W03	K_W12	C3	Lec 3	N1, N2
PEK_W04	K_W12	C4	Lec 4-Lec 6	N1, N2
PEK_W05	K_W12	C5	Lec 7-Lec 8	N1, N2, N3
PEK_U01	K_U14	C6	Lab 1	N2, N4
PEK_U02	K_U14	C7	Lab 2	N2, N4
PEK_U03	K_U14	C8	Lab 2-Lab 12	N2, N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Fotogrametria i Teledetekcja
Name in English: Photogrammetry and Remote Sensing
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG4055
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	90		120		
Form of crediting	Examination		crediting with grade		
For a group of courses mark (X) for the final course					
Number of ECTS points	3		4		
including number of ECTS points for practical (P) classes			2		
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 basic knowledge of algebra and mathematical analysis and mathematical statistics
2. The student has knowledge and skills in basic surveying, detailed surveying measurements and surveying engineering

SUBJECT OBJECTIVES

C1 Familiarizing students with the basic functions and tasks of photogrammetry, the essence of analogue, analytical and digital photogrammetry
C2 Learning measurements methods of spatial data obtaining based on aerial and satellite stereograms images and processing them for DTM and a digital orthophotomap
C3 Learning and understanding the methods of laser scanning and radar imaging for topographic and environmental purposes

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has basic knowledge of the essence and basis of photogrammetry and remote sensing in topographic and non-topographic applications

PEK_W02 The student has knowledge of the acquisition and spatial data processing based on ground stereograms and aerial images, geo-referencing and coordinate systems transformations

PEK_W03 The student has a detailed knowledge of the digital terrain model construction (DTM) and a digital orthophotomap based on spatial data obtained by photogrammetric method

PEK_W04 The student understand the essence of laser scanning LIDAR and radar imaging capabilities of topographic and environmental applications

relating to skills:

PEK_U01 The student can perform field work and in-house works associated with the acquisition and development of analytical photogrammetric images

PEK_U02 The student can develop a photogrammetric model on photogrammetric stations and build DTM and digital orthophotomap using specialized software

PEK_U03 The student can perform laser scanning, develop the results of recorded points coordinates and build DEM

PEK_U04 The student can perform field work associated with taking pictures using non-metric cameras, develop a photogrammetric model and prepare a 3D model in Open Source software environment

PEK_U05 The student can perform the analysis of radar images for the environmental purposes

relating to social competences:

PEK_K01 The student can work in measurement teams and in multi-disciplinary teams

PEK_K02 The student helps to build self-esteem and self-control and responsibility for the measurements results delivery and photogrammetric determinations

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Introductory concepts, principles of central projection, the advantages of photogrammetric method	2
Lec 2	Photogrammetric cameras, photo orientation elements, basic stereophotogrammetry, surface and core radii	2
Lec 3	Analytical development of single stereogram: coordinate systems, systems transformations, basic formulas	2
Lec 4	Assessment of accuracy of set coordinates for a single stereogram	2
Lec 5	Aerial triangulation in photogrammetry matrix compaction using GPS and INS	2
Lec 6	Methods of aerial photos stereograms development on digital photogrammetric stations	2
Lec 7	Acquisition and data processing for digital terrain models and orthophotomaps	2
Lec 8	Digital photogrammetry: geometric features, radiometric and spectral, resampling, imaging correlation	2
Lec 9	Photo interpretation of aerial photographs and satellite imagery, classification of thematic content of digital images, physical basis of remote sensing.	2
Lec 10	Introduction to the aerospace and terrestrial laser scanning: scanning, basic operations, recording and editing data	2
Lec 11	Possibilities of imaging radar applications in environmental data acquisition	2

Lec 12	Non-topographic application of photogrammetry in the inventory measurement and engineering deformation measurements	2
Lec 13	3D modelling, integration with digital orthophotomap and DTM	2
Lec 14	Using photogrammetric and remote sensing data for the needs of SIP / GIS	2
Lec 15	Digital photogrammetry and remote sensing geoenvironmental applications	2
	Total hours	**30**

Form of classes - laboratory		**Number of hours**
Lab 1	Regulation of classes, health and safety training, photogrammetric cameras, elements of internal orientation	2
Lab 2	The study of engineering facilities deformations based on photogrammetric stereograms images from fixed positions	2
Lab 3	The study of engineering facilities deformations based on single photogrammetric images	2
Lab 4	Compacting of photogrammetric matrix without GPS and INS with adjustment	2
Lab 5	Compacting of photogrammetric matrix with the usage of GPS and INS	2
Lab 6	Aerial photos stereogramms development on photogrammetric stations	2
Lab 7	Construction of DNM based on data from photogrammetric measurement stations, TIN and GRID, break lines	2
Lab 8	Orthophotomap generation on photogrammetric stations using specialized software	2
Lab 9	Obtaining spatial data with the usage of laser scanning from fixed positions	2
Lab 10	Construction of a 3D model and spatial animation of a construction based on data from laser scanning	2
Lab 11	Digital photogrammetry using non-metric cameras, field work	2
Lab 12	Development of photos stereograms taken with the usage of non-metric cameras, in-house works, construction of a model, coordinates determination, georeferences	2
Lab 13	DTM and 3D model development on the basis of the stereograms images development of performed by non-metric cameras	2
Lab 14	Thematic analysis of imaging radar	2
Lab 15	Summary of digital photogrammetry studies, crediting the course	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Lecture - traditional with multimedia presentations N2. Laboratory classes - preparing reports as basic trig data with counting results and visualisation N3. Own work - continuing laboratory tasks N4. Own work - individual studies and preparation for the exam 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_U05	Oral answers, written tests
F2	PEK_U01-PEK_U05	Grade from reports (mean of F1 and F2)
P2	PEK_W01-PEK_W04	Written-oral exam

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Adamczyk J., Będkowski K. Metody cyfrowe w teledetekcji. Pub. SGGW. Warszawa 2005.
[2] Bernasik J. Elementy fotogrametrii i teledetekcji. Pub. AGH, Kraków 2000.Kurczyński Z.: Lotnicze i satelitarne obrazowanie Ziemi (tom 1 i 2). Oficyna Wydawnicza PW, Warszawa 2006.
[3] Kurczyński Z., Preuss R.: Podstawy Fotogrametrii. Oficyna Wydawnicza PW, Warszawa 2004
[4] Sitek Z. Wprowadzenie do teledetekcji lotniczej i satelitarnej. Pub. AGH, Kraków 2000.
[5] Świątkiewicz A. Fotogrametria. PWN, Warszawa 1983.

SECONDARY LITERATURE:

[1] Geodeta - Miesięcznik geoinformacyjny. Geodeta Sp. z o.o. Publishing, Warszawa
[2] GIM International. Miesięcznik geomatyczny
[3] Materiały konferencyjne międzynarodowego kongresu fotogrametrycznego i teledetekcyjnego ISPRS
[4] Archiwum Fotogrametrii, Kartografii i Teledetekcji. Politechnika Warszawska

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Photogrammetry and Remote Sensing
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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	Lec 1	N1,N4,N5
PEK_W02	K_W13	C2	Lec 2-Lec 7 Lec 12, Lec13	N1,N4,N5
PEK_W03	K_W13	C2, C3	Lec 8-Lec 9	N1,N4,N5
PEK_W04	K_W13	C3	Lec 10, Lec 11 Lec 14, Lec 15	N1,N4,N5
PEK_U01	K_U15	C1	Lab 1-Lab 4	N2, N3, N5
PEK_U02	K_U15	C2	Lab 5-Lab 8	N2, N3, N5
PEK_U03	K_U15	C3	Lab 9-Lab 10	N2, N3, N5
PEK_U04	K_U15	C3	Lab 11-Lab 13	N2, N3, N5
PEK_U05	K_U15	C3	Lab 14-Lab 15	N2, N3, N5
PEK_K01	K_K04	C2, C3	Lec 1-Lec 15 Lab 1-Lab 15	N1-N5
PEK_K02	K_K07	C2, C3	Lec 1-Lec 15 Lab 1-Lab 15	N1-N5

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Podstawy Ekonomii
Name in English: Introduction to Economics
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: EKG4010
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

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

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

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

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

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

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

PEK_W04 Understands the consequences of dishonest operations for the economy.

relating to skills:

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

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

PEK_U03 Can appreciate the importance of honesty in economy.

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

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

relating to social competences:

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

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

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

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

PROGRAMME CONTENT

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

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

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

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

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

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Kamerschen D.R., McKenzie R.B., Nardinelli C.: Ekonomia, Fundacja Gospodarcza NSZZ „Solidarność" , Wyd. III, Gdańsk 1993.

[2] Begg D., Fisher S., Dornbusch R.: Ekonomia T1 i T2, PWE, Warszawa 1993.

[3] Samuelson W.F., Marks S.G. : Ekonomia menedżerska, PWE, Warszawa 1998.

SECONDARY LITERATURE:

[1] Rabushka A.: Od Adama Smitha do bogactwa Ameryki, Centrum im. Adama Smitha, Warszawa 1996.

[2] Samuelson P.A., Nordhaus W.D.: Ekonomia T1 i T2, Wydawnictwa Naukowe PWN, Warszawa 1996.

[3] Varian H.R.: Mikroekonomia, kurs średni ujęcie nowoczesne, Wydawnictwo Naukowe PWN, Warszawa 1995.

[4] Hall R.E., Taylor J.B.: Makroekonomia - teoria, funkcjonowanie i polityka, Wydawnictwo Naukowe PWN 1995.

[5] Błaszczyński A.: Słownik pojęć ekonomicznych, Szkoła Zarządzania Uniwersytetu Jagiellońskiego, Towarzystwo Handlowe „Atlant", Kraków 1995.

[6] Chiang A.C.: Podstawy ekonomii matematycznej, PWE, Warszawa 1994

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

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01 PEK_W02	K_W21	C1	Lec 1- Lec 15	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 15	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 - 07	C1, C2	Lec 1-Lec 15 Sem 1-Sem 7	N 1, N4, N5 N 2, N3, N6-N7
PEK_K04	K_K01 - 07	C1	Lec 1	

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Rachunek Wyrównawczy II
Name in English: Adjustment Calculations II
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG4056
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15	15			
Number of hours of total student workload (CNPS)	60	60			
Form of crediting	Examination	crediting with grade			
For a group of courses mark (X) for the 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	2			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has knowledge on rules and methods used while conducting surveying measurements
2. The student has knowledge on the theory of errors and the sources of their arising
3. The student can select the method of measuring for the assumed complex accuracy
4. The student can level the horizontal and high network

SUBJECT OBJECTIVES

C1 Learning principles of surveying observations sets development with protruding measurement data
C2 Learning methods of compensation of complex and different tolerances surveying networks
C3 Acquiring practical skills of interpolation and observational data approximation

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student knows the theory of horizontal and vertical surveying network alignment in different classes

PEK_W02 The student has basic knowledge concerning surveying network alignment with protruding observations

PEK_W03 The student knows the rules of approximation surveys results of different methods

relating to skills:

PEK_U01 The student can level a multi-row, space surveying network with protruding data

PEK_U02 The student can perform interpolation of the measured data using different statistical methods

relating to social competences:

PEK_K01 The student can formulate and share knowledge concerning equalization account in different aspects and fields of technical knowledge.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Levelling a horizontal network with detection of protruding connecting points	1
Lec 2	Alignment of levelling network of I, II, III and IV class of accuracy	2
Lec 3	Alignment of levelling networks with taking into account errors of connecting points.	2
Lec 4	Levelling a levelling networks with detection of protruding connecting points	2
Lec 5	Gauss - Markow observational model: Recursive formulas.	2
Lec 6	Conditional observational model. General observational model.	2
Lec 7	Parametric observational model with constraints. Observational model with deterministic and random parameters	2
Lec 8	Interpolation and approximation methods: polynomial, inverse distance method, the surface of minimum curvature, kriging.	2
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Angles errors calculations measured in series. Angle error calculation by means of Ferraro method.	1
Lab 2	Calculation of the comparative and heat correction. Calculation of the total station EDM scale correction	2
Lab 3	Preliminary analysis of the coordinate designation accuracy, angles and distances measurement, height differences	2
Lab 4	Calculation of one kilometre sequence levelling error on the basis of the double sequence levelling results and on the basis of mesh closures	2
Lab 5	Alignment of levelling network of I, II, III and IV class	2
Lab 6	Alignment of levelling networks with taking into account errors of connecting points.	2
Lab 7	Levelling a levelling networks with detection of protruding connecting points	2
Lab 8	Interpolation of layers by means of polynomial method, inverse distance, the surface of minimum curvature, kriging.	2
	Total hours	**15**

TEACHING TOOLS USED
N1. Type of lectures - traditional, illustrated with multimedia presentations with the usage of audio-visual equipment N2. Preparation of reports from laboratory tasks. N3. 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
P1	PEK_W01-PEK_W03	P1 passing final test from the given scope of material
F, P2	PEK_U01-PEK_U02	F1 grade from written tests concerning knowledge of particular laboratory groups of topics F2. Grade from reports from particular subject laboratories groups P2.Final grade (mean of F1 and F2)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Wiśniewski Z. Rachunek wyrównawczy w geodezji. Pub. UWM, Olsztyn 2005
[2] Osada E. Geodezja. Oficyna Pub. PWr., Wrocław 2002
[3] Adamczewski Z. Rachunek wyrównawczy w 15 wykładach. Oficyna Pub. PW, Warszawa 2007
[4] Osada E. Wykłady z geodezji i geoinformatyki. Osnowy geodezyjne. UxLan, Wrocław 2010
[5] Baran L. W. Teoretyczne podstawy opracowania wyników pomiarów geodezyjnych. PWN, Warszawa 1999

SECONDARY LITERATURE:

[1] Adamczewski Z. Teoria błędów dla geodetów. Oficyna Pub. PW, Warszawa 2005
[2] Osada E. Analiza, wyrównanie i modelowanie Geo-Danych. Podręcznik elektroniczny programu Mathcad dla Windows 98. Pub. AR, Wrocław 1998
[3] Materiały z wykładu

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Adjustment Calculations II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W15	C2	Lec 1-Lec 2	N1, N3
PEK_W02	K_W15	C1	Lec 3-Lec 7	N1
PEK_W03	K_W15	C3	Lec 8	N1, N3
PEK_U01	K_U17	C1, C2	Lab 1-Lab 7	N2, N3
PEK_U02	K_U17	C3	Lab 8	N2, N3

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Systemy Informacji Geograficznej I
Name in English: Geographic Information Systems I
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG4057
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	90		60		
Form of crediting	crediting with grade		crediting with grade		
For a group of courses mark (X) for the final course					
Number of ECTS points	3		2		
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 basic knowledge of database systems, managing and implementing a database in a variety of informatics systems
2. The student can design a logical and physical structure of database, enter data using forms, output data by means of a query
3. The student has basic knowledge concerning numerical maps construction , knows and understands the methodology for the development of numerical maps
4. The student can manage computer tools to support maps designing

SUBJECT OBJECTIVES

C1Transfer of knowledge concerning representation models and digital objects inscription, phenomena and processes in geographic information systems.
C2 Presentation and discussion on the components of geographic information systems.
C3 Acquisition of knowledge and skills concerning construction and management of spatial databases
C4 Learning basic methods and phases of spatial analysis.
C5 Developing skills in procedures forming in a formal language, and their implementation using geographic information systems programs.
C6 Understanding the principles of visualization of spatial data in GIS.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student knows the basic concepts of geographic information systems,

PEK_W02 The student knows basic models of real world representation and distinguish digital methods of spatial data recording,

PEK_W03 The student can describe methods of phenomena and spatial objects modelling and distinguish spatial analysis methods in GIS

relating to skills:

PEK_U01 The student can design, supply, update, and manage thematic spatial databases

PEK_U02 The student uses GIS tools to perform the tasks aimed at given problem solution in the environment of geographical information systems

PEK_U03 The student can graphically demonstrate and interpret the results of spatial analysis

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Syllabus, conditions of crediting, literature Data and spatial information. Digital reality representation.	2
Lec 2	Characteristics of geographic information systems (GIS / GIS) - components, functions, tasks	2
Lec 3	Models of objects, phenomena and spatial processes in geographic information systems. Discrete objects and fields	2
Lec 4	Vector model	2
Lec 5	Raster model	2
Lec 6	Object model	2
Lec 7	Numerical surface models (TIN, GRID) Interpolation and height approximation methods	2
Lec 8-9	Spatial databases (graphic objects and descriptive attributes). Projecting, construction, management.	4
Lec 10-11	Overview of spatial information systems applications. Examples of use in administration, economy and science.	4
Lec 12	Phases of spatial analysis	2
Lec 13-14	Methods of spatial analysis Operators and functions. Models of data processing procedures. Examples of raster and vector analysis.	4
Lec 15	Geovisualisation	2
	Total hours	**30**

Form of classes - laboratory		**Number of hours**
Lab 1	Presentation of the scope of practice, crediting conditions and literature. Introduction to ArcGIS Desktop. Work with ArcCatalog application	2
Lab 2	Introduction to ArcGIS. Work with ArcMap application	2
Lab 3	Spatial database construction. Georeference - fitting a raster into map's coordinate system.	2
Lab 4	Spatial database construction. Obtaining spatial data (raster vectorisation,	2

	coordinates). Topological validation.	
Lab 5	Spatial database construction. Acquisition and update of descriptive data	2
Lab 6	Updating spatial database based on surveying and GPS	2
Lab 7	Statistical analysis using GIS tools. Building a database from online sources (BDL GUS)	2
Lab 8	Statistical analysis using GIS tools. Selection and classification of data.	2
Lab 9	Statistical analysis using GIS tools. Presentation of data according to administrative units and periods. Thematic maps (cartogram, cartodiagram)	2
Lab 10	Spatial analysis - assessing the suitability of land for the investment location. Spatial database construction.	2
Lab 11	Spatial analysis - assessing the suitability of land for the investment location. Selection of procedures and performing analytical operations. Developing a model of spatial data processing	2
Lab 12	Spatial analysis - assessing the suitability of land for the investment location. Presentation of the analysis results - general map, detailed map, report	2
Lab 13	Construction of the numerical surface model based on discrete data. Development of TIN surface (Triangulated Irregular Network) using Delaunay triangulation	2
Lab 14	Construction of the numerical surface model based on discrete data. Interpolation using the inverse distance weighted method (IDW)	2
Lab 15	Reports grade of performed laboratory research. Test.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem solving lecture. N2. Multimedia presentations. N3. Preparing own written semester work on a given topic. N4. Conduct and preparation of laboratory tasks reports. 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
F, P	PEK_W01-PEK_W03	P1.Final grade of written test. F2 Grade from a semester written test. P1 - Final grade from a lecture (weighted average of F1 - 70% and F2 - 30%
F, P	PEK_U01-PEK_U03	F3 Grade from performing a task and a written report F4- written test grade P2 - Final grade from a laboratory (weighted average of F3 - 80% and F4 - 20%).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Longley P. A., Goodchild M. F., Maguire D. J., Rhind D. W.: GIS. Teoria i praktyka. Naukowe PWN Publishing, Warszawa 2006;
[2] Litwin L, Myrda G., 2005: Systemy Informacji Geograficznej. Zarządzanie danymi przestrzennymi w GIS, SIP, SIT, LIS, Helion Publishing;
[3] Urbański J., 2010. GIS w badaniach przyrodniczych, Uniwersytet Gdański Publishing
[4] Gaździcki J., 2010: Leksykon geomatyczny. Wydanie internetowe.@ http:// http://ptip.org.pl/

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[1] Gotlib D., Iwaniak A., Olszewski R., 2007: GIS. Obszary zastosowań, Wydaw. Naukowe PWN, Warszawa;
[2] Heywood I., Cornelius S., Carver S., 2006: An Introduction to Geographical Information Systems, 3rd Edition, Pearson – Prentice Hall;
[3] Kennedy M., 2009: Introducing Geographic Information Systems with ArcGIS: A Workbook Approach to Learning GIS, Second Edition, John Wiley and Sons;
[4] Longley P. A., Goodchild M. F., Maguire D. J., Rhind D. 2011: Geographic Information Systems and Science, John Wiley & Sons
[5] Geodeta. Magazyn geoinformacyjny;
[6] Kwartalnik Arkana GIS. Magazyn dla użytkowników oprogramowania ESRI;
[7] Magazyn informacyjny ArcNews;
[8] Roczniki Geomatyki – Zeszyty Naukowe Polskiego Towarzystwa Informacji Przestrzennej;
[9] Geoforum – portal internetowy @ http://geoforum.pl
[10] GISPlay – portal geoinformacyjny @ http://geoforum.pl

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Geographic Information Systems I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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	C1, C2	Lec 1, Lec 3-Lec 7	N1, N2
PEK_W02	K_W14	C1, C4	Lec 2, Lec 10-Lec 11	N1, N2
PEK_W03	K_W14	C1, C4	Lec 12 Lec 13-Lec 14	N1, N2, N3
PEK_U01	K_U16	C3	Lec 8-Lec 9, Lab 1- Lab 6	N2, N4
PEK_U02	K_U16	C5	Lab 7-Lab 8, Lab 10-Lab 11, Lab 13-Lab 14	N4
PEK_U03	K_U16	C6	Lec 15, Lab 9, Lab 12	N2, N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Bhp i Ergonomia
Name in English: Occupational Safety and Health and Ergonomics
Faculty of studies: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG4014
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses basic knowledge of technologies used in open-pit mines and underground mines.
2. Is able to use Microsoft Office environment to prepare documents in Word, multimedia presentations in Power Point and work with Excel spreadsheets.
3. Understands the need and knows the possibilities of constant education (2nd and 3rd level studies, postgraduate studies, and courses), improving professional, personal and social skills.

SUBJECT OBJECTIVES

C1 - To familiarize students with the basics of occupational safety in the European Union and in Poland.
C2 - To familiarize students with the principles of occupational safety monitoring in a company and principles of supervision exercised by external institutions.
C3 – To familiarize students with basic terminology and procedures associated with accidents at work and occupational diseases, and also analysis and assessment of exposure to harmful agents in the workplace.
C4 – To enable students to identify and characterize hazards of harmful and dangerous factors occurring in the work environment with particular emphasis on mines.
C5 – To create a safety culture attitude of labour by understanding phenomena associated with occupational hazards and appropriate labour evaluation in aspects of its safety.
C6 – To familiarize students with the latest developments in the field of occupational safety in highly developed organizations.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 - Possesses general knowledge about the basics of occupational safety in the European Union and in Poland.

PEK_W02 Knows rules of monitoring occupational safety in the workplace (including mines).

PEK_W03 Knows rules of supervision of occupational safety by external institutions.

PEK_W04 - Possesses general knowledge about accident hazards and hazards of harmful factors in workplaces in the mining industry.

PEK_W05 - Understands relationships and dependencies between systems and mining technologies and hazards with harmful and dangerous factors in the work environment.

PEK_W06 - Possesses general knowledge of the parameters and application of standards – which are results of legal and normative regulations associated with accidents at work, occupational diseases and harmful factors in the work environment.

PEK_W07 - Knows the mining environment and is able to characterize parameters of dangerous and harmful factors in the work environment.

PEK_W08 - Knows basic legal and normative regulations regarding accidents at work, occupational diseases and also analysis and assessment of exposure to harmful agents in the workplace.

PEK_W09 - Possesses basic knowledge about procedures after accidents, carrying out after accident documentation, occupational diseases, principles of measurements, compiling research documentations, evaluation and registration of harmful factors in the work environment, principles of co-operation with research laboratories, assessment of exposure to harmful factors and the interpretation of results.

relating to skills:

PEK_U01 - Is able to characterize occupational posts in the mining industry concerning aspects of accident hazards and hazards of harmful agents.

PEK_U02 - Is able to identify harmful, dangerous and disruptive factors in the workplace.

PEK_U03 - Is able to analyse activities in the area of forming the conditions and organization of labour based on assessment results of accident hazards and exposure to harmful factors in the work environment.

PEK_U04 - Is able to interpret results of accident analysis and research of harmful factors in the work environment.

PEK_U05 -Is able to develop and present the results of project work (paper report, multimedia presentation) after accident documentation, reports of research on assessment of exposure to harmful factors and the interpretation of results.

relating to social competences:

PEK_K01- Is able to work in a team and together carry out research of the work environment and develop results and required documentation in the form of a team report. Knows examples of good practices and the promotion of Occupational Health and Safety, and is aware of the value and need of creating a culture of occupational safety.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Conventions and Directives regarding Occupational Health and Safety. The legal basis of occupational safety in Poland. Sources of responsibilities regarding Occupational Health and Safety (OHS). 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	Measurement strategy of a work environment. Dust in workplaces.	2
Lec 6	Vibration and noise in the work environment.	2
Lec 7	Microclimate, artificial lighting, chemical factors.	
Lec 8	Biological factors in the work environment, mechanical hazards.	2
	Total hours	**15**

Form of classes - classes		**Number of hours**
Cl 1	AFTER ACCIDENT PROCEDURES. Legal regulations regarding accidents at work, aspects and aims of carrying out after accident investigations, after accident procedure concerned as an element of OHS reactive monitoring. Procedures – reporting an accident, appointing an after accident committee, security of an accident site, provision of first aid, procedures at an accident site, after accident team operations. Formal and legal rules of preparation and approval of after accident documentation.	2
Cl 2	INVESTIGATION OF ACCIDENTS AT WORK and PREPARATION OF AFTER ACCIDENT DOCUMENTATION. Mechanism of origin and models of accidents, investigation of the circumstances and causes of an accident, conclusion formulation and prevention activities. Completion of after accident documentation, elements of a statistical card of accidents at work and classification of the causes of an accident. Samples and examples of after accident forms and a statistical card. Assignment of topics to prepare after accident documentation for student teams.	2
Cl 3	LEGAL ASPECTS OF ACCIDENTS AT WORK. Legal definitions of various accidents and their examples. Elements of the definition of an 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.	2
Cl 4	ANALYSIS OF ACCIDENT RATE. Keeping a register of accidents at work and statistical documents. Accident rates, scope and structure analysis, planning activities in the area of OHS. Analyses of the accident rate in the mining industry according to State Mining Authority materials - statistics, groups of risk, the main causes and circumstances of accidents, the main activities to enhance safety in the mining industry.	2
Cl 5	PRESENTATION of after accident documentations developed by teams of students, discussion on their correctness. PROMOTION and CULTURE of occupational safety. Good practices of accident prevention and creation of an occupational safety culture - alerts of accidents and	2

	potentially accidental activities, internal security codes, promotional actions of the State Mining Authority.	
Cl 6	Accident HAZARDS in mines. Natural hazards (legal qualification), hazards associated with conducting blasting, geotechnical and other technical hazards related to the employment of foreign entities, organizational and human hazards. Examples of particularly dangerous works in the mining industry and rules of conducting them. Examples of hazards included in safety documents of mining enterprises and methods of their prevention.	2
Cl 7	OCCUPATIONAL DISEASES. Relation between occupational diseases and harmful factors in the work environment, legal list of occupational diseases, examples of judicial jurisdiction in disputes relating to the recognition of an occupational disease. Documentation of procedures of occupational disease establishment – samples of forms established by law. Keeping a register of occupational diseases. Statistics of occupational diseases in the mining industry according to State Mining Authority analysis.	2
Cl 8	Summary of classes and final test.	1
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Completion of documentation of harmful factor research of the work environment in a workplace (registry of harmful factors, research cards of harmful factors, characteristics of work post and timing of work time, research plans of harmful factors). Stages of the research process of a work environment. Frequency of research, formal and practical rules of sampling in the workplace. Types of measuring devices and principles of metrological supervision on measuring devices according to principles of measuring coherence (standards, calibrators, reference materials, control of environmental parameters), the concept of measurement uncertainty. Formal and practical aspects of cooperation between workplaces and research laboratories, the role of a workplace in the planning and preparation of research, contracting, agreeing sampling protocols. Familiarise employees with test results, the importance of research in the development of hazards awareness and occupational safety culture. Rules of preparing research reports and an assessment of the working environment due to harmful factors (an example of a report made by the accredited laboratory, sample form of student report).	2
Lab 2	DUST in the work environment, criteria for harmfulness evaluation (NDS). Identification and description of the object of research, sources of hazards in mining and methods of prevention. Methodology according to the standard, measurement set, measurement strategy, the principles of conducting measurements. Practical conducting of measurements using measurement devices. Determination of exposure assessment indicators. Exposure assessment and interpretation – compliance with regulations, assessment of occupational risk, date of next research. Report from research carried out by individual students and discussion of results during consultation hours.	2
Lab 3	NOISE in the work environment, criteria for harmfulness evaluation (NDS). Identification and description of the object of research, sources of hazards in mining and methods of prevention. Methodology according to the standard,	2

	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.	
Lab 4	General and local MECHANICAL VIBRATIONS in the work environment, criteria for harmfulness evaluation (NDS). Identification and description of the object of research, sources of hazards in mining and methods of prevention. Methodology according to the standard, measurement set, measurement strategy, the principles of conducting measurements. Practical conducting of measurements using measurement devices. Determination of exposure assessment indicators. Exposure assessment and interpretation – compliance with regulations, assessment of occupational risk, date of next research. Report from research carried out by individual students and discussion of results during consultation hours.	2
Lab 5	MICROCLIMATE in the work environment, indicators of temperate hot and cold microclimates, criteria of evaluation of the thermal load of hot and cold stress. Determination of the warmth retention of clothing with tabular methods and energy expenditure and metabolism class with tabular and measurement methods. Identification and description of the object of research, sources of hazards in mining and methods of prevention. Methodology according to the standard, measurement set, measurement strategy, the principles of conducting measurements. Practical conducting of measurements using measurement devices. Determination of exposure assessment indicators. Exposure assessment and interpretation – compliance with regulations, assessment of occupational risk, date of next research. Report from research carried out by individual students and discussion of results during consultation hours.	2
Lab 6	LIGHTING at work, evaluation criteria. Identification and description of the object of research. Methodology according to the standard, measurement set, measurement strategy, the principles of conducting measurements. Practical conducting of measurements using measurement devices. Determination of basic parameters of lighting assessment. Assessment of lighting conditions and interpretation of compliance with the requirements. Research reports carried out by teams and discussion of results during classes.	2
Lab 7	CHEMICAL FACTORS in the work environment, criteria of hazard evaluation (NDS, NDSCH, NDSP). Identification and description of the object of research, sources of hazards in mining and methods of prevention. Methods of sampling and measurement strategies, examples of research with the absorption spectrometry method - set of research apparatus, principles of research methodology. Fast reading devices of chemicals in the mining environment and rules for their use. Determination of exposure assessment indicators. Assessment of exposure, cumulative exposure and interpretation – compliance with regulations, occupational risk evaluation, date of next research.	2
Lab 8	Summary of classes and test.	1
	Total hours	**15**

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

EVALUATION OF SUBJECT EDUCATIONAL OUTCOME 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, completion of classes and laboratory classes in the form of a report, presentation of a report, consultation, final grade from a written exam covering the entire material.
P2, F1, F2	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, 1997

[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, Gdansk, 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 217/2002, poz.1833 z późn. zm.);

[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] PN-/Z-04008/07 "Zasady pobierania prób powietrza w środowisku pracy i interpretacji wyników";
[6] PN-91/Z-04030/05 "Oznaczenie pyłu całkowitego na stanowiskach pracy metodą filtracyjno-wagową";
[7] PN-91-/Z-04030/06 "Oznaczenie pyłu respirabilnego na stanowiskach pracy metodą filtracyjno-wagową";
[8] PN-N-01307:1994 „Hałas. Dopuszczalne wartości parametrów hałasu w środowisku pracy. Wymagania dotyczące wykonywania pomiarów";
[9] PN-ISO 9612 „Akustyka. Wytyczne do pomiarów i oceny ekspozycji na hałas";
[10] PN–EN 14253 „Drgania mechaniczne. Pomiar i obliczanie zawodowej ekspozycji na drgania o ogólnym oddziaływaniu na organizm człowieka dla potrzeb ochrony zdrowia. Wymagania praktyczne";
[11] PN-EN-ISO–5349-1 „Drgania mechaniczne. Pomiar i wyznaczanie ekspozycji człowieka na drgania mechaniczne przenoszone przez kończyny górne. Część 1- wymagania ogólne";
[12] PN-EN-ISO–5349-2 „Drgania mechaniczne. Pomiar i wyznaczanie ekspozycji człowieka na drgania mechaniczne przenoszone przez kończyny górne. Część 2 - praktyczne wytyczne do wykonywania pomiarów na stanowiskach pracy";
[13] PN-84/E-02033 „Oświetlenie wnętrz światłem elektrycznym"
[14] PN-EN 12464-1 „Światło i oświetlenie. Oświetlenie miejsc pracy. Część 1: Miejsca pracy we wnętrzach
[15] PN-EN12464-2 „Światło i oświetlenie. Oświetlenie miejsc pracy . Część 2: Miejsca pracy na zewnątrz.
[16] PN-EN ISO 11399 „Ergonomia środowiska termicznego. Zasady i stosowanie związanych norm międzynarodowych"
[17] PN-EN27243 „Środowisko gorące. Wyznaczanie obciążenia termicznego działającego na człowieka podczas pracy oparte na wskaźniku WBGT"
[18] PN-EN ISO 7730 „Środowisko termiczne umiarkowane. Wyznaczanie wskaźnika PMV i PPD oraz określenie komfortu termicznego"
[19] PN-EN ISO11079 „Ergonomia środowiska termicznego. Wyznaczanie i interpretacja stresu termicznego wynikającego z eksploatacji na środowisko zimne z uwzględnieniem izolacyjności cieplnej (IREQ) oraz wpływu wychłodzenia miejscowego

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Occupational Safety and Health and Ergonomics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_ W43	C1	Lec 1	N1-N3, N6
PEK_W02	K_ W43	C2	Lec 3	N1-N3, N6
PEK_W03	K_ W43	C2	Lec 4	N1-N3, N6
PEK_W04	K_ W43	C4	Lec 2	N1-N3, N6
PEK_W05	K _W43	C4	Lec 5	N1-N3, N6
PEK_W06	K _W43	C3	Lec 2, Lec 5	N1-N3, N6
PEK_W07	K_ W43	C4	Lec 5-Lec 8, Lab 1-Lab 7	N1-N6
PEK_W08	K_ W43	C3	Lec 2, Lec 5-Lec 8 Cl 1-Cl 7, Lab 1-Lab 7	N1-N6
PEK_W09	K_ W43	C3	Lec 2, Lec 5-Lec 8 Cl 1-Cl 7, Lab1-Lab 7	N1-N6
PEK_U01	K_ U46	C3, C4, C5	Lec 2, Lec 5	N1-N6
PEK_U02	K _U46	C4	Lec 6-Lec 8 Lab 1-Lab 7	N1-N6
PEK_U03	K_ U46	C3, C4, C5, C6	Lab 1-Lab 7	N1-N6
PEK_U04	K_ U46	C3, C4	Cl 1-Cl 7, Lab1-Lab 7	N1-N6
PEK_U05	K_ U46	C5, C6	Cl 1-Cl 7, Lab 1-Lab 7	N1-N6
PEK_K01	K_ K04	C5, C6	Cl 1-Cl 7, Lab 1-Lab 7	N1-N6

SEMESTER 5

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geodezja Wyższa I
Name in English: Geodesy I
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG5056
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		30		
Number of hours of total student workload (CNPS)	60		60		
Form of crediting	crediting with grade		crediting with grade		
For a group of courses mark (X) for the 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		1		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has knowledge concerning calculus, spherical trigonometry, power series,
2. The student has knowledge concerning the emission of electromagnetic waves, ground gravity
3. The student has knowledge concerning engineering geometry
4. The student has knowledge concerning the accuracy assessment and levelling of geodetic measurements.
5. The student has knowledge of the basic geodetic calculations and measurements.

SUBJECT OBJECTIVES

C1 Presentation of theoretical knowledge in the field of sphere and ellipsoid geometry
C2 Presentation of theoretical knowledge in the field of geodetic astronomy
C3 Acquisition of practical skills in the field of geodesic measurements on a sphere and ellipsoid
C4 Acquisition of practical skills of determining width, length and astronomical azimuth

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student characterises issues concerning sphere and ellipsoid geometry
PEK_W02 The student characterises issues concerning geodetic astronomy

relating to skills:

PEK_U01 The student can perform geodetic measurements on a sphere and ellipsoid
PEK_U02 The student can determine width, length and astronomical azimuth

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Derivation, basic formulas of spherical trigonometry, spherical triangle, spherical excess.	1
Lec 2	Solving geodesic triangles (spherical) using Legendre method, method of additaments and spherical trigonometry.	1
Lec 3	Coordinate systems on ellipsoid. Ellipsoids' geometrical parameters. Normal sections.	1
Lec 4	Calculation the meridian and parallel arc of length. Arbitrary and mutual cross-sections. Determination of ellipsoid's solids (classical method).	1
Lec 5	Geodesic line. Geodesic line equitation, course on ellipsoid.	1
Lec 6	Counting coordinates and azimuth on orthodromic arc, forward and backward task Clark's method.	1
Lec 7	Transferring coordinates and azimuth using power series.	1
Lec 8	Astronomic coordinate systems: equatorial and horizontal. Equatorial triangle.	1
Lec 9	Daily movement of the celestial sphere.	1
Lec 10	Time measurement. Time change.	1
Lec 11	Refraction, aberration, precession, parallax and nutation.	1
Lec 12	Basics of geodesic astronomy.	1
Lec 13	Methods for determination of length, width and astronomical azimuth.	1
Lec 14	Measurement and determination of the azimuth basing on Polaris observation.	1
Lec 15	Repertory. Crediting.	1
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Solving geodesic triangles (spherical) using Legendre method, method of additaments and spherical trigonometry.	2
Lab 2	Transformation of dimensional coordinates B, L, H<->X, Y, Z	2
Lab 3	Normal sections, solving geodetic triangles, geodetic line.	4
Lab 4	Transferring coordinates and azimuth by means of Clarke and Kivioj's method.	4
Lab 5	Coordinate systems: equatorial and horizontal, astronomical year.	2
Lab 6	Equatorial triangle, converting coordinates.	4
Lab 7	Phenomena of daily stars movement, astronomical time, time measurement.	2
Lab 8	Phenomena influencing astronomical observations.	2
Lab 9	Counting the astronomical azimuth basing on Polaris observation.	6
Lab 10	Crediting classes.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem solving lecture. N2. Multimedia presentations. N3. Conduct and preparation of laboratory measurement tasks reports. N4. Duty hours

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at the end of semester)	Educational effect number	Way of evaluating educational effect achievement
F, P	PEK_W01-PEK_W02	F1- written exam grade P1 Final grade from the lecture (weighted mean of F1 - 100%)
F, P	PEK_U01-PEK_U02	F2 Grade from performing a task and a written report F3- written test grade P2 - Final grade from a laboratory (weighted average of F2 - 25% and F3 - 75%)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] „Geodezja wyższa i astronomia geodezyjna", praca zbiorowa. PWN, Warszawa–Wrocław 1981.
[2] „Geodezja wyższa i astronomia geodezyjna — zadania i przykłady", praca zbiorowa. PWN, Warszawa–Wrocław 1988.
[3] K. Czarnecki, „Geodezja współczesna w zarysie". Pub. Gall, Warszawa 2010.
[4] „Niwelacja precyzyjna", praca zbiorowa. PPWK, Warszawa 1993.
[5] J. Kryński, Nowe obowiązujące niebieskie i ziemskie systemy i układy odniesienia oraz ich wzajemne relacje, Pub. IGiK, Warszawa 2004.

SECONDARY LITERATURE:

[1] Aktualne instrukcje i wytyczne techniczne GUGiK, seria G-1 i G-2.
[2] Materiały sympozjów krajowych i zagranicznych od 1985 roku.
[3] Publikacje w geodezyjnych czasopismach periodycznych i nieperiodycznych (np. Zeszyty Naukowe) polskich i zagranicznych od 1985 roku.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Geodesy I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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	Lec 1-Lec 7	N1, N2
PEK_W02	K_W01	C2	Lec 8-Lec 15	N1, N2
PEK_U01	K_U27	C3	Lab 1-Lab 4	N2, N4
PEK_U02	K_U27	C4	Lab 5-Lab 10	N2, N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geodezja Inżynieryjna III
Name in English: Engineering Geodesy III
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG5050
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has knowledge and skills concerning surveying networks levelling.
2. The student has knowledge and skills concerning displacement measurements.
3. The student has knowledge and skills concerning geodesic investment processes

SUBJECT OBJECTIVES

C1 Presentation of knowledge concerning law and geodetic documentation in investment services
C2 Presentation of knowledge concerning real estate management related to linear investments
C3 Presentation of knowledge concerning measurements performance and volume measurements
C4 Presentation of the software used in engineering surveying
C5 Acquisition of skills necessary to prepare surveying -cartographic documentation related to geodetic investment service
C6 Acquisition of skills concerning complex study of displacement measurements of engineering objects
C7 Acquisition of skills to use surveying and numerical measurements of a terrain model to calculate the volume

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student characterises issues concerning law and geodetic documentation in investment services

PEK_W02 The student characterises issues concerning real estate management related to linear investments

PEK_W03 The student characterises issues concerning measurements performance and volume measurements

PEK_W04 The student can characterise software which is used in engineering surveying

relating to skills:

PEK_U01 The student can prepare surveying -cartographic documentation related to geodetic investment service

PEK_U02 The student can develop displacement measurements of engineering objects

PEK_U03 The student can count volumes.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Realisation stages in investment processes Building Law.	2
Lec 2	Maps used in an investment process. Rules of map performance for design.	2
Lec 3	Rules of industry interviews' conducting. Documentation Coordination Office - its role in realisation of technical infrastructure projects	2
Lec 4	Surveying development of investment projects. General Plan.	2
Lec 5	Rules of asiding lands for non-agricultural and non-forest purposes. Procedures for excluding land from agricultural or forestry production.	2
Lec 6	Real estate acquisition for roads construction.	2
Lec 7	Surveying works concerning measurements performance and volume measurements Mass balance.	2
Lec 8	Overview of the software used in engineering surveying	1
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Surveying development of the General Plan.	2
Lab 2	The rules for creating documentation of industry interviews.	2
Lab 3	Creating surveying-cartographic documentation for design purposes.	2
Lab 4	Creating surveying-cartographic documentation for real estate acquisition for roads construction.	2
Lab 5	A comprehensive study of measurements and determination of cooling chimneys displacements.	4
Lab 6	A comprehensive study of measurements and determination of dams' displacements.	4
Lab 7	A comprehensive study of measurements and determination of landslips displacements.	4
Lab 8	Creating cross-and longitudinal sections on the basis of measurements and numerical terrain model - work with specialized software.	4
Lab 9	Volume counting. Mass balance calculations - work with specialized software.	2
Lab 10	Development of the measurements results of bottom depth of a water tank - work with specialized software.	4
	Total hours	**30**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem solving lecture. N2. Multimedia presentations. N3. Preparing own written semester work on a given topic. N4. Conduct and preparation of exercises reports. 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
F, P	PEK_W01-PEK_W04	P1.Final grade of written test. F2 Grade from a semester written test. P1 Final grade from the lecture (weighted mean of F1 - 80% and F2 - 20%)
F, P	PEK_U01-PEK_U03	F3 Grade from performing a task and a written report F4- written test grade P2 - Final grade from a laboratory (weighted average of F3 - 50% and F4 - 50%

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Witold Prószyński, Mieczysław Kwaśniak, Podstawy geodezyjnego wyznaczania przemieszczeń. Pojęcia i elementy metodyki, Oficyna Wydawnicza Politechniki Warszawskiej, 2006.

[2] Jan Gocał, Geodezja inżynieryjno-przemysłowa cz. II, AGH Publishing, 2009.

[3] Praca zbiorowa – „Geodezja Inżynieryjna" t. 1, 2 i 3, Pub. PPWK, Warszawa 1993-1994.

SECONDARY LITERATURE:

[1] Praca zbiorowa pod redakcją F. Roli – „Geodezja inżynieryjno-przemysłowa", wykłady cz. I, II i III, skrypt AGH Kraków 1985.

[2] Praca zbiorowa pod redakcją J. Ponikowskiego – „Ćwiczenia z geodezji inżynieryjno-przemysłowej", cz. I, II i III, Pub. PPWK Warszawa 1972.

[3] K. Kamieńska-Czyż, M. Pekalski – „Wybrane działy geodezji inżynieryjnej", Pub. Politechniki Warszawskiej Warszawa 1982.

[4] T. Lazzarini – Geodezyjne pomiary przemieszczeń budowli i ich otoczenia", Pub. PPWK Warszawa 1979.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Engineering Surveys
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W17	C1	Lec 1-Lec 4	N1, N2
PEK_W02	K_W17	C2	Lec 5-Lec 6	N1, N2
PEK_W03	K_W12	C3	Lec 7	N1, N2
PEK_W04	K_W12	C4	Lec 8	N1, N2,N3
PEK_U01	K_U19	C5	Lab 1-Lab 4	N2, N4
PEK_U02	K_U26	C6	Lab 5-Lab 7	N2, N4
PEK_U03	K_U21	C7	Lab 8-Lab 10	N2, N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Systemy Informacji Geograficznej II
Name in English: Geographic Information Systems II
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG5058
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student knows the basic concepts of geographic information systems,
2. The student can distinguish and describe models of real world representation and digital methods of spatial data recording,
3. The student knows and is able to apply basic methods of spatial analysis to solve some tasks in the environment of geographical information systems
4. The student can build, supply and manage spatial databases
5. The student can graphically demonstrate and interpret the results of spatial analysis

SUBJECT OBJECTIVES

C1 Presentation and architecture analysis and the standards of spatial information systems construction;
C2 Characterization of national spatial data infrastructure and geospatial network services Inspire, OGC
C3 Presenting examples of geo-information systems in public administration and enterprises
C4 Acquisition of skills in GIS tools to solve some planning problems and analysis of phenomena and processes occurring in space regardless of hardware platform
C5 Creating ability to perform spatial analysis using raster calculator
C6 Understanding the principles of design and geoinformation systems construction using network services

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student can distinguish ad describe architecture and the standards of spatial information systems construction;

PEK_W02 The student can characterise the national spatial data infrastructure and geospatial network services Inspire, OGC

PEK_W03 The student knows examples of construction and implementation of geo-information systems in public administration and enterprises

relating to skills:

PEK_U01 The student can use GIS tools to solve some planning problems and analysis of phenomena and processes occurring in space regardless of hardware platform

PEK_U02 The student performs advanced spatial analysis including a raster calculator

PEK_U03 The student can design and build geoinformation systems including network services

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Syllabus, conditions of crediting, literature, semester's project Geoinformation infrastructures. Spatial Information Infrastructure (SII)	2
Lec 2	Network service. Geospatial service.	2
Lec 3	Network services OGC (Open Geospatial Consortium). Network services INSPIRE	2
Lec 4	Geoinformation metadata.	2
Lec 5	Spatial database harmonization. Introduction to application schemas	2
Lec 6	Strategy of geo-information systems implementation in public administration and enterprises Geoinformation systems in enterprises and administration functioning. Public geoinformation systems.	2
Lec 7	Supporting decision with GIS. Development scripts. Examples.	2
Lec 8	Repertory.	1
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Presentation of the scope of practice, crediting conditions and literature. Introduction to Quantum GIS programme.	2
Lab 2	Supporting taking decisions (optimal localisation of an investment). Spatial database construction.	2
Lab 3	Supporting taking decisions (optimal localisation of an investment). Preparing data for analysis. Performing spatial analysis	2
Lab 4	Supporting taking decisions (optimal localisation of an investment). Record of model spatial analysis in a scripting language and graphic interface	2
Lab 5	Supporting taking decisions (optimal localisation of an investment). Results presentation in cartographic form and a report	2
Lab 6	Construction of geoinformation systems. Geoportal	2
Lab 7	Construction of geoinformation systems. Publication of spatial data using geospatial Web services - data preparation for publication	2
Lab 8	Construction of geoinformation systems. Publication of spatial data using	2

	geospatial Web services - data preparation	
Lab 9	Construction of geoinformation systems. Preparing geoinformation system using Web services WMS and WFS	2
Lab 10	Raster analysis. Introduction to maps algebra language (raster calculator)	2
Lab 11	Raster analysis. Analysis of decrease of visibility and surface exposure using raster calculator	2
Lab 12	Raster analysis. Path of the lowest cost	2
Lab 13	Raster analysis. Surface interpolation (variable) based on discrete data.	2
Lab 14	Raster analysis. Visualization of the analysis results in 3D	2
Lab 15	Reports grade of performed laboratory research. Test.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem solving lecture. N2. Multimedia presentations. N3. Preparing own written semester work on a given topic. N4. Conduct and preparation of laboratory tasks reports. 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
F, P	PEK_W01-PEK_W03	P1.Final grade of written test. F2 Grade from a semester written test. P1 - Final grade from a lecture (weighted average of F1 - 80% and F2 - 20%)
F, P	PEK_U01-PEK_U03	F3 Grade from performing a task and a written report F4- written test grade P2 - Final grade from a laboratory (weighted average of F3 - 80% and F4 - 20%).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Kubik T., 2009: GIS. Rozwiązania sieciowe, Naukowe PWN Publishing, Warszawa;
[2] Longley P. A., Goodchild M. F., Maguire D. J., Rhind D. W.: GIS. Teoria i praktyka. Naukowe PWN Publishing, Warszawa 2006;
[3] Gaździcki J., 2010: Leksykon geomatyczny. Wydanie internetowe.@ http:// http://ptip.org.pl/;
[4] Ustawa z dnia 4 marca 2010 roku o infrastrukturze informacji przestrzennej, Dziennik Ustaw nr 76, poz. 489;
[5] Dyrektywa 2007/2/WE Parlamentu Europejskiego i Rady z dnia 14 marca 2007 r. ustanawiająca infrastrukturę informacji przestrzennej we Wspólnocie Europejskiej (INSPIRE), Dziennik Urzędowy Unii Europejskiej 25.4.2007, L 108/1

SECONDARY LITERATURE:

[1] Gotlib D., Iwaniak A., Olszewski R., 2007: GIS. Obszary zastosowań, Wydaw. Naukowe PWN, Warszawa;
[2] Heywood I., Cornelius S., Carver S., 2006: An Introduction to Geographical Information Systems, 3rd Edition, Pearson – Prentice Hall;
[3] Kennedy M., 2009: Introducing Geographic Information Systems with ArcGIS: A Workbook Approach to Learning GIS, Second Edition, John Wiley and Sons;
[4] Longley P. A., Goodchild M. F., Maguire D. J., Rhind D. 2011: Geographic Information Systems and Science, John Wiley & Sons;
[5] Geodeta. Magazyn geoinformacyjny;
[6] Geoforum – portal internetowy @ http://geoforum.pl;
[7] GISPlay – portal geoinformacyjny @ http://geoforum.pl;
[8] INSPIRE Forum, INSPIRE Network Services Tutorial @ http://inspire-forum.jrc.ec.europa.eu/pg/pages/view/87055/inspire-network-services-tutorial;
[9] Kwartalnik Arkana GIS. Magazyn dla użytkowników oprogramowania ESRI;
[10] Magazyn informacyjny ArcNews;
[11] Open Geospatial Consortium, OGC Standards, @http://www.opengeospatial.org/standards
[12] Roczniki Geomatyki – Zeszyty Naukowe Polskiego Towarzystwa Informacji Przestrzennej;

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Geographic Information Systems II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W18	C1	Lec 1-Lec 2, Lec 4	N2
PEK_W02	K_W18	C2	Lec 3, Lec 5	N1, N2
PEK_W03	K_W18	C3	Lec 6-Lec 7	N2, N3
PEK_U01	K_U20	C4	Lab 1-Lab 5	N4
PEK_U02	K_U20	C5	Lab 10-Lab 15	N4
PEK_U03	K_U20	C6	Lab 6-Lab 9, Lec 3, Lec 6	N3, N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geodezja Górnicza
Name in English: Mining Surveying
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG5055
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has basic knowledge concerning mathematical analysis necessary to understand mathematical issues of engineering character.
2. The student has an elementary knowledge of the wider issues of underground mining as one of the most important areas of technical and human economic activity
3. The student has basic knowledge of engineering geodesy, satellite, cartography and IT

SUBJECT OBJECTIVES

C1 The course aims to familiarize students with the legal requirement of geodetic activities within a mine.

C2 Acquisition of knowledge concerning the specific nature and role of geodetic measurements which are held underground and in an open-cast pit.

C3 Mastering the ability to create and use basic documentation, in particular measuring analogue and digital maps in underground mines and open-cast pits. Acquiring the ability to design engineering issues and to conduct geodetic measurements associated with rational and safe economy of deposit.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has basic knowledge concerning legal conditions of mining geodesy functioning within mine geodesy within the mine's activity, its role and responsibilities arising from rational and safe management of deposit.

PEK_W02 The student has necessary knowledge concerning kind of geodetic measurements, their accuracy and ways of documenting.

PEK_W03 The student has knowledge concerning designing countershafts works connecting mining excavations in order to reach the deposit and prepare it for excavation.

relating to skills:

PEK_ U01 The student can individually and in a team perform surveying measurements in underground mine excavations and in open-cast pits, to prepare documents and to mark excavation work progress and also control the geometric condition of machines and mining equipment.

PEK_ U02 The student has the ability to design countershafts issues and their implementation in connection to mining works.

relating to social competences:

PEK_K01 The student is aware of the importance and role of mine surveying in proper mine functioning

PEK_K02 The student can use and share his knowledge at the stage of design of mining excavations in the context of a systematic and safe deposit management

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Legal basis, role and tasks of the surveyor department in underground mines and open-cast pits, legal conditions.	2
Lec 2	Mining maps. Ways of formation, update, division and completing the maps.	2
Lec 3-4	Elevation and horizontal orientation of underground mines.	4
Lec 5	Situational and high geodetic control networks in open-cast and underground mining.	2
Lec 6	Measuring output control in underground and in open-cast mines.	2
Lec 7-8	Countershafts issues, conducting mining excavations, special measurements.	3
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Presentation of the scope of classes, crediting conditions. Familiarising with the specific content and the markings on mining maps, learning how to read a map and overview of Polish standards.	2
Lab 2	Elevation orientation of underground excavations. Preparatory works, simultaneous measurement of the two teams on the surface and at oriented level.	2
Lab 3	Individual performance of benchmarks calculations at the oriented level with the accuracy analysis, development of geodetic report.	2
Lab 4	Horizontal orientation of underground excavations. Preparatory works, simultaneous measurement of the two teams on the surface and at oriented level by means of Weisbach method.	2
Lab 5	Individual performance of coordinates calculations of selected points of mining	2

	control network at oriented level.	
Lab 6	Accuracy analysis of horizontal orientation measurements and the development of geodetic report.	2
Lab 7	Situational measurement of mining matrix. Measurement of angles and side lengths of hanging traverse in relation to designated points of horizontal orientation.	2
Lab 8	Performing calculations of traverse coordinates together with the accuracy analysis. Performing a geodetic report.	2
Lab 9	Elevation measurement of mining matrix. Levelling measurements of elevation matrix control points in relation to the benchmarks designated by means of elevation orientation.	2
Lab 10	Performing elevation calculations of elevation matrix together with the accuracy analysis. Performing a geodetic report.	2
Lab 11	Measuring output control on the example of open-cast coal mine. On the numerical map designation of sites and the development of vertical intersections.	2
Lab 12	Determination of the intersection surface by mechanical method using digital planimeters and analytical method.	2
Lab 13	Performing calculations of the amount of the removed barren rock and coal extracted in total and during the reporting period. Performing a geodetic report.	2
Lab 14	Breaking project development - simple and complex countershaft. Determination of circular arc countershaft elements (vertex, starting and finishing point of the circular arc of a given radius), designation of length and angle to keep the circular excavation.	2
Lab 15	Determination of angles and lengths to conduct excavations in simple countershaft. Preparing a countershaft a drawing. Preparing a geodetic report.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem solving lecture. N2. Multimedia presentations with the usage of audio-visual equipment N3. 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
P1	PEK_W01-PEK_W03	passing final written test from the given scope of material
P2	PEK_U01-PEK_U02	F1 Grade from performing and merits of exercises F2- Grade from defence (presentation) matters contained in the geodesic report P2 - Final grade from classes (weighted average of F1 - 70% and F2 - 30%)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Zygmunt Kowalczyk: Miernictwo górnicze cz. 1 „Pomiary sytuacyjno-wysokościowe kopalń". Śląsk Katowice Publishing 1968;
[2] Zygmunt Kowalczyk: „Orientacja kopalń" Śląsk Katowice Publishing 1965;
[3] Ustawa z dnia 4 lutego 1994 roku. Prawo geologiczne i górnicze (Dz. U. Nr 27, poz. 96 z późniejszymi. zmianami.),
[4] Rozporządzenie Ministra Gospodarki z dnia 19 czerwca 2002 roku w sprawie dokumentacji mierniczo-geologicznej (Dz. U. Nr 92, poz. 819),
[5] Polskie Normy,
[6] Włodzimierz. Kiełbasiewicz Ćwiczenia z miernictwa górniczego i ochrony terenów w górnictwie, Skrypt PWr.1979r.

SECONDARY LITERATURE:

[1] Poradnik Górnika Tom 1.
[2] Dni Miernictwa Górniczego i Ochrony Terenów Górniczych. Prace naukowe GIG. Seria: Konferencje. GIG Katowice Publishing
[3] Przegląd Górniczy, Miesięcznik, Pub. 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:
[6] Ustawa o ochronie i kształtowaniu środowiska z 31 stycznia 1980 roku (tekst jednolity Dz.U. z 1994r. Nr 49 poz. 196)
[7] 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
geodesy and cartography

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_W19	C1, C2	Lec 1-Lec 8	N1, N 2
PEK_U01 PEK_U02	K_U01	C3	Lab 1-Lab 15	N1, N 3
PEK_K01 PEK_K02	K_K07	C1-C3		

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Hydrogeologia
Name in English: Hydrogeology
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GEG5010
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

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

SUBJECT OBJECTIVES

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

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

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

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

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

PEK_W04 The student has general knowledge concerning groundwater protection and contamination, as well as concerning risks associated with groundwater flow and water table lowering.

relating to skills:

PEK_U01 The student can mark basic hydrogeological rocks properties and to evaluate their accuracy.

PEK_U02 On the basis of hydrogeological rocks properties the student can evaluate their abilities to gather, conduct and deliver water by a rock.

PEK_U03 The student can, using analytical methods, predict flows to a well and depression cone formation for simple waterside conditions.

PEK_U04 The student can estimate the amount of subsidence associated with groundwater table lowering.

relating to social competences:

PEK_K01 The student can work in team and together prepare and conduct a task of hydrogeological rocks properties and to prepare the achieved results and to present the effects of the conducted research as a team paper report.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Subject's programme, conditions of crediting, literature Groundwater as part of the hydrosphere.	1
Lec 2	Water properties. Waters in aeration and saturation area. Genesis and age of groundwater.	1
Lec 3	Hydrogeological rocks properties.	1
Lec 4	Dependence of water appearance on geological structure. Groundwater division. Fluctuations and measurement of groundwater level. Springs.	2
Lec 5	Basic law of groundwater movement. Flow theories. Groundwater flow equations.	1
Lec 6	Analytical solutions for the chosen flow tasks and depression cone formation.	2
Lec 7	Water intakes. Groundwater and mining.	1
Lec 8	Mining drainage methods. New and traditional geophysics methods in hydrogeological research.	2
Lec 9	Physical and chemical properties of groundwater. Medicinal water.	1
Lec 10	Groundwater resources and their protection. Water endangers - recognition and counter action. Running sand phenomenon, suffosion, soil expansion, land yielding associated with groundwater table lowering.	2
Lec 11	Hydrogeological documentation. Water in law system.	1
	Total hours	**15**

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

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

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

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

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

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

SECONDARY LITERATURE:

[1] Bieniewski J., Odwadnianie kopalń, Pub. Pol. Wroc., Wrocław 1983.
[2] Jordan H. P., Kleczkowski A. S., Silar J., Szestakow W. M., Witczak S., Ochrona wód podziemnych , Geol.Publishing, Warszawa 1984,
[3] Kulma R., Podstawy obliczeń filtracji wód podziemnych, AGH Publishing Kraków 1995,
[4] Macioszczyk A., Hydrogeochemia, Pub. Geol., Warszawa 1987,
[5] Wacławski M., Geologia inżynierska i hydrogeologia, część II – Hydrogeologia, Pub. Zakł. Graficzne Politechniki Krakowskiej 1995.
[6] Rogoż M., Hydrogeologia kopalniana z podstawami hydrogeologii ogólnej, Katowice, Główny Instytut Górnictwa 2004.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Hydrogeology
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF **STUDY**
geodesy and cartography

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W30	C1, C2	Lec 1, Lec 2, Lec 9, Lec 10	N1
PEK_W02	K_W30	C3	Lec 3, Lec 7, Lab 1-Lab 8	N1, N5
PEK_W03	K_W30	C4	Lec 5	N1
PEK_W04	K_W30	C5	Lec 4, Lec 10, Lec 11	N1
PEK_U01	K_U33	C3	Lec 3 Lab 2-Lab 7	N1, N5
PEK_U02	K_U33	C3, C5	Lab 2, Lab 3, Lab 8, Lab 11	N1
PEK_U03	K_U33	C4	Lec 6, Lab 7	N1, N5
PEK_U04	K_U33	C5	Lec 10, Lab 5, Lab 7	N1, N5
PEK_K01	K_K04		Lab 2-Lab 7	N2-N5

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geotechnika
Name in English: Geotechnics
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GHG0115
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has basic knowledge concerning complex numbers, polynomials, matrix algebra for solving linear equations systems, analytic geometry on a surface and in space, and conic sections (symbol K_W35, educational effects OT1A_W01, OT1A_W07)
2. The student has basic knowledge concerning functions properties (trigonometric, power, exponential, logarithmic, cyclometric and inverse to them), advanced calculus and indefinite integrals of one variable function, which is necessary for the understanding of the essence of engineering sciences (symbol K_W36)
3. The student has basic knowledge concerning definite integral and improper integral, advanced calculus of many variables function, double and triple integral, numerical and integral series which is necessary for the understanding of mathematical issues in engineering sciences (symbol K_W36, educational effects OT1A_W01, OT1A_W07)
4. The student has basic knowledge concerning genesis, appearance and groundwater movement

SUBJECT OBJECTIVES

C1 Introduction to the basics concerning mechanics of soils and rocks including: the basic concepts of geotechnical engineering, GIS techniques to create three-dimensional geological model, description of stresses and strains, groundwater flow, consolidation theory, stability of slopes and stability of land filtering

C2 Practical learning of solving geotechnical issues by numerical methods including: creating a spatial numerical geological model, solving groundwater flow and consolidation by finite element method, calculation of slope stability.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has to learn the basics of rock and soil mechanics including geological spatial modelling, numerical modelling of groundwater flow and land consolidation, calculation of slope stability and the stability of land filtering

PEK_W02 The student has to acquaint with the methods of creating numerical maps and methods of generating digital terrain model and footwalls of particular geological layers and how to create a dimensional geological model

PEK_W03 The student has to master methods of rock and soils mechanics in civil and water engineering, mining and environmental protection

relating to skills:

PEK_U01 The student can independently perform dimensional numerical map and a footwall map of particular geological layers and on this basis generate a dimensional numerical geological model of considered area in MicroStation and in InRoads and generate and geological and hydro-geological intersections

PEK_U02 The student can independently create scripts for calculations using FEM method containing groundwater flow including calculations in the field of water table or isometric pressures surface, power link, velocity vector field, soil stability filter

PEK_U03 The student can create a script for the calculation of land consolidation based on Biot Darcy model and interpret the calculations results in the state of soil stress and deformation of, yield potential, displacement of porous centre

relating to social competences:

PEK_K01 The student understands the need and knows the possibilities of lifelong learning (II and III degree studies, postgraduate courses), improving professional, personal and social skills in geology, rock and soil mechanics

PEK_K02 The student has the skills for practical choice of methods and can use techniques for deformation monitoring in mining and civil engineering

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Basic concepts concerning geotechnics (the essence of scientific and technical disciplines, interdisciplinary links, fragmentation, multicomponent structure, the effect of liquid element), rocks and soil physical properties	2
Lec 2	Application of GIS technique in geotechnical engineering, creation of spatial geological model based on the NMT technique	2
Lec 3	Description of stresses and strains, isotropic and anisotropic elastic body model, simple examples of solutions for the elastic half-plane and half-space	2
Lec 4	Basic issues of soil mechanics: land rheological properties, distribution of stresses and strains in the soil, stability issues in soil mechanics, the theory of consolidation	2
Lec 5	Basic concepts of rock mechanics: rocks rheological properties, in situ rock mass condition, rock mechanics engineering issues	1
Lec 6	The theory of filtration and land consolidation, modelling of flow through porous media, two-phase medium distortion, filter stability of land	2
Lec 7	Methods of slope stability calculations, Coulomb - Mohr's condition, other conditions of borderline, stability calculation methods, methods of soils and rocks reinforcement	2
Lec 8	Crediting test	2
	Total hours	**15**

Form of classes - laboratory		Number of hours
Lab 1	Introductory information for laboratory classes	1
Lab 2	Introduction to the construction of a geological dimensional model in MicroStation and InRoads tools: construction of three-dimensional numerical terrain map, NMT in MicroStation and InRoads tools	2
Lab 3	Construction of numerical geological model by the creation of NMT particular footwall of geological layers	2
Lab 4	Application of a method of finite differences and finite elements for solving rock and soil mechanics	2
Lab 5	Using FlexPDE v software. 6 for solving the issues of groundwater flow using FEM calculation of filter stability measurements	2
Lab 6	Creating a geological intersections together with the calculated levels of groundwater in InRoads tools	2
Lab 7	Slope stability calculation with the usage of Fellenius method	2
Lab 8	Land consolidation measurements	2
	Total hours	**15**

TEACHING TOOLS USED
1. Computers on classes with MicroStation and InRoads software 2. Laptop on lectures with Power Point software

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_W01, PEK_W03	Achieving a grade -performing measurements concerning the stability of slopes with the usage of Fellenius method and determining methods of land reinforcement
F2	PEK_W02 , PEK_U01	Achieving a grade - performing a dimensional numerical map and land numerical model and geological numerical model and geological intersections
F3	PEK_W01, PEK_W02, PEK_U02, PEK_U03	Achieving a grade - performing numerical calculations concerning groundwater flow, land consolidation and the potential yield P1 (mean of F1, F2, F3)
P2 Written test from the lecture		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Kisiel (red.), W. Derski, R. Izbicki, Z. Mróz: Mechanika Techniczna, Mechanika skał i gruntów, PWN, Warszawa 1982

[2] T. Strzelecki (red.), S. Kostecki, S. Żak: Modelowanie przepływów przez ośrodki porowate, DWE, Wrocław, 2008

[3] E. Dembicki, A. Tejchman: Wybrane zagadnienia fundamentowania budowli hydrotechnicznych, PWN pub. II, Warszawa, 1981

SECONDARY LITERATURE:

[1] J. Bear, Y Bachmat: Introduction to Modeling of Transport Phenomena in Porous Media, Kluwer, Amsterdam, 1990

[2] B. Wosiewicz, Z. Sroka: Komputerowe obliczanie filtracji, WNT, Warszawa, 1992

[3] Instrukcja programu FLEX PDE v.6 : FlexPDE Reference, http://www.pdesolutions.com, 2012

[4] Instrukcja programu MicroStation i InRoads: Bentley Systems, SELECT Server: selectserver.bentley.com

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Geotechnics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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, K_U34, K_U35, K_K01, K_K09	C1	Lec 1, Lec 3, Lec 4, Lec 5, Lec 7, Lab 3, Lab 4, Lab 5, Lab 6, Lab 7	N1, N2
PEK_W02	K_W32, K_U35, K_U36, K_K01, K_K09	C2	Lec 2, Lab 1, Lab 2, Lab 5	N1, N2
PEK_U01	K_W32, K_U35, K_U36, K_K01, K_K09	C2	Lec 2, Lab 1, Lab 2, Lab 5	N1, N2
PEK_U02	K_W31, K_U34, K_U36, K_K01, K_K09	C1	Lab 3, Lab 4	N2
PEK_U03	K_W31, K_U34, K_U36, K_K01, K_K09	C1	Lec 3, Lec 4, Lec 6, Lab 7	N1, N2
PEK_K01	K_W31, KW_32, K_U34, K_U35, K_U36	C1, C2	Lec 1, Lec 2, Lec 4, Lec 5, Lec 6	N1
PEK_K02	K_W31, KW_32, K_U34, K_U35, K_U36	C1, C2	Lec 1, Lec 2, Lec 4, Lec 5, Lec 6	N1

FACULTY OF ENGNEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Budownictwo Ogólne
Name in English: General Structural Engineering
Main field of study: Geodesy and Cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: IBG000115
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15	15			
Number of hours of total student workload (CNPS)	30	30			
Form of crediting	crediting with grade	crediting with grade			
For group of courses mark (X) final course					
Number of ECTS points	1	1			
including number of ECTS points for practical (P) classes		0,3			
including number of ECTS points for direct teacher-student contact (BK) classes	0,7	0.6			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has necessary knowledge of modern building materials as well as the rules and processes of their production.
2. Possesses knowledge in the field of general mechanics, material resistance and general rules of building construction.
3. Is well aware of the common rules of descriptive geometry and technical drawing concerning creating and reading architectural, building and geodetic drawings with the use of CAD. Has the ability to draw technical drawing with the assist of computer programs.

SUBJECT OBJECTIVES

C1. Familiarizing students with basic rules of designing and creating basic construction elements of buildings erected with the use of traditional methods such as: foundations, bricklaying, ceiling and rafter framing.
C2. Familiarizing students with technological-design solutions which are used in modern systems of multi-family building.
C3. Obtaining (by students) the ability to use and record technical documentation.
C4. Improving the ability to work as a member of a team and becoming aware of constant need of expanding one's knowledge in the field of modern design technologies of erecting multi-family buildings and ways of improving them.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Knows and understands notions and terminology in the field of general building engineering. Possesses knowledge of types of constructional systems and the rules of creating basic construction elements such as: foundations, bricklaying, ceiling and rafter framing

PEK_W02 Knows and understands the rules of designing and constructing multi-storey buildings (monolithic and prefabricated).

relating to skills:

PEK_U01 Is able to design a project of land development and chosen technical drawing documentation of a small-scale building constructed in a traditional fashion.

PEK_U02 Is able to characterize and calculate basic construction blue-prints.

relating to social competences:

PEK_K01 Is able to work on a given problem alone or as a part of a team.

PEK_K02 Is aware of necessity to expand his/her knowledge in the field of traditional design approach as well as modern technologies of erecting multi-storey buildings.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Introduction, presentation of the rules governing the course. Land development plans. Situating the building on a construction site. Construction lines and structural building modules. Rules of scaling a technical drawing.	2
Lec 2	Earthworks engineering, frame and wall house foundations.	2
Lec 3	Types of beam-frame and brick constructions in traditional house building.	4
Lec 4	Basic characterization of wooden roof and flat-roof construction.	2
Lec 5	General characterization of large panel welfare buildings in Poland on the example of W-70, W_k-70 and WWP systems.	2
Lec 6	Characteristics of modern systems of erecting large panel concrete monolithic buildings on an example of DOKA and PERI systems.	2
Lec 7	Final test	1
	Total hours	**15**

Form of classes - class		**Number of hours**
Cl 1	Overview of the scope of the curriculum, orientation, schedule and credit. Overview and give out of exercises.	2
Cl 2	Overview of the rules of situating the building on a construction site and situational view of the technical drawing.	2
Cl 3	Overview of the rules of dimensioning of a technical drawing..	2
Cl 4	Exercise evaluation nr 1	2
Cl 5	Overview of methods of designing the ground floor in buildings erected using traditional methods.	2
Cl 6	Overview of constructing wooden rafter framing.	2
Cl 7	Exercise evaluation nr 2.	2
Cl 8	Final test	1
	Total hours	**15**

TEACHING TOOLS USED	
N1.	Lecture: the contents of the lecture shall be presented in the form of multimedia presentations, didactic films and white board.
N2.	Exercises: Compiling selected technical drawings along with their scaling
N3.	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
F1	PEK_U01, PEK_U02, PEK_K01, PEK_K02	Exercise evaluation no 1
F2	PEK_U01, PEK_U02, PEK_K01, PEK_K02	Exercise evaluation no 2
P1 = 0,50 x F1 + 0,50 x F2		
P2	PEK_W01, PEK_W02	Grade based on a final test evaluation

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Żenczykowski W., Budownictwo Ogólne, Tom II/1 i II/2, Elementy i konstrukcje budowlane, Arkady, Warszawa, 1990.

[2] Schabowicz K., Gorzelańczyk T., Materiały do ćwiczeń projektowych z budownictwa ogólnego, DWE, Wrocław 2009.

[3] Praca zbiorowa pod kierunkiem Wiesława Buczkowskiego, Budownictwo ogólne T.4. Konstrukcje budynków, Arkady, Warszawa 2009.

[4] Pyrak S., Włodarczyk W., Posadowienie budowli, konstrukcje murowe i drewniane, WSiP, Warszawa 2011.

[5] Dzierżewicz Z., Staropolski W., Systemy Budownictwa Wielkopłytowego w Polsce w latach 1970-1985, Wolters Kliwer, 2010.

SECONDARY LITERATURE:

[1] Rozporządzenie Ministra Infrastruktury z dnia 12 kwietnia 2002 r. w sprawie warunków technicznych, jakim powinny odpowiadać budynki i ich usytuowanie, Dz. U. nr 75 z dnia 15 czerwca 2002 r., poz. 690, z późniejszymi zmianami.

[2] Praca zbiorowa, Nowy poradnik majstra budowlanego, Warszawa, Arkady 2011,

[3] Michalak H., Pyrak S., Domy jednorodzinne. Konstruowanie i obliczanie, Arkady, Warszawa 2006.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
General Structural Engineering
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W08, K_W33,	C1-C2	Lec 1-Lec 4	N1, N3
PEK_W02	K_W08, K_W33,	C1-C2	Lec 5-Lec 6	N1, N3
PEK_U01	K_U35, K_U36, K_U47,	C3-C4	Ćl 1-Ćl 7	N2, N3
PEK_U02	K_U35, K_U36, K_U47,	C3-C4	Ćl 1-Ćl 7	N2, N3
PEK_K01	K_K04, K_K06,	C3-C4	Cl 2-Cl 7	N1, N2
PEK_K02	K_K01, K_K06,	C4	Lec 1-Lec 6 Cl 1-Cl 7	N1, N2

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Inżynieria Lądowa
Name in English: Civil Engineering
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: BDG5010
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	1			1	
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				1	
including number of ECTS points for direct teacher-student contact (BK) classes	0.7			0.7	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge concerning CAD programs.
2. Ability to use from technical rules and requirements
3. Knowledge of basic rules of projects documentation performance

SUBJECT OBJECTIVES

C1. Acquiring knowledge concerning design of the transport infrastructure elements in the plan and longitudinal and cross sections.
C2. Ability to prepare basic project documentation.
C3. Ability to cooperate in project team.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student knows the basic principles of elements design of the transport infrastructure.

PEK_W02 The student knows how to prepare project documentation.

relating to skills:

PEK_U01The student can use computer applications and technical rules to design transport infrastructure.

PEK_U02 The student can design selected road elements.

relating to social competences:

PEK_K01The student can work individually and in a team to solve a project issue.

PROGRAMME CONTENT

Form of classes - lecture		**Number of hours**
Lec 1	Introduction. Characteristics of transport infrastructures in civil engineering. Division and classification. (The history of the automotive industry).	2
Lec 2	Policy of routing elements of transport infrastructure in the plan, taking into account terrain and spatial development.	2
Lec 3	Elements and principles of vertical alignment design. Rules of designing vertical arcs.	2
Lec 4	Elements of road longitudinal section. Traffic capacity of urban roads. Principles of cross-sectional surface. Development of escarpments, excavations and embankments.	2
Lec 5	Materials and road surfaces. Designing a road construction.	2
Lec 6	Urban roads crossroads - division, characteristics, designing rules.	2
Lec 7	Engineering facilities - characteristics and principles of design. Elements of visualisation in designing transport infrastructure elements. Summary of the lectures.	2
Lec 8	Crediting.	1
	Total hours	**15**

Form of classes - project		**Number of hours**
Proj 1	Modelling and traffic prediction, selection of speed design and basic geometrical parameters of a cross-section.	2
Proj 2	Urban road routing, drawing in 1:5000 scale.	2
Proj 3	Designing a road in cross-section. Drawing of a cross-section, 1:500/5000 scale.	2
Proj 4	Checking the cross-section working life and PSR determination and bandwidth (urban road, a segment between sections - the base year and the horizon + 15 years), drawings of two normal sections (straight and arc), 1:50 scale.	2
Proj 5	Selection of a road construction.	2
Proj 6	Conception of urban crossroad - 1:500 scale.	2
Proj 7	Rules how to prepare design documentation. Summary of the classes.	2
Proj 8	Crediting.	1
	Total hours	**15**

TEACHING TOOLS USED
N1. Informative lecture, multimedia presentation, problematic lecture. N2. Project's presentation, duty hours, problematic discussion.

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 (project)	PEK_W01, PEK_U01, PEK_U02, PEK_K01	Activity and work progress while classes
F2 (project)	PEK_W01, PEK_U01, PEK_U02, PEK_K01	Project
P = 0.4xF1+0.6xF2		
P (lecture)	PEK_W01, PEK_W02,	crediting test

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Rozporządzenie Ministra Transportu i Gospodarki Morskiej z dnia 2 marca 1999 r. w sprawie warunków technicznych jakim powinny odpowiadać drogi publiczne i ich usytuowanie. Dz.U.99.43.430 [2] Rozporządzenie Ministra Transportu i Gospodarki Morskiej z dnia 30 maja 2000 r. w sprawie warunków technicznych jakim powinny odpowiadać drogowe obiekty inżynierskie i ich usytuowanie. Dz.U.00.63.735. [3] Rozporządzenie Ministra Infrastruktury z dnia 3.07.2003 r. w sprawie szczegółowego zakresu i formy projektu budowlanego . Dz.U.03.120.1133. Zmiany: Dz.U.08.201.1239 (Dz.U.08.228.1513) [4] J. Sysak „Drogi kolejowe". PWN Warszawa, 1985 [5] Z. Szling, Winter J., Drogi wodne śródlądowe. Skrypt Politechniki Wr., Wrocław, 1988 **SECONDARY LITERATURE:** [1] Rozporządzenie Ministrów Infrastruktury z dnia 3 lipca 2003 r. w sprawie szczegółowych warunków technicznych dla znaków i sygnałów drogowych oraz urządzeń bezpieczeństwa ruchu drogowego i warunków ich umieszczania na drogach. Dz.U. 2003 nr 220 poz. 2181. [2] Wytyczne projektowania ulic. WPU. GDDP Warszawa 1995 [3] Wytyczne projektowania skrzyżowań. Część I i II. GDDP Warszawa 2001
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MEMBERS OF TEACHING TEAM (NAME AND SURNAME)
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Civil Engineering
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W33	C1	Lec 1-Lec 7	N1
PEK_W02	K_W03, K_W33	C1, C2	Lec 1-Lec 7	N1
PEK_U01	K_U36	C1	Proj 1-Proj 6	N2
PEK_U02	K_U36	C1, C2, C3	Proj 1-Proj 7	N2
PEK_K01	K_K01, K_K04	C3	Proj 1-Proj 7	N2

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Gospodarka Przestrzenna
Name in English: Spatial Planning and Development
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG5051
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		15		
Number of hours of total student workload (CNPS)	30		30		
Form of crediting	crediting with grade		crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	1		1		
including number of ECTS points for practical (P) classes			0,5		
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 knows the basic concepts of geographic information systems
2. The student knows how to use spatial databases
3. The student has basic knowledge of GIS software (ArcGIS, Quantum GIS)

SUBJECT OBJECTIVES

C1 Acquisition with basic theories explaining spatial development variations and allocation models
C2 Acquisition of skills concerning spatial analysis of settlement units techniques
C3 Understanding of planning documents that determine how land is developed

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has basic knowledge concerning spatial development theory and status examining methods and changes in spatial development and supporting models which help in planning decisions,

PEK_W02 The student knows planning documents specifying spatial development and has basic knowledge necessary for their understanding

relating to skills:

PEK_U01 The student can use GIS tools in the study of concentration and density of development, status analysis and development process of change and availability analysis

PEK_U02 The student can use GIS tools to assess the suitability of land for development

PEK_U03 The student can search and interpret the assessments of spatial development

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Syllabus, conditions of crediting, literature Settling structures. Forms of urbanization. Cities' functions.	2
Lec 2	The problems of concentration and hierarchy	2
Lec 3	Introduction to location theory and spatial development. Location factors.	2
Lec 4	Spatial development mechanisms and their modelling	2
Lec 5	Spatial planning in Poland - legal basis, structure	2
Lec 6	Types of spatial development plans. Spatial policy instruments	2
Lec 7	Spatial Information Systems in planning and spatial development - conditions and development directions	3
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Presentation of the scope of classes, crediting conditions and literature. The study of concentration and density of development using GIS tools - building databases and density analysis	2
Lab 2	The study of concentration and density of development using GIS tools - presentation of the results in cartographic form and interpretation	2
Lab 3	Availability studies - construction of a database and network analysis	2
Lab 4	Availability studies - presentation of the results in cartographic form and interpretation	2
Lab 5	Multi-criteria evaluation of land suitability for development - the choice of data and analysis tools	2
Lab 6	Multi-criteria evaluation of land suitability for development - spatial analysis and presentation of the results	2
Lab 7	Records analysis of spatial development plan	2
Lab 8	Reports grade of performed laboratory research.	1
	Total hours	**15**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem solving lecture. N2. Multimedia presentations. N3. Preparing own written semester work on a given topic. N4. Conduct and preparation of laboratory tasks reports. 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
F, P	PEK_W01-PEK_W02	P1.Final grade of written test. F2 Grade from a semester written test. P1 - Final grade from a lecture (weighted average of F1 - 70% and F2 - 30%).
F, P	PEK_U01-PEK_U03	F3 Grade from performing a task and a written report F4- written test grade P2 - Final grade from a laboratory (weighted average of F3 - 80% and F4 - 20%).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Domański R. 2011: Gospodarka przestrzenna. Podstawy teoretyczne Naukowe PWN Publishing, Warszawa;
[2] Cymerman R., 2011: Podstawy planowania przestrzennego i projektowania urbanistycznego, Publishing Uniwersytet Warmińsko-Mazurski Publishing;
[3] Zipser T., Zasady planowania przestrzennego. Politechnika Wrocławska Publishing, Wrocław, 1983,
[4] Ustawa z 27 marca 2003 roku o planowaniu i zagospodarowaniu przestrzennym, Dz.U. z 2003 r. Nr 80, poz. 717;

SECONDARY LITERATURE:

[1] Gotlib D., Iwaniak A., Olszewski R., 2007: GIS. Obszary zastosowań, Wydaw. Naukowe PWN, Warszawa;
[2] Longley P. A., Goodchild M. F., Maguire D. J., Rhind D. W.: GIS. Teoria i praktyka. Naukowe PWN Publishing, Warszawa 2006;
[3] Roczniki Geomatyki – Zeszyty Naukowe Polskiego Towarzystwa Informacji Przestrzennej;
[4] Geoforum – portal internetowy @ http://geoforum.pl
[5] GISPlay – portal geoinformacyjny @ http://geoforum.pl

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Spatial Planning and Development
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W20	C1	Lec 1-Lec 4	N1, N2, N3
PEK_W02	K_W20	C1	Lec 5-Lec 6	N1, N2
PEK_U01	K_U22	C2, C3	Lab 2-Lab 3	N4
PEK_U02	K_U22	C2, C3	Lab 5-Lab 6	N2, N4
PEK_U03	K_U22	C2, C3	Lab 6, Lec 7	N2, N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Ochrona Środowiska
Name in English: Environmental Protection
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG5053
Group of courses: YES

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses abilities to design geo-information systems.
2. Possesses abilities to make electronic maps.

SUBJECT OBJECTIVES

C1 Familiarizing students with the characteristics of the particular elements which are part of the environment.
C2 Presenting the problems concerning the threats to the environment including the protection principles.
C3 Familiarizing students with legal and formal aspects of the environment protection.
C4 Presenting the review of the selected IT systems supporting environmental management.
C5 Preparing student to be able to perform tasks that refer to solving environmental conflicts during the creation of an investment plan that may affect the environment.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Possesses knowledge concerning the evaluation of the situation and the characteristics of the particular elements that are part of the environment and its threats.

PEK_W02 Knows the basic legal and formal regulations concerning environment protection.

PEK_W03 Possesses knowledge about the possibilities and practical application of particular IT systems supporting environmental management.

relating to skills:

PEK_U01 Is prepared to the sensible management of the particular components of the environment.

PEK_U02 Is able to use IT tools necessary to present the quality of the particular elements of the environment.

PEK_U03 Can use particular IT tools to determine the location of an investment that affects the environment.

PEK_U04 Is able to build a database using the available IT tools.

PEK_U05 Can compile and present the effects of the laboratory studies in a form of a cartographic presentation and a paper report.

relating to social competences:

PEK_K01 Is able to work in a team.

PEK_K02 Understand the importance of the environmental conflicts resulting from the choice of an investment location that affects the particular elements of the environment.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Discussing the curriculum, presenting grading rules and the literature. Defining and describing the particular elements of the environment such as: the atmosphere, the hydrosphere, the lithosphere, the biosphere, the pedosphere.	2
Lec 2	The characteristics of the threats to the natural environment resulting from the human activities (the pollution of air, water, soil; noise, waste material, electromagnetic radiation).	3
Lec 3	The characteristics of the monitoring systems of certain environmental elements (air, surface water, groundwater, noise, soil, waste material, electromagnetic radiation).	2
Lec 4	The legal aspects of environment protection.	2
Lec 5	The basic tools of environmental management (the evaluation of the influence on the environment, integrated permit, audit and others).	3
Lec 6	The selected IT systems supporting the environmental management. For example: The Central Geological Database, HYDRO Bank, Infogeoskarb, MIDAS, IKAR and others.	2
Lec 7	Getting a credit.	1
	Total hours	**15**

Form of classes - laboratory		Number of hours
Lab 1	Discussing the curriculum, presenting grading rules and the literature. The project of a geo-base concerning the System of Environmental Management for a district (a group work).	2
Lab 2 Lab 3	The structure of a geo-base for the System of Environmental Management: - an administrative division (a district and municipality boarder line) - a settlement network of a town - infrastructure (roads and railways) - the destination of land (CORINE LANDCOVER) - surface water and groundwater - protected areas - soil - waste management - monitoring systems	4
Lab 4	The presentation of qualitative and quantitative data concerning the quality conditions of the environment in a district, a municipality – results: thematic maps, tables, charts.	3
Lab 5	The location of an investment affecting the environment (e.g.: The Centre of District Recycling and Waste Treatment /Powiatowe Centrum Odzysku i Unieszkodliwiania Odpadów Komunalnych) in compliance with the minimum conflict with the protected areas, forests, water and rivers - results: thematic maps, tables, charts.	2
Lab 6	Setting out the access roads to the investment that affect the environment (e.g. PCOiUOK): in compliance with the minimum conflict with the buildings, the protected areas, forests, water and rivers - result: thematic maps, tables, charts.	2
Lab 7	The presentation and evaluation of the System of Environmental Management for a particular district.	2
	Total hours	**15**

TEACHING TOOLS USED
N1. Informational lecture with problem-based elements. N2. Multimedia presentations. N3. Didactic discussion during the lectures and laboratory classes. N4. Preparation of reports from laboratory classes. N5. Office 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
F1	PEK_W01, PEK_W02, PEK_W03, PEK_U01, PEK_K02,	Written and oral test grade.
F2	PEK_U02, PEK_U03, PEK_U04, PEK_U05, PEK_K01, PEK_K02	The evaluation of the written and the graphic aspects of the report.
P - Final grade (a weighted-average of laboratory classes 40% and a lecture 60%).		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Gajdzik B., Wybrane aspekty ochrony środowiska i zarządzania środowiskowego, Wydawnictwo Politechniki Śląskiej, Gliwice, 2010
[2] Dobrzańska B. M. i in., Ochrona środowiska przyrodniczego, Wydawnictwo Naukowe PWN, Warszawa, 2008
[3] Mazur M., Systemy ochrony powietrza, AGH Uczelniane Wydawnictwa Naukowo-Dydaktyczne, Kraków 2004
[4] Maciak F., Ochrona i rekultywacja środowiska, Wydawnictwo SGGW, Warszawa, 2003
[5] Chłopek Z., Ochrona środowiska naturalnego, Wydawnictwa Komunikacji i Łączności, Warszawa, 2002
[6] Ostrowski J., Ochrona środowiska na terenach górniczych, Wydawnictwo Instytutu Gospodarki Surowcami Mineralnymi i Energią PAN, Kraków, 2001
[7] Instrukcja do ćwiczeń laboratoryjnych

SECONDARY LITERATURE:

[1] [Górka K., Ochrona środowiska: problemy społeczne, ekonomiczne i prawne, Polskie Wydawnictwo Ekonomiczne, Warszawa, 2001
[2] Engel Z., Ochrona środowiska przed drganiami i hałasem, Wydawnictwo Naukowe PWN, Warszawa, 2001
[3] Strony internetowe podawane w ramach zajęć
[4] Raporty środowiskowe przygotowywane przez Wojewódzki Inspektorat Ochrony Środowiska
[5] Opracowania ekofizjograficzne
[6] Plany ochrony środowiska sporządzane dla województw, powiatów i gmin.

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Environmental Protection
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W10, K_W14, K_W21	C1, C2	Lec 1, Lec 2, Lec 3	N1, N2, N3, N5
PEK_W02		C3	Lec 4, Lec 5	N1, N2, N3, N5
PEK_W03		C4	Lec 6	N1, N2, N3, N5
PEK_U01	K_W23	C1, C2, C3	Lec 1-Lec 6	N1, N2, N3, N5
PEK_U02	K_U16, K_U23	C4	Lab 1-Lab 7	N1, N3, N4, N5
PEK_U03	K_U20, K_U24, K_U30	C5	Lab 5, Lab 6	N1, N3, N5
PEK_U04	K_U13	C1, C2, C4, C5	Lab 1, Lab 2	N1, N3, N5
PEK_U05	K_U02, K_U03, K_U24, K_U30	C1, C2	Lab 4-Lab 7	N4
PEK_K01	K_K04	C5	Lab 1-Lab 7	N3, N4
PEK_K02	K_K02	C2, C5	Lab 5, Lab 6, Lec 2	N1, N3, N5

SEMESTER 6

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Kartografia I
Name in English: Cartography I
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG6010
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses basic knowledge concerning geomatics and detail surveying necessary to do tasks regarding mathematical and thematic cartography.
2. Possesses knowledge concerning mathematical analysis and statistics regarding basic mathematical calculations.
3. Possesses basic abilities to use GIS and cartographic software.

SUBJECT OBJECTIVES

C1 The characteristics of The National Reference Spatial System and map projections used in Poland.
C2 The characteristics of data bases and thematic maps in the mapping and surveying resources.
C3 The presentation of the cartographic generalization principles and maps editing depending on the scale.
C4 The presentation and the structure of multi-resolution and multi-representative databases.
C5 Acquiring abilities to work with topographic maps in terms of graphic and descriptive data acquisition and creation as well as its editing.
C6 Acquiring the ability to work with thematic maps in terms of graphic and descriptive data acquisition and creation as well as its editing.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Is able to characterize The National Reference Spatial System and map projections used in Poland.

PEK_W02 Is able to characterize the data bases and thematic maps in the mapping and surveying resources.

PEK_W03 Is able to characterize the cartographic generalization principles and maps editing depending on the scale.

PEK_W04 Can characterize multi-resolution and multi-representative databases.

relating to skills:

PEK_U01 Possesses abilities necessary to work with topographic maps in terms of graphic and descriptive data acquisition and creation as well as its editing.

PEK_U02 Possesses abilities necessary to work with thematic maps in terms of graphic and descriptive data acquisition and creation as well as its editing.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	The introduction to cartography. The National Reference Spatial System, topographic and thematic map projections in Poland: the coordinate system, Cartesian coordinate system, map identification numbers.	2
Lec 2	Topographic data bases and topographic maps in the Mapping and Surveying Resources - the scope, the content, the news and the cover.	2
Lec 3	The digital cartographic and landscape models, geo-visualization models.	2
Lec 4	The function and forms of maps.	2
Lec 5	Topographic data bases and thematic maps in the Mapping and Surveying Resources and departments (the scope, the content, the news and the cover).	2
Lec 6	Multi-resolution databases.	2
Lec 7	The cartographic generalization (the dimension of the objects, the survey scales, the depiction of the objects and the characteristics of their occurrence).	2
Lec 8	Multi-representative databases.	1
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Creating a graphic and attributable data set: the structure, the attributes, the types of variables. Making a topographic map 1:10 000 on the basis of a raster.	6
Lab 2	Updating the created map on the basis of an orthophoto.	3
Lab 3	Editing a topographic map with a scale of 1:50 000 on the basis of a map with a scale of 1:10 000 using TBD (for the selected layers of data).	6
Lab 4	Editing a military topographic map with a scale of 1:50 000 on the basis of VMap L2 database.	6
Lab 5	Spatial data. Retrieving and organizing data necessary to compile thematic maps. Graphic presentation – graphs. Continuous and discrete thematic scale.	6
Lab 6	The connection of external data base to GIS.	3
	Total hours	**30**

Form of classes - project		Number of hours
Proj 1	The characteristics of topographic maps: coordinate systems, map projections, map identification numbers.	3
Proj 2	The characteristics of topographic maps: the content, the characteristics of the groups of objects, conventional signs.	3
Proj 3	The characteristics of the thematic maps in Mapping and Surveying Resources.	3
Proj 4	A sozological and hydrographic map and Sozo and Hydro database. The evaluation of the content, cartographic methods, visualization variables of the sozological and hydrographic maps.	3
Proj 5	The methods of quantitative data aggregation in classes. The evaluation of the accuracy of this division.	3
	Total hours	**15**

TEACHING TOOLS USED
N1. Lecture and didactic discussion. N2. Multimedia presentations. N3. Preparation of reports on tasks undertaken during the laboratory classes. N4. Preparation of reports on project tasks. N5. Office 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_W08	P1 Final written exam grade.
F, P	PEK_U01-PEK_U02	F1 Test grade. F2 Task accomplishment and a written report grade. P2 Final laboratory grade (weighted-average of F1 – 60% and F2 - 40%).
F, P	PEK_U01-PEK_U02	F3 Test grade. F4 Task accomplishment and a written report grade. P3 Final project grade (weighted-average of F1 – 80% and F2 - 20%).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Pasławski J. i współautorzy, „Wprowadzenie do kartografii i topografii", Wydawnictwo Nowa Era, Wrocław 2006.
[2] Ratajski L., „Metodyka kartografii społeczno-gospodarczej", wyd. 2, PPWK 1989.
[3] Robinson A., Sale R., Morison J., „Podstawy kartografii", PWN Warszawa, 1988
[4] Saliszczew K.A., „Kartografia ogólna", PWN Warszawa, 1998, 2003.
[5] Kraak M.-J., Ormeling F., „Kartografia. Wizualizacja danych przestrzennych", PWN Warszawa, 1998.
[6] Geodezja i Kartografia, kwartalnik naukowy PAN Komitetu Geodezji
[7] Polski Przegląd Kartograficzny, kwartalnik Polskiego Towarzystwa Geograficznego.
[8] Seria „Studia Geograficzne" publikacje Wydawnictwa Uniwersytetu Wrocławskiego
[9] Materiały Ogólnopolskich i Międzynarodowych Konferencji Kartograficznych.

SECONDARY LITERATURE:

[1] Rozporządzenie Ministra Rozwoju Regionalnego i Budownictwa z dnia 15 maja 2001 r. w sprawie określenia rodzajów map, materiałów fotogrametrycznych i teledetekcyjnych, stanowiących państwowy zasób geodezyjny i kartograficzny, których rozpowszechnianie, rozprowadzanie oraz reprodukowanie w celu rozpowszechniania i rozprowadzania wymaga zezwolenia, oraz trybu udzielania tych zezwoleń.
[2] Rozporządzenie Ministra Rozwoju Regionalnego z dnia 8 lutego 2001 r. w sprawie rodzajów prac geodezyjnych i kartograficznych mających znaczenie dla obronności i bezpieczeństwa państwa oraz szczegółowych zasad współdziałania między Służbą Geodezyjną i Kartograficzną i Służbą Topograficzną Wojska Polskiego w zakresie wykonywania tych prac, a także wzajemnego przekazywania materiałów.
[3] Rozporządzenie Ministra Obrony Narodowej z dnia 18 lipca 2003 r.w sprawie terenów zamkniętych niezbędnych dla obronności państwa.
[4] Rozporządzenie Ministra Spraw Wewnętrznych i Administracji z dnia 17 maja 1999 r. w sprawie określenia rodzajów materiałów stanowiących państwowy zasób geodezyjny i kartograficzny, sposobu i trybu ich gromadzenia i wyłączania z zasobu oraz udostępniania zasobu. (Dz. U. z dnia 31 maja 1999 r.)
[5] Ustawa o lasach z dnia 28 września 1991 r. Dz.U. 1991 Nr 101 poz. 444
[6] Prawo wodne USTAWA z dnia 18 lipca 2001 r. Dz. U. 2001.115.1229 z dnia 11.11 2001r.)
[7] Ustawa z dnia 29 sierpnia 2003 r. o urzędowych nazwach miejscowości i obiektów fizjograficznych.
[8] Rozporządzenie Rady Ministrów z dn. 8.08.2000 w sprawie państwowego systemu odniesień przestrzennych.
[9] K-2.8 Zasady wykonywania ortofotomap w skali 1:10 000
[10] K-3.1 Mapy społeczno-gospodarcze w skalach 1:5000, 1:10 000 i 1:25 000
[11] O-2 Ogólne zasady opracowania map dla celów gospodarczych
[12] TBD - Baza Danych Topograficznych. GUGiK, Warszawa 2007
[13] K-3.6 System Informacji o Terenie. Mapa Sozologiczna Polski skala 1:50 000
[14] K-3.4 System Informacji o Terenie. Mapa Hydrograficzna Polski skala 1:50 000, w formie analogowej i numerycznej
[15] GIS-4 Mapa Sozologiczna Polski skala 1:50 000
[16] GIS-3 Mapa Hydrograficzna Polski skala 1:50 000
[17] K-2 Mapy topograficzne do celów gospodarczych
[18] K-3 Mapy tematyczne
[19] Zasady redakcji mapy topograficznej w skali 1:10 000. Wzory znaków
[20] Zasady redakcji mapy topograficznej w skali 1:50 000. Katalog znaków
[21] Tymczasowe zasady opracowania i przygotowania do druku wojskowych map topograficznych do-stosowanych do standardów NATO i w standardach NATO w skalach 1: 25 000, 1: 50 000 i 1: 100 000, Oddział Topograficzny Sztabu Generalnego WP, 1997 z późniejszymi zmianami;

[22] Znaki umowne do mapy topograficznej w skali 1: 50 000 wraz z objaśnieniami (przeznaczone dla operatorów stacji roboczych), Zarząd Topograficzny Sztabu Generalnego WP, 1995 z późniejszymi zmianami;
[23] Obiekty mapy topograficznej w skali 1: 50 000. Materiał pomocniczy dla operatorów graficznych stacji roboczych, Zarząd Topograficzny Sztabu Generalnego WP, 1995;
[24] Zaktualizowane Instrukcje obiektów wraz z atrybutami (opisami) Vmap Level 2, Wojskowe Centrum Geograficzne, 2004; ;
[25] Przewodnik toponimiczny cześć I, II, III, Główny Urząd Geodezji i Kartografii, Warszawa 2003.

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Cartography I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W22	C1	Lec 1	N1, N2
PEK_W02	K_W22	C2	Lec 2- Lec 5	N1, N2
PEK_W03	K_W22	C3	Lec 7	N1, N2
PEK_W04	K_W22	C4,C5	Lec 6, Lec 8	N1, N2
PEK_U01	K_U24,K_U30	C5	Lab 1-Lab 6 Proj 1-Proj 2	N2-N4
PEK_U02	K_U24, K_U30	C6	Lab 7-Lab 8 Proj 3-Proj 5	N2-N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Kataster i Gospodarka Nieruchomościami
Name in English: Land Cadastre and Management
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG6011
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses basic knowledge concerning geodesy and engineering geodesy.
2. Possesses knowledge concerning mathematical analysis and adjustment calculus necessary to make basic calculations concerning the area of a record parcel (before and after equalization in the current coordinate system) as well as calculations of agricultural land in a complex.
3. Possesses skills in engineering graphics and technical drawing necessary to prepare a field draft and a background map to provide maps and land development projects.
4. Is a proficient user of Microsoft Office programmes.
5. Can do basic geodetic calculations using C-Geo program (possesses ability to undertake a project, to make a table and a map using C-Geo program).

SUBJECT OBJECTIVES

C1 Familiarizing students with terms concerning the cadastre, land and real estate management (including real estate, a land parcel, a farm, a cadastral unit and a geodesic precinct) as well as the zone of spatial planning.
C2 Studying the rules of pursuing and modernizing the cadastre in Poland as well as familiarizing students with IT systems of how to run the cadastre.

C3 Studying the rules of how to prepare basic trig data concerning legal transactions of cadastral objects (combing land parcels, subdividing, re-parcelling, demarcation, re-establishing the property boundary).
C4 Familiarizing students with the terms and definitions concerning spatial planning.
C5 Studying the rules of real estate management belonging to SP and government units.
C6 Studying the rules of how to perform the basic tasks during the real estate appraisal. The student acquires theoretical knowledge regarding the approaches, methods and techniques of the real estate appraisal.
C7 Developing team work and thoroughness while doing geodetic works, skills consolidation.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Defines the following terms: real estate, a parcel of land, a farm, cadastre, land and property register.
PEK_W02 Possesses the knowledge of how to provide land and property register, modernize and upgrade the cadastre data.
PEK_W03 Recognises the concept of a land registration unit, registration groups, land sites, lists types of land.
PEK_W04 Lists the criteria and the rules compulsory during the processes of combining a plot, plot subdivision on agricultural basis and on the basis of real estate management rules. Re-parcelling, demarcation and re-establishing the property boundary.
PEK_W05 Defines basic concepts regarding spatial planning.
PEK_W06 Describes procedures regarding SP real estate management, territorial units, expropriation of property, municipalization, granting the property rights.
PEK_W07 Describes legal regulations referring to the real estate appraisal, its approach, methods and techniques.

relating to skills:

PEK_U01 Compares legal status of the real estate in the land and property register as well as in the real estate register.
PEK_U02 Sees the difference concerning real estate management (real estate and a parcel of land, physical division of property and judicial division of property).
PEK_U03 Calculates the plot area before and after the division, calculates the area of a plot in a divided complex.
PEK_U04 Prepares descriptive and graphic part of the zoning plan.
PEK_U05 Prepares a technical report of geodetic and legal procedures. Prepares the following engineering documentation: information about activities referring to the establishment of boundary lines, new boundary stones, border markers re-establishment, acceptance of boundary lines, property boundary acceptance record, division of immovable property project, division of immovable property map, list of changes in the entry concerning a plot and a building.
PEK_U06 Completes the tasks concerning the usage of data from the spatial database and a map visualization.
PEK_U07 Prepares legal documentation concerning compulsory purchase, municipalization and granting the property rights in a form of a decision.
PEK_U08 Differentiates approaches, methods and techniques of a real estate appraisal.

relating to social competences:

PEK_K01 Is able to work in different teams. Cooperating with colleagues, can prepare a technical report of geodetic and legal procedures. Knows how to use basic geodetic calculator software.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	The concepts of real estate, a farm, land and property register-cadastre.	2
Lec 2	The legal basis of the cadastre and its authorities in Poland.	2
Lec 3	The legal status of real estate, real estate register.	2
Lec 4	Cadastral units, entities and objects in cadastre - sets of information about entities and objects.	2
Lec 5	The taxonomy of agricultural land, land registration units, registrations groups.	2
Lec 6	A cadastral file, legal and technical documentation of cadastral objects.	2
Lec 7	The rules of establishing land register and its modernization, cadastral database upgrade rules, land cadastre vs. real estate register – interrelationship. EGiB systems.	4
Lec 8	Property boundaries, establishing and re-establishing boundary lines, the rules of measurement areas and maps' update.	2
Lec 9	The demarcation and division of immovable properties – procedure and geodetic works.	2
Lec 10	Basic concepts and definitions concerning spatial planning, the policy of zoning, research, studies and analysis of zoning, strategies and scenarios of spatial development.	2
Lec 11	Land consolidation and soil replacement – purposes, projects, and procedures.	2
Lec 12	The rules of real estate management owned by The State Treasury and The Local Government Unit.	2
Lec 13	Compulsory purchase, legal basis, resituation of property, municipalisation and granting the property rights to a natural and a legal person – geodetic documentation.	2
Lec 14	Regulations by law concerning real estate appraisal. Approaches, methods, appraisal techniques.	2
	Total hours	**30**

Form of classes - laboratory		**Number of hours**
Lab 1	The update of basic trig data-combining parcels of land.	4
Lab 2	The update of basic trig data-changes of the way of a land parcel development.	4
Lab 3	The establishment of property boundaries-re-establishing of property boundaries.	4
Lab 4	The establishment of property boundaries-real estate demarcation.	6
Lab 5	The division of immovable property-subdivision survey of a plot.	6
Lab 6	The division of immovable property-subdivision survey of an urbanized plot.	6
	Total hours	**30**

TEACHING TOOLS USED
N1. Lecture and a didactic discussion. N2. Multimedia presentations. N3. Preparation of reports in an form of technical reports. N4. Test on practical and theoretical knowledge.

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_W07	Final written exam grade.
F1	PEK_U01-PEK_U03	Practical knowledge test.
F2	PEK_U04, PEK_U05, PEK_U07	Preparation grade and content-related grade from a technical report.
F3	PEK_U06, PEK_U08	Practical knowledge test (P2 arithmetic mean of F1, F2, F3)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Malina R., Kowalczyk M. Geodezja katastralna. Wyd. Gall. Katowice 2009.
[2] Pułecka A. i inni: Współczesne problemy katastru i gospodarki nieruchomościami", Wyd. PW. Warszawa 2006 .
[3] Instrukcja techniczna G-5 from 2005.
[4] Rozporządzenie Ministra Rozwoju Regionalnego i Budownictwa z dnia 29 marca 2001 w sprawie ewidencji gruntów i budynków Dz.U. nr38, poz.454 from 2001.
[5] Ustawa o własności lokali z dnia 24 czerwca 1994r z późniejszymi zmianami (Dz.U.00.80.903, Dz.U.00.29.355, Dz.U.04.141.1492).
[6] Ustawa z dnia 21 sierpnia 1997 o gospodarce nieruchomościami Dz.U. 46, poz.543 from 2000 z późn. zmianami (2004).
[7] Ustawa z 17 maja 1989 Prawo Geodezyjne i Kartograficzne, Dz.U. 100, poz.1086, from 2000.

SECONDARY LITERATURE:

[1] Bazy Danych Biblioteki Głównej PWR (np. Compendex)
[2] Geodeta - Miesięcznik geoinformacyjny, Wydawnictwo Geodeta Sp. z o.o., Warszawa

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

dr inż. Józef Woźniak, jozef.wozniak@pwr.wroc.pl

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Land Cadastre and Management
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W07	K_W20, K_W23	C1, C4, C2, C5	Lec 1, Lec 10, Lec 2 – Lec 5, Lec 7, Lec 14	N1-N2
PEK_U01-PEK_U06	K_U19, K_U25	C3, C6, C7	Lec 8, Lec 9, Lec 6, Lec 11, Lec 13, Lec 12 Lab 1-Lab 8	N3-N4
PEK_K01	K_K04	C3	Lab 1-Lab 8	N3

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Pomiary Deformacji
Name in English: Monitoring of Deformations
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG6020
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		30		
Number of hours of total student workload (CNPS)	30		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			1		
including number of ECTS points for direct teacher-student contact (BK) classes	1		1		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has a basic knowledge of: structures, division and functions of geodesy in the field of engineer's environment
2. Is acknowledged with the notions of geodesy.
3. Knows and is able to implement geodetic methods of terrain measurement.
4. Possesses basic knowledge of coordinate calculations and precision of precision of measurement and calculations.

SUBJECT OBJECTIVES

C1 Presentation and overview of engineering disciplines such as: mining and construction engineering.
C2 Presentation and overview of newest monitoring techniques.
C3 Overview and performance of measurement analysis deformation.
C4 Presentation of examples of measurement automation and the newest trends within the discipline.
C5 Acquisition of the ability to select basic methods used in solving problems connected with monitoring different mining and engineering facilities.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Is able to distinguish and describe monitoring techniques within the spectrum of engineering disciplines such as mining and construction engineering.
PEK_W02 Is able to characterize newest monitoring techniques.
PEK_W03 Possesses the ability to analyse the scale of deformation.

relating to social competences:

PEK_U01 Possesses the ability to choose appropriate techniques of monitoring deformations.
PEK_U02 Possesses the ability to analyse deformation measurements.
PEK_U03 Is able to design geodetic measurement systems.
PEK_U04 Is able to adopt automatic geodetic measurement systems.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Syllabus, conditions of getting credit, technical literature. Basic models of deformation and introduction to deformation mechanics.	2
Lec 2	Models of deformation and introduction to deformation mechanics.	2
Lec 3	General classification of methods of monitoring: absolute and relative measurements, advantages and disadvantages of geodetic and geotechnical-structural methods, notion of integrated measurements.	2
Lec 4	Review of geodetic displacement measurement: geometric and trigonometric levelling, electronic theodolites, high precision range-finders and automatic tacheographs, status of satellite navigation systems and attainable accuracy (GPS, Glonass, Galileo), pseudolites, ground and satellite radar interferometry, laser scanners, problems with atmospheric refraction in geodetic measurements.	2
Lec 5	Introduction to ALERT-DDS software, Review of basic geotechnical deformation measurement, clinometers and inclinometers, extensometers, deformation meters, mechanical plumb-lines (inverted and underslung), automatic monitoring transmitters, MEMS technology.	2
Lec 6	Calculating dislocations and deformations on the basis of geodetic measurement: identifying unstable check points with the use of IWST method, dislocation-deformation relationship, introduction to GEOLAB software.	2
Lec 7	Practical examples: orogenic belt deformation in the underground mining exploitation site, monitoring slopes in strip mines, monitoring and modelling orogenic belt sedimentation in oil- and gas fields, deformations of large dams, bridge deformations.	2
Lec 8	Recapitulation lecture	1
	Total hours	**15**

Form of classes - laboratory		Number of hours
Lab 1	Presentation of the scope of the exercises, conditions of getting credit and technical literature.	2
Lab 2	Vertical displacement calculations of a test levelling network with the displacement of reference points and identification of unstable reference points with the use of IWST software.	2
Lab 3	Vertical displacement calculations with the identification of unstable points of reference. Reports	2
Lab 4	Horizontal displacement calculations with the use of GPS and electronic tachometers with the identification of unstable points of reference with the use of IWST software.	2
Lab 5	Horizontal displacement calculations with identifying unstable points of reference with the use of IWST software. Reports.	2
Lab 6	Introduction to the usage of automatic system ALERT	2
Lab 7	Calculations with the use of ALERT system	2
Lab 8	Evolving potential methods of usage of automatic system ALERT	2
Lab 9	Presentation of reports from the exercises.	2
Lab 10	Geometric analysis of measuring a deformation, dislocation, distortion, visual presentation of the results.	2
Lab 11	Applying displacement analysis on mining areas with the use of Knoth method	2
Lab 12	Displacement calculation in mining areas with the use of complete elements using SIGMA/W software. Familiarizing with the software.	2
Lab 13	Running test calculations on SIGMA/W software.	2
Lab 14	Summary and comparison of introduced methods.	2
Lab 15	Report evaluation. Final test	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Introductory lecture with elements of problem based lecture. N2. Multimedia presentations. N3. Preparation of reports from laboratory exercises. N4. Software usage: IWST, ALERT, SIGMA/W N5. Office 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
F, P	PEK_W01-PEK_W03	F1 Final grade based on final test F2 Evaluation based on a written test P1 Final grade for lecture (arithmetic average z F1 and F2)
F, P	PEK_U01-PEK_U03	F3 Grade based on an assignment and report F4 Grade from a test P2 Final grade from laboratory (weighted average z F3 – 80% and F4 - 20%).

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Szostak-Chrzanowski, A., A. Chrzanowski,(2010), „INTEGETED ANALYSIS OF DEFORMATIONS IN GEOMECHANICS “, UNB, Fredericton, N.B., 220p. **SECONDARY LITERATURE:** [1] Szostak-Chrzanowski, A., A. Chrzanowski, M. Massiera (2005) “Use of deformation monitoring results in solving geomechanical problems – case studies “, *Engineering Geology*, vol. 79, pp. 3-12. [2] Chrzanowski,A. (1993):"Modern Surveying Techniques for Mining and Civil Engineering" Chapter 33 in: *Comprehensive Rock Engineering*, Pergamon Press, Vol.3. Chapter 33, pp.773-809.
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Monitoring of Deformations
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W18	C1	Lec 1-Lec 2, Lec 4	N2
PEK_W02	K_W18	C2	Lec 3, Lec 5	N1, N2
PEK_W03	K_W18	C3	Lec 6-Lec 7	N2, N3
PEK_U01	K_U20	C4	Lab 1-Lab 5	N4
PEK_U02	K_U20	C5	Lab 10-Lab 15	N4
PEK_U03	K_U20	C6	Lab 6-Lab 9, Lec 3, Lec 6	N3, N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geodezja Satelitarna
Name in English: Satellite Geodesy
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG6012
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15		30		
Number of hours of total student workload (CNPS)	30		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			1		
including number of ECTS points for direct teacher-student contact (BK) classes	1		1		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses knowledge and skills concerning surveying calculations and data adjustments.
2. Possesses knowledge concerning astronomical coordinate systems.
3. Possesses knowledge and skills concerning coordinate systems on a sphere and an ellipsoid and mutual recalculations of coordinates.

SUBJECT OBJECTIVES

C1 Presenting theoretical information concerning points positioning on the Earth's surface using GPS method.
C2 Presenting theoretical information concerning GPS surveying methods and technologies.
C2 Acquiring practical skills concerning static and kinematic GPS surveying.
C3 Acquiring practical skills in the compilation of GPS surveying results.

SUBJECT EDUCATIONAL EFFECTS
relating to knowledge: PEK_W01Describes issues concerning points positioning on the Earth's surface using GPS method. PEK_W02 Describes issues concerning GPS surveying methods and technologies. **relating to skills:** PEK_U01 Can conduct static and kinematic GPS surveys. PEK_U02 Can compile GPS surveying results.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	The movement of the Earth's artificial satellites, the elements of orbits, perturbations, the structure of satellites' segments.	2
Lec 2	GPS, GLONASS, Galileo systems – current condition and the outlook.	2
Lec 3	The essence of points positioning using satellite techniques, observational methods.	2
Lec 4	The satellite methods of measuring the Earth's gravitational field.	2
Lec 5	The methods of determining the positions of points and the methods of measuring a geodetic network.	2
Lec 6	GPS measurement technologies – static and kinematic (RTK, DGPS)	2
Lec 7	The role of permanent GNSS stations. The application of satellite observations in geodynamic research and other studies.	3
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Determining the position of a satellite on the basis of orbital parameters.	2
Lab 2	Determining the position of a receiver on the basis of the measurement of pseudo-range.	2
Lab 3	Determining DOP parameters.	2
Lab 4	Geodetic satellite receivers GPS.	2
Lab 5	Points surveying using a static method.	4
Lab 6	The compilation of surveying results using GPS static method.	4
Lab 7	Points surveying using a kinematic method.	4
Lab 8	The compilation of surveying results using GPS kinematic method in post-processing.	4
Lab 9	Surveying and compilation of the satellite levelling results.	4
Lab 10	Summing up and crediting.	4
	Total hours	**30**

TEACHING TOOLS USED
N1. Informational lecture with problem-based elements. N2. Multimedia presentations. N3. Preparation of the reports on laboratory tasks. N4. Office 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_W02	P1 Written exam grade.
F, P	PEK_U01-PEK_U02	F1 Task completion and a written report grade. F2 Test grade. P2 Final grade from a laboratory (weighted-average from F1 – 25% and F2 - 75%).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] [Czarnecki K., „Geodezja współczesna w zarysie". Wyd. Gall, Warszawa, 2010;
[2] Lamparski J., „Navstar GPS od teorii do praktyki". Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego, Olsztyn, 2001;
[3] Januszewski J., Systemy satelitarne GPS, Galileo i inne, PWN, Warszawa, 2006
[4] Rogowski J., Klęk M., Geodezja satelitarna, Wydawnictwo UWMSC, Warszawa 2009

SECONDARY LITERATURE:

[1] Materiały sympozjów krajowych i zagranicznych od 1985 r.
[2] Publikacje w geodezyjnych czasopismach periodycznych i nieperiodycznych polskich i zagranicznych.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Satellite Geodesy
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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	C1	Lec 1-Lec 3	N1, N2
PEK_W02	K_W16	C2	Lec 4-Lec 7	N1, N2
PEK_U01	K_U09, K_U18	C3	Lab 1-Lab 5, Lab 7, La9	N2, N3, N4
PEK_U02	K_U09, K_U18	C4	Lab 6, Lab 8, Lab 10	N2, N3, N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Ochrona Terenów Górniczych
Name in English: Mining Areas Protection
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GGG6030
Group of courses: NO

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			30	
Number of hours of total student workload (CNPS)	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				1	
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 has a basic knowledge of mathematical analysis necessary for the understanding of mathematical- engineering sciences.
[2] The student possesses basic knowledge of common issues connected with surface and underground mining, as one of the areas of technical and human economic activity.
[3] The student possesses general concepts of reservoir geology and hydrogeology, mining and knows how to characterize the lithological profile in major mining regions.
[4] The student has basic knowledge of geodesy and geotechnical construction

SUBJECT OBJECTIVES

C1 Familiarizing students with legal requirements of classifying mining areas into categories depending on the risks and means of documenting impacts of underground opencast mining on the land surfaces and rock masses.

C2 The acquisition of knowledge and skills in process of optimization of mining in terms of the protection of land mines on the basis of performed forecasts.

C3 Gaining knowledge of how to design and conduct mining operations to minimize impacts on surface buildings and underground infrastructure.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has a basic understanding of the legal and economic rules governing mining areas and is able to distinguish the nature of the deformation of the direct and indirect result of underground mining quarries, and its impact on surface underground infrastructure in terms of essential description of the quantity and quality of surface deformations and rock masses on the basis of surveys carried out.

PEK_W02 The student possesses essential knowledge to classify the mining areas buildings into categories according to the type of threat

PEK_W03 The student has knowledge of forecasting effects of mining and the use of preventive mining construction in order to minimize the impacts of mining on surface buildings underground infrastructure

relating to skills:

PEK_U01 The student is able to autonomously identify, determine and interpret the effects of underground mining quarries on the surface underground infrastructure

PEK_U02 The student is able to predict the variant surface and rock mass deformations in terms of minimizing surface deformations on buildings and underground infrastructure on the basis of mining and geological conditions

relating to social competences:

PEK_K01 The student is aware of the consequences of the impact of mining on the environment

PEK_K02 The student is able to use and share the obtained knowledge in the design of mining activities in connection with mining areas

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Legal Grounds for Protection of Surface Mining Areas. The role and tasks of the department of mines surveyor in the protection of mining areas projects.	4
Lec 2	Characteristics of influence of underground opencast mining on the components of the natural environment, the division, the impact zone	4
Lec 3	Surveying the control lines. Determination of values of deformation, analysis and geometric interpretation	2
Lec 4	Classification of mining areas into categories in the respect of the deformation of the continuous, discontinuous bumps mining	4
Lec 5	Forecasting the effects of mining on the land surface and rock mass based on mining and geological conditions according to the theory of Budryk-Knothe	6
Lec 6	The classification of buildings into categories resistance, simplified inventory, facility protection against mining damage	2
Lec 7	Determination of safety pillars for surface facilities in mining on the example of coal and copper ores.	4
Lec 8	Operating shaft safety pillars and its influence on deformation of the pipe shaft, forecasting and securing the pipe shaft.	4
	Total hours	**30**

Form of classes - project		Number of hours
Proj 1	Presenting the scope and conditions of completing a project. Students' individual assignments. Guideline presentation of project No. 1 on "The Development of the network design control and measurement for monitoring changes in land surface for surface and underground mining"	2
Proj 2	Project Development of control and measurement network for monitoring changes in land surface in the case of underground mining on the substrate of a raster map. Development of guidelines for the methodology of the control measures of the type of equipment and frequency of measurements.	2
Proj 3	Project Development of control and measurement network for monitoring changes in land surface in the case of surface mining on the substrate of a raster map. Development of guidelines for the methodology of the control measures of the type of equipment and frequency of measurements. Development of project report No. 1	2
Proj 4	Assigning individual students' topics. Presentation of guidelines for project No. 2 on "Determination of deformation indexes based on surveying, analysis and geometric interpretation." Implementing of deformation indicators.	2
Proj 5	Analysis of the size of the deformation generated geometric interpretation (charts indicators). The classification of the site to the appropriate category of the mining area. Development of project report No. 2	2
Proj 6	Discussion of guidelines for project No. 3 on "Determination of parameters of the theory Budryka Knothe, forecasting impacts of underground mining on the basis of mining geological conditions." Determination of parameters Budryka-Knothe theory based on the results of the project No. 2	2
Proj 7	Calculations of expected rates of deformation for the proposed use. Design calculations rays of graphic on subsidence and deformation of given scales. Subsidence prognosis and deformation direction at selected points.	2
Proj 8	Development of land subsidence contours for the proposed mining development project report No. 3	2
Proj 9	Assignment of individual design topics. Discussion of guidelines for project No. 4 on "The Influence of surface deformation mining on a housing development." Performance indicators of variant projections of maximum deformation of the site for the proposed mining operation at a housing estate.	2
Proj 10	Determination of resistance for each category of objects located using a housing inventory method with a simplified graphical interpretation of the map. Determination of the probability of exceeding each mining area of given categories. Development of project report No. 4	2
Proj 11	Assignment of individual design topics. Discussion of guidelines for project No. 5 on "The Prognosis of deformation of the pipe shaft and its security." An assessment deformation of the pipe shaft for two variants of the shaft pillar operation with a graphic interpretation.	2
Proj 12	Designing of a protection of the torque tube shaft infrastructure. Development of project report No. 5	2
Proj 13	Assignment of individual design topics. Discussion of guidelines for project No. 6 on "Determination of the protective pillars for a surface with sloping layers." Justification of need to carry out the design of protection pillar for a given object. Determination of mean values of the parameters characterizing the rock mass.	2
Proj 14	Appointment within the radius of protection pillar of the seams of coal on the board, lift of the precipitation and lift of decks.	2
Proj 15	Graphic design pillars in the vertical sections projected on the horizontal plane. Development of project report No. 6	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Lecture N2. Multimedia presentations N3. 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_W03	Written exam
P2	PEK_U01-PEK_U02, PEK_K01-PEK_K02	F1- Evaluation of a project F2- Grade for presentation P2- Final grade from project (weighted mean of F1 – 70% and F2 - 30%)

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Praca zbiorowa, Ochrona powierzchni terenów górniczych, Wyd. Śląsk Katowice 1980r
[2] Edward Popiołek Ochrona terenów górniczych.. Wyd. AGH Kraków 2009r
[3] Włodzimierz. Kiełbasiewicz Ćwiczenia z miernictwa górniczego i ochrony terenów w górnictwie, Skrypt PWr.1979r

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 zmi)
[6] Ustawa o ochronie i kształtowaniu środowiska z 31 stycznia 1980 roku (tekst jednolity Dz.U. z 1994r. Nr 49 poz. 196)
[7] Ustawa o odpadach (Dz.U. z 1997r. Nr96 poz. 592)
[8] Internet

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mining Areas Protection
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W26	C1, C2	Lec 1-Lec 8	N1, N 2
PEK_U01 PEK_U02	K_U29	C3	Proj 1-Proj 15	N1, N 3
PEK_K01 PEK_K02	K_K07			

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Geodezja wyższa II
Name in English: Geodesy II
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG6013
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has knowledge concerning calculus, spherical trigonometry, power series,
2. The student has knowledge concerning the emission of electromagnetic waves, ground gravity
3. The student has knowledge concerning engineering geometry
4. The student has knowledge concerning the accuracy assessment and levelling of geodetic measurements.
5. The student has knowledge concerning basic geodetic calculations and measurements.
6. The student has knowledge concerning Geodesy I

SUBJECT OBJECTIVES

C1 Presentation of theoretical knowledge concerning scope of cartographic mapping
C2 Presentation of theoretical knowledge concerning scope of dynamic geodesy
C3 Presentation of theoretical knowledge concerning scope of basics of geodetic matrices
C4 Acquiring skills necessary to count geodetic coordinates between systems and counting deformation mapping
C5 Acquiring skills necessary to count plumbs deviation components
C6 Acquiring the design skills of basic geodetic networks
C7 Acquiring skills of basic networks measurements and development of results measurements

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 The student has knowledge concerning cartography mapping
PEK_W02 The student has knowledge concerning dynamic geodesy
PEK_W03 The student has knowledge concerning basic geodetic matrices

relating to skills:

PEK_U01 The student can count geodetic coordinates between systems and count deformation mapping
PEK_U02 The student can count plumbs deviation components and perform a reduction of geodetic measurements
PEK_U03 The student can design basic geodetic networks

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Cartographic mapping of a sphere and ellipsoid.	1
Lec 2	Gauss-Kruger mapping, deformation mapping	1
Lec 3	Gravitational field of the Earth. Potential, acceleration of gravity	1
Lec 4	Measurements of gravity acceleration, measurements reductions	1
Lec 5	Geometry of gravitational field. Normal poles, disturbing potential	1
Lec 6	Gravimetric anomalies. Geoid, quasi-geoid, the deviation of plumb line	1
Lec 7	Theoretical basis of elevation systems, system corrections	1
Lec 8	Basic, classic horizontal heading, points classification	1
Lec 9	Project, measurements, reductions, basic horizontal heading levelling	1
Lec 10	Basic vertical heading - project, measurements, reductions, levelling	1
Lec 11	Modernisation of basic, classical horizontal and elevation heading	1
Lec 12	Satellite, basic horizontal heading EUREF-POL 92 and POLREF-96	1
Lec 13	The study of contemporary vertical rind movements	1
Lec 14	Development trends of geodesy	1
Lec 15	Repertory.	1
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Transformation transitions between systems. Deformation mapping.	4
Lab 2	Gravitational field of the Earth.	2
Lab 3	Measurements of gravity acceleration - getting known the gravimeter	2
Lab 4	Elevation systems - elevation measurements in different systems	2
Lab 5	Elevation systems - measuring levelling corrections	2
Lab 6	Components of plumb deviation	2
Lab 7	Reductions of geodetic observations	2
Lab 8	Project of II class horizontal network. Measurements project, preliminary accuracy analysis	4
Lab 9	Project of II class horizontal network by means of GPS method	2
Lab 10	Project of II class precision levelling network.	2
Lab 11	Ways of methods and measurement techniques development. Summary of geodetic network projects.	4
Lab 12	Three dimensional network idea.	2
Lab 13	Crediting classes.	2
	Total hours	**30**

TEACHING TOOLS USED
N1. Informative lecture with the elements of problem solving lecture. N2. Multimedia presentations. N3. Conduct and preparation of laboratory tasks reports. N4. Duty hours

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at the end of semester)	Educational effect number	Way of evaluating educational effect achievement
F, P	PEK_W01-PEK_W03	F1- written exam grade P1 Final grade from the lecture (weighted mean of F1 - 100%)
F, P	PEK_U01-PEK_U04	F2 Grade from performing a task and a written report F3- written test grade P2 - Final grade from a laboratory (weighted average of F2 - 25% and F3 - 75%

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] „Geodezja wyższa i astronomia geodezyjna", praca zbiorowa. PWN, Warszawa–Wrocław 1981.
[2] „Geodezja wyższa i astronomia geodezyjna — zadania i przykłady", praca zbiorowa. PWN, Warszawa–Wrocław 1988.
[3] K. Czarnecki, „Geodezja współczesna w zarysie". Pub. Gall, Warszawa 2010.
[4] „Niwelacja precyzyjna", praca zbiorowa. PPWK, Warszawa 1993.
[5] J. Kryński, Nowe obowiązujące niebieskie i ziemskie systemy i układy odniesienia oraz ich wzajemne relacje, Pub. IGiK, Warszawa 2004.

SECONDARY LITERATURE:

[1] Aktualne instrukcje i wytyczne techniczne GUGiK, seria G-1 i G-2.
[2] Materiały sympozjów krajowych i zagranicznych od 1985 roku.
[3] Publikacje w geodezyjnych czasopismach periodycznych i nieperiodycznych (np. Zeszyty Naukowe) polskich i zagranicznych od 1985 roku.

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Geodesy II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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	Lec 1-Lec 2	N1, N2
PEK_W02	K_W01	C2	Lec 3-Lec 7	N1, N2
PEK_W03	K_W01	C3	Lec 8-Lec 15	N1, N2
PEK_U01	K_U27	C4	Lab 1	N2, N4
PEK_U02	K_U27	C5	Lab 2-Lab 7	N2, N4
PEK_U03	K_U27	C6	Lab 8-Lab 13	N2, N4

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Tektonika z Geofizyką
Name in English: Tectonics and Geophysics
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GEG6011
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of fundamentals of geology, mineralogy and petrography.
2. Possesses basic knowledge concerning mathematical analysis necessary to understand mathematical issues in engineering types of studies.
3. Possesses basic knowledge about the elements of the theory of elasticity.

SUBJECT OBJECTIVES

C1 Mastering the basic knowledge concerning the scope of research, fields and research methods of tectonics.
C2 Knowledge of tectonic structures and tectonic phenomena and their influence on the Earth's structure.
C3 Ability to correctly interpret the land relief taking into consideration the identification of tectonic structures.
C4 Familiarizing students with geophysics of the lithosphere including the Earth's global fields and physical processes of the Earth as well as geophysical methods of their research.
C5 Familiarizing students with the physical features of the Earth's interior and the role of the geophysical research in geotectonics.
C6 Ability to interpret the results of geotectonic research and to compile and present the effects of this interpretation in a form of a report.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01Correctly applies the terminology concerning tectonics, knows the mechanisms of the formation of tectonic structures.

PEK_W02 Understands the influence of tectonics on the land relief.

PEK_W03 Describes basic physical phenomena taking place in the lithosphere and knows the geophysical methods for geophysical fields research and physical features of the Earth's interior.

PEK_W04 Understands and discusses the role of geophysical research in developing the theory of global tectonics.

relating to skills:

PEK_U01 Correctly interprets the land relief identifying tectonic structures.

PEK_U02 Processes and interprets the measurement results of geophysical anomalies and is able to compile and present the effects of the project in a form of a report.

relating to social competences:

PEK_K01Understands the influence of tectonic phenomena on the development of civilization and human life.

PEK_K02 Sees the necessity of applying geophysical methods in the description of physical phenomena taking place in the lithosphere that create life conditions on the Earth.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	The Physiography of the Earth's Terrestrial Surface and the structure of the Earth's interior.	1
Lec 2	Geotectonics.	1
Lec 3	Diastrophism.	1
Lec 4	Fault tectonics.	1
Lec 5	Natural division of rocks.	1
Lec 6	Folding tectonics.	1
Lec 7	Igneous rock bodies.	1
Lec 8	Salt tectonics.	1
Lec 9	Glaciotectonics.	1
Lec 10	Neotectonics and the current tectonic motion.	1
Lec 11	Earth's gravitational field.	1
Lec 12	Seismology. The seismology image of the Earth's interior.	1
Lec 13	Physical properties of the Earth's interior.	1
Lec 14	Geomagnetism and paleomagnetism.	1
Lec 15	The role of geophysical field research in geotectonics.	1
	Total hours	**15**

Form of classes - project		Number of hours
Proj 1	Studying a cartographic image of various tectonic structures.	2
Proj 2	Two practical exercises concerning the identification of tectonic structures on the basis of the interpretation of map sheets.	7
Proj 3	Discussion and the outline of the issues referring to the methodology of geophysical measurements and the interpretation of their results (magnetic and gravimetric methods).	2
Proj 4	Knowledge assessment necessary to complete a project. Doing one practical exercise that deals with processing and interpreting the geophysical measurement results (magnetic anomaly measurements or gravimetric measurements).	4
	Total hours	**15**

TEACHING TOOLS USED
N1. Traditional lecture with multimedia presentations. N2. Sets of topographic maps, geologic maps and other maps, analogue and digital examples. N3. Professional software for image analysis and graphics editing. N4. Informational lecture with problem-based elements. N5. Specialized software for data processing and for the interpretation of the results of geophysical research. N6. Data set of geophysical field measurements.

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	Final written exam.
F1	PEK_W02, PEK_U02	Final written test.
P2	PEK_U01-PEK_U02	Grade from the reports on completing three projects (the average of constituent grades).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Dadlez R., Jaroszewski W., Tektonika, Wyd. Nauk. PWN, Warszawa, 1994.
[2] Mizerski W., Geologia dynamiczna dla geografów, Wyd. Nauk. PWN, Warszawa, 1999.
[3] Fowler C.M.R., The Solid Earth. An Introduction to Global Geophysics, CUP, 2005.
[4] Lowrie W., Fundamentals of Geophysics, CUP, 2007.

SECONDARY LITERATURE:

[1] Czubla P., Mizerski W., Świerczewska-Gładysz E., Przewodnik do ćwiczeń z geologii, Wyd. Nauk. PWN, Warszawa, 2005.
[2] Mortimer Z., Zarys fizyki Ziemi, AGH, Kraków, 2004.
[3] Reynolds J.M., An Introduction to Applied and Environmental Geophysics,Wiley, 2007.

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Tectonics and Geophysics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W41	C1, C2	Lec 1-Lec 10	N1
PEK_W02	K_W41	C2, C3	Lec 1-Lec 10, Proj 1, Proj 2	N1-N3
PEK_W03	K_W41	C4, C5	Lec 11-Lec 15	N1, N4
PEK_W04	K_W41	C4, C5	Lec 11-Lec 15	N1, N4
PEK_U01	K_U44	C2, C3	Proj 2	N2, N3
PEK_U02	K_U44	C6	Proj 3-Proj 4	N4-N7
PEK_K01	K_K07	C2	Lec 1-Lec 10	N1
PEK_K02	K_K07	C4, C5	Lec 11-Lec 15	N1, N4

SEMESTER 7

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Prawo Geodezyjne i Górnicze
Name in English: Surveying and Mining Law
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: PRG7010
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses knowledge about the fundamentals of national law and UE law.
2. Possesses knowledge about the fundamentals of geodesy and mining.

SUBJECT OBJECTIVES

C1 Studying the legal system applicable to geodesy and mining and their interrelationship.
C2 Mastering the ability to retrieve information from legal systems, legal literature and other sources. Compiling the retrieved information concerning current geodesic and mining regulations of law and putting them in practice to express personal opinions.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Possesses basic knowledge concerning geodetic law, geological law and mining law necessary to work in geodetic professions.

relating to skills:

PEK_U01Can retrieve information from the databases of legal systems, legal literature and other sources, can compile the retrieved information concerning current geodesic and mining regulations of law and can draw conclusions and express and justify personal opinion.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Fundamentals of geodetic law – general regulations.	2
Lec 2	Geodesic and Cartographic Service.	2
Lec 3	Geodesic and cartographic works.	2
Lec 4	Land and property register.	2
Lec 5	Inventory and register of utility network.	2
Lec 6	Demarcation of land.	2
Lec 7	National Geodetic and Cartographic Resource.	2
Lec 8	Professional qualifications.	2
Lec 9	Fundamentals of geodetic and mining law.	2
Lec 10	Licence in geological and mining works.	2
Lec 11	Survey and geological works.	2
Lec 12	Survey and geological documentation.	2
Lec 13	Qualification for survey and geological works and for personnel supervision.	2
Lec 14	Mining damage. Responsibility.	2
Lec 15	Mining maintenance.	2
	Total hours	**30**

Form of classes – seminar		**Number of hours**
Sem 1	Seminar introduction, distribution of topics for presentations. The presentations deal with current PG and PGiG problems that are mentioned during the lectures. They also refer to legal issues arising from executive regulations to an act with respect to their usage in geodetic works and mining maintenance.	2
Sem 2 – Sem 14	Students presentations (25-30 minutes) and a group discussion.	28
	Total hours	**30**

TEACHING TOOLS USED
N1. Traditional lectures, multimedia presentations. N2. The presentations of students should include multimedia presentations and digital 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
P1	PEK_W01	Written test covering materials presented during the lectures.
P2	PEK_W02	After a presentation there is a group discussion. The results of the discussion are graded. Students are graded according to: 1. Subject matter of the presentation. 2. Formal aspects of the presentation. 3. Being active in the discussion. The final grade is a weighted average consisting of three grades respectively 0.6, 0.2 and 0.2.

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Ustawa Prawo Geodezyjne i kartograficzne,
[2] Ustawa o strukturze informacji przestrzennej,
[3] Ustawa Prawo geologiczne i górnicze,
[4] Przepisy wykonawcze.

SECONDARY LITERATURE:

Strony internetowe: Sejmu RP, MŚ, MG I WUG, UGiK.

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

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Surveying and Mining Law
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

SUBJECT EDUCATIONAL EFFECT	Correlation between subject educational effect and educational effects defined for main field of study	SUBJECT OBJECTIVES	Programme content	Teaching tool number
PEK_W01	K_W34	C1	Lec 1-Lec 15	N1
PEK_U01	K_U37	C2	Sem 2-Sem 15	N2

FACULTY OF GEOENGINEERING, MINING AND GEOLOGY

SUBJECT CARD

Name in Polish: Kartografia II
Name in English: Cartography II
Main field of study: geodesy and cartography
Level and form of studies: 1st level, full-time
Kind of subject: obligatory
Subject code: GKG7020
Group of courses: NO

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Possesses basic knowledge concerning geomatics and detail surveying necessary to do tasks regarding mathematical and thematic cartography.
2. Possesses theoretical and practical knowledge concerning mathematical and thematic cartography as well spatial databases in the mapping and surveying resources.
3. Is able to use basic cartographic software, GIS.

SUBJECT OBJECTIVES

C1 Presenting the rules of editing and compiling the content of the maps.
C2 Characterizing the issues concerning the compilation of the thematic maps.
C3 Presenting the automating processes of compiling and publishing maps.
C4 Acquiring knowledge about the compilation of thematic maps.

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEK_W01 Can characterize the rules of editing and compiling the content of the maps.
PEK_W02 Can characterize the issues concerning the compilation of the thematic maps.
PEK_W03 Can characterize the automating processes of compiling and publishing maps.

relating to skills:

PEK_U01 Compiles the thematic maps.

PROGRAMME CONTENT		
Form of classes - lecture		**Number of hours**
Lec 1	Spatial data (the properties and cartographic resources). The statistic methods of the spatial data processing (basic statistics). Data aggregation.	2
Lec 2	The rules of editing and compiling the content of the maps (topographic maps, general geographic maps) – the concept and editing stage.	2
Lec 3	Geographical names (The National Register of Geographical Names).	2
Lec 4	The cartographic aspects of the Spatial Information System.	2
Lec 5	Thematic cartography. The cartographic means of expression (visual variables, configuration).	2
Lec 6	Cartographic Methods of Presentation. Quantitative data presentation methods: cartiodiagram, isolines, a choropleth map, the point method, a dasymetric map.	2
Lec 7	Thematic maps. Model generalization in the thematic cartography. The possibility of using computer software in the mentioned methods.	2
Lec 8	Digital cartography. The automating processes of compiling and publishing maps.	2
	Total hours	**15**

Form of classes - laboratory		**Number of hours**
Lab 1	Map compilation using a catrodiagram method for some data.	2
Lab 2	Map compilation using catrodiagram method in continuous and discrete scale and MapInfo program. The evaluation of data accuracy and precision obtained on the basis of a map compilation during which various diagrams were used.	3
Lab 3	Map compilation using a choropleth method.	2
Lab 4	Map compilation using MapInfo program. The evaluation of data accuracy and precision obtained on the basis of a map compilation during which various diagrams were used.	3
Lab 5	The structure of one-, two- and three- layered maps using IT technology. The compilation of complex maps for qualitative and quantitative data using the already known methods. The selection of methods, graphic variables adjusted to the purpose and the use of a map.	3
Lab 6	The internet maps. The evaluation of their correctness (cartographic methods, graphic variables used) the evaluation of the thematic scale.	2
	Total hours	**15**

TEACHING TOOLS USED
N1. Informational lecture with problem-based elements. N2. Multimedia presentations. N3. Preparation of reports on tasks undertaken during the laboratory classes. N4. Office 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_W03	P1 Final written exam grade.
F, P	PEK_U01	F1 Test grade. F2 Task accomplishment and a written report grade. P2 Final laboratory grade (weighted-average of F1 – 60% and F2 - 40%).

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] Pasławski J. i współautorzy, „Wprowadzenie do kartografii i topografii", Wydawnictwo Nowa Era, Wrocław 2006.
[2] Ratajski L., „Metodyka kartografii społeczno-gospodarczej", wyd. 2, PPWK 1989.
[3] Robinson A., Sale R., Morison J., „Podstawy kartografii", PWN Warszawa, 1988
[4] Saliszczew K.A., „Kartografia ogólna", PWN Warszawa, 1998, 2003.
[5] Kraak M.-J., Ormeling F., „Kartografia. Wizualizacja danych przestrzennych", PWN Warszawa, 1998.
[6] Geodezja i Kartografia, kwartalnik naukowy PAN Komitetu Geodezji
[7] Polski Przegląd Kartograficzny, kwartalnik Polskiego Towarzystwa Geograficznego.
[8] Seria „Studia Geograficzne" publikacje Wydawnictwa Uniwersytetu Wrocławskiego
[9] Materiały Ogólnopolskich i Międzynarodowych Konferencji Kartograficznych.

SECONDARY LITERATURE:

[1] Rozporządzenie Ministra Rozwoju Regionalnego i Budownictwa z dnia 15 maja 2001 r. w sprawie określenia rodzajów map, materiałów fotogrametrycznych i teledetekcyjnych, stanowiących państwowy zasób geodezyjny i kartograficzny, których rozpowszechnianie, rozprowadzanie oraz reprodukowanie w celu rozpowszechniania i rozprowadzania wymaga zezwolenia, oraz trybu udzielania tych zezwoleń.
[2] Rozporządzenie Ministra Rozwoju Regionalnego z dnia 8 lutego 2001 r. w sprawie rodzajów prac geodezyjnych i kartograficznych mających znaczenie dla obronności i bezpieczeństwa państwa oraz szczegółowych zasad współdziałania między Służbą Geodezyjną i Kartograficzną i Służbą Topograficzną Wojska Polskiego w zakresie wykonywania tych prac, a także wzajemnego przekazywania materiałów.
[3] Rozporządzenie Ministra Obrony Narodowej z dnia 18 lipca 2003 r.w sprawie terenów zamkniętych niezbędnych dla obronności państwa.
[4] Rozporządzenie Ministra Spraw Wewnętrznych i Administracji z dnia 17 maja 1999 r. w sprawie określenia rodzajów materiałów stanowiących państwowy zasób geodezyjny i

kartograficzny, sposobu i trybu ich gromadzenia i wyłączania z zasobu oraz udostępniania zasobu. (Dz. U. z dnia 31 maja 1999 r.)
[5] Ustawa o lasach z dnia 28 września 1991 r. Dz.U. 1991 Nr 101 poz. 444
[6] Prawo wodne USTAWA z dnia 18 lipca 2001 r. Dz. U. 2001.115.1229 z dnia 11.11 2001r.)
[7] Ustawa z dnia 29 sierpnia 2003r. o urzędowych nazwach miejscowości i obiektów fizjograficznych.
[8] Rozporządzenie Rady Ministrów z dn. 8.08.2000 w sprawie państwowego systemu odniesień przestrzennych.
[9] K-2.8 Zasady wykonywania ortofotomap w skali 1:10 000
[10] K-3.1 Mapy społeczno-gospodarcze w skalach 1:5000, 1:10 000 i 1:25 000
[11] O-2 Ogólne zasady opracowania map dla celów gospodarczych
[12] TBD - Baza Danych Topograficznych. GUGiK, Warszawa 2007
[13] K-3.6 System Informacji o Terenie. Mapa Sozologiczna Polski skala 1:50 000
[14] K-3.4 System Informacji o Terenie. Mapa Hydrograficzna Polski skala 1:50 000, w formie analogowej i numerycznej
[15] GIS-4 Mapa Sozologiczna Polski skala 1:50 000
[16] GIS-3 Mapa Hydrograficzna Polski skala 1:50 000
[17] K-2 Mapy topograficzne do celów gospodarczych
[18] K-3 Mapy tematyczne
[19] Zasady redakcji mapy topograficznej w skali 1:10 000. Wzory znaków
[20] Zasady redakcji mapy topograficznej w skali 1:50 000. Katalog znaków
[21] Tymczasowe zasady opracowania i przygotowania do druku wojskowych map topograficznych do-stosowanych do standardów NATO i w standardach NATO w skalach 1: 25 000, 1: 50 000 i 1: 100 000, Oddział Topograficzny Sztabu Generalnego WP, 1997 z późniejszymi zmianami;
[22] Znaki umowne do mapy topograficznej w skali 1: 50 000 wraz z objaśnieniami (przeznaczone dla operatorów stacji roboczych), Zarząd Topograficzny Sztabu Generalnego WP, 1995 z późniejszymi zmianami;
[23] Obiekty mapy topograficznej w skali 1: 50 000. Materiał pomocniczy dla operatorów graficznych stacji roboczych, Zarząd Topograficzny Sztabu Generalnego WP, 1995;
[24] Zaktualizowane Instrukcje obiektów wraz z atrybutami (opisami) Vmap Level 2, Wojskowe Centrum Geograficzne, 2004; ;
[25] Przewodnik toponimiczny cześć I, II, III, Główny Urząd Geodezji i Kartografii, Warszawa 2003

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Cartography II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
geodesy and cartography

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_W27	C1	Lec 1-Lec 3	N1, N2
PEK_W02	K_W27	C2	Lec 4-Lec 7	N1, N2
PEK_W03	K_W27	C3	Lec 8	N2-N4
PEK_U01	K_U30	C4	Lab 1-Lab 6	N2-N4