Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Ekonomia**
Name in English: **Economics**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **EKZ001167**
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				
Group of courses					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. mathematics - basic knowledge of functional dependencies

SUBJECT OBJECTIVES

C1. Getting to know students with basic terms which help to describe economic phenomena and market processes
C2. The presentation of the households' and companies' behaviours on the market. The presentation of the economic aspects of functioning of enterprises
C3. Providing tools to understand and to analyse macroeconomic phenomena, their causes and effects. Explaining the influence of macro-environmental elements on the behaviour of business entities and their choice.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Is able to know and to understand basic terms, economic rights and economical phenomena as well as their effects for market economy

PEK_W02 - Is able to know the conditions and the principles of optimal decisions by market entities (producers and consumers)

PEK_W03 - Is able to know the national account system, the principles of the indexes of changing macroeconomic values related to production, income, inflation, labour market, balance of payment

II. Relating to skills:

III. Relating to social competences:

PEK_K01 - Is able to understand the importance of the knowledge of economics for the efective functioning in all areas of life.

PEK_K02 - Is able to understand economic aspects and engineering activity and its effects.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction to economics: economics, housekeeping, basic economic problems (economic issues), need, good (kinds of goods according to selected criteria), resource, stream, positive and normative economics, microeconomics, macroeconomics. Economics as science, ceteris paribus.	2
Lec2	The decision problem in economics: the rationality of action - its terms, types and assumptions, short-run, long-run, production possibility frontier, opportunity cost, total and marginal product, the law of diminishing marginal product. Production possibility frontier and short-run and long-run decisions. Rules of decision optimization.	2
Lec3	Market. Market economy: the kinds of economies and the mechanizm of resource allocation in these economies, market definition according to separated economic schools, market elements. Competition.	2
Lec4	Demand, supply, price: Market and its elements; Demand, demand curve, determinants of demand, value of demand, law of demand. Untypical demand curves (bandwagon effect, snob effect, Giffen effect, Veblen effect). Supply, supply function, determinants of supply, supply value, law of supply.	2
Lec5	Reaction of demand to the fluctuation of price and income. Price elasticity of supply. Price elasticity of demand (point and arc elasticity), income elasticity of demand (kinds of goods: inferior, necessary, normal, luxury; Engel’s law and curve), cross price elasticity of demand (goods: substitutes, complementary, neutral). Quantitative tax - costs and transfers.	2
Lec6	Enterprises and its function in economy. Aims and legal forms of businesses.Opportunity cost and book cost. Economic profit and financial profit. Ecnomic aspects af non-profit organizations	2
Lec7	Costs and reveniues in business in short run. Economic laws addressed to short-run costs. Cost: flexible, variable, average, marginal and relationship between these costs. Revenue: total, marginal, optimal level of production in short-run.	2

Lec8	National Income Account. Gross Domestic Product in closed economy. Circulation in economy. Methods of measurement of GDP. GDP and GNP. Gross National Product and National Income. Product and national income as index of: economic growth, economic development and welfare.	2
Lec9	Aggregated demand and sustainable level of income and production. Keynes model. Equilibrium mechanizm. Components of global demand and planned expenditure. Consumption function. Equilibrium in the simple model of economy. Multiplier. Equilibrium in the development model of economy.	2
Lec10	Economic growth and development. economic growth and economic growth rate. Economic growth theories. Growth frontiers. Growth models. Economic growth and macroeconomic policy.	2
Lec11	State budget and fiscal policy. Fiscal policy and its aims. Budget functions. Laffer's curve. Active and passive fiscal policy.Taxes and budgetary expenditure. Multiplier effect of expenditure, taxes and sustainable budget. Budget deficit and public debt.	2
Lec12	Inflation. Labour market and unemployment. Inflation and its measurement. Main theories of inflation. Inflation and unemployment. Conception of Phillip's curve. Costs and profits of inlation. Ways to counteract inflation. Unemployment and its types. Reasons of unemployment in equilibrium and non-equilibrium conditions on the labour market (neoclassical theories and Keynesian). Cost of unemployment. State functions to reduce unemployment	2
Lec13	Money and capital market. Non-bank financial intermediaries. Instruments of capital market. Billing and credit instruments. The foreign currency and euro-currency exchange market. Exchange rate policy.	2
Lec14	Open economy. Balance of payments. Current account balance and domestic equilibrum. Economic policy in open economy. World economic system and its global dimension. Regional integration.	2
Lec15	Crediting test	2
		Total hours: 30

TEACHING TOOLS USED

N1. informative lecture
N2. multimedia presentation
N3. self study - self studies and preparation for examination
N4. tutorials

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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	Crediting test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

P.Smith, D.Begg, „Ekonomia”, PWE, Warszawa 2001
D. Begg, S.Fischer, R. Dornbusch, Mikroekonomia, wyd. IV zmienione, PWE, Warszawa 2007
R.Milewski (redakcja), Podstawy ekonomii, PWN, Warszawa 2001 i kolejne wydania.

SECONDARY LITERATURE

N. Acocella, Zasady polityki gospodarczej, Wydawnictwo Naukowe PWN, Warszawa 2002.
Elementy mikro- i makroekonomii dla inżynierów, S. Marciniak (red.), Warszawa, 1994.
M. Friedman, R. Friedman, Wolny wybór, Kraków 1997.
W. Kwaśnicki, Zasady ekonomii rynkowej, Wrocław 2001.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Economics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01 PEK_W02 PEK_W03	K1TR_W02	C1, C2, C3	Lec1, Lec2, Lec3, Lec4, Lec5, Lec6, Lec7, Lec8, Lec9, Lec10, Lec11, Lec12, Lec13, Lec14, Lec15	N1, N2, N3, N4
PEK_K01 PEK_K02	K1TR_K02, K1TR_K05	C1, C2, C3	Lec1, Lec2, Lec3, Lec4, Lec5, Lec6, Lec7, Lec8, Lec9, Lec10, Lec11, Lec12, Lec13, Lec14, Lec15	N1, N2, N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Fizyka**
Name in English: **Physics**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **FZP001067**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	15	15		
Number of hours of total student workload (CNPS)	90	60	30		
Form of crediting	Examination	Crediting with grade	Crediting with grade		
Group of courses					
Number of ECTS points	3	2	1		
including number of ECTS points for practical (P) classes		2	1		
including number of ECTS points for direct teacher-student contact (BK) classes	2.0	1.0	1.0		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Competences in subjects Mathematics and Physics with Astronomy for graduate of the Secondary School.

SUBJECT OBJECTIVES

C1. C1. Gain basic knowledge from selected areas of classical and modern Physics.
C1.1. Principles of kinematics, dynamics and law of conservation of impulse, energy and momentum.
C1.2. Vibration and wave motion.
C1.3. Basics of Phenomenological and Statistical Physics.
C1.4. Electrostatics, Magnetostatics and Electromagnetic Induction.
C1.5. Specific theory of relativity.
C1.6. Quantum physics, physics of the atom, physics of the atomic nucleus.
C2. C2. Gain skills on qualitative understanding of selected principles and laws of Classical and Modern Physics as well as quantitative analysis selected phenomena from this area of knowledge.
C3. C3. Acquire experience of basic measurements methods and techniques of selected physical quantities and gain skills in:
C3.1. Performing basic measurements of physical quantities.
C3.2. Numerical analysis and processing of experimental data with evaluation of measurement uncertainties.
C3.3. Preparation of written report from performed measurements with application of used software.
C4. C4. Development of social competences including emotional intelligence involving the ability to work in a student group. Fixation of sense of responsibility and honesty in academe and society.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - PEK_W01 knows: a) basics of the vector calculus in the Cartesian coordinate system, c) basics of the unit analysis, the physical quantity concept and the rules of instant estimation of values; the importance of physics in the surrounding world and the everyday life as well as discoveries and achievements of a selected classical and modern physics for the progress of the civilization,
PEK_W02 - has a basic knowledge on the dynamics of the progressive movement, has a knowledge on: a) the conception of the mass and force, b) the condition of applicability of the Newton laws and the correct writing of the equations of motion, c) the formulation of the second law of dynamics using the concept of momentum, d) the formulation of the momentum conservation law.
PEK_W03 - has a knowledge on fields of conservative forces, is able to determine the following physical quantities: the work and the power of a mechanical force, the kinetic and potential energies; knows: a) the law of work and kinetic energy, b) relationship between conservative forces and the potential energy, c) is able to formulate the law of conservation of the mechanical energy.
PEK_W04 - is able to define: the torque, the angular momentum and the moment of inertia for the material points, the system of the material points and the rigid body, the kinetic energy of the system of the material points and the rigid body in the rotary movement, knows the second law of the dynamics for the rotation of a rigid body about a fixed axis, is able to formulate and prove the law of the angular-momentum conservation for: the single particle, the system of the material points, and the rigid body.
PEK_W05 - has a knowledge on the dynamics of the periodic motion, and the detailed knowledge of: a) the harmonic motion of the simple and physical pendula, the particle performing the harmonic oscillations in the vicinity of the balanced state, b) the damped oscillations, c) the forced oscillations and the mechanical resonance.
PEK_W06 - has a knowledge of the wave motion and has the detailed knowledge of: a) basic properties of the mechanical waves (including the sound) and their sources, b) the monochromatic plane wave equations and basic physical quantities of the wave motion, c) velocities connected to the wave motion, d) relations between the wave velocity (including the sound) and the elastic properties of the medium, the mechanical energy transported by the waves, e) the transportation of the mechanical energy by the waves, f) the dependence between the wave intensity and the distance from the wave source, g) the Doppler effect, h) the acoustic-wave interference and the clumping.
PEK_W07 – has a basic knowledge on the principles of the phenomenological thermodynamics, knows basic thermodynamic concepts, the heat transportation and its description, the functions of the thermodynamic state, the thermodynamic processes (the ideal gas, the ideal gas equation), has detailed knowledge on; a) the

thermodynamic temperature scale, b) the conversions of the ideal gas, c) the internal energy and the entropy of the system, d) the work made by gas and the heat exchange in thermodynamic processes of the ideal gas, e) methods of evaluation of the changes of the entropy of the ideal gas, f) the thermodynamics of the heat engines and their efficiency in the direct and reverse cycles, g) the Bolzmann-Planck entropy (the statistical interpretation of the entropy), h) the Bolzmann (barometric formula) and Maxwell distribution functions, i) the average square velocity of the particles of the ideal gas, the microscopic interpretation of the temperature and pressure of the ideal gas; the principle of the equal partition of the heat energy.
PEK_W8 - knows basic mathematical tools of the vector-field analysis: the operators of gradient, divergence, rotation, knows the Gauss-Ostrogradskii and Stokes theorems.
PEK_W9 - has a basic knowledge on the properties of the gravitational and electro-magnetic fields, has a knowledge on the generation of the gravitational, electrostatic, and magnetostatic fields; has a knowledge on the magnetostatics particularly in; a) the impact of the magnetic field on the electric charges and the current carrying conductors (the Lorentz force), b) the Biot-Savart and Ampere laws and their applications for determining the intensity and induction of the magnetic fields of the selected sources (linear and circular current-carrying conductors, coil), c) the definition of unit of the magnetic field intensity; is able to describe quantitatively the potential energy of the magnetic dipole and the torque acting on the magnetic dipole in an external magnetic field; has a knowledge on the energy and the energy density of the electromagnetic field. Furthermore, he/she has a knowledge on the electromagnetic induction phenomenon (knows the Faraday law and the Lenz rule), has a knowledge on the Maxwell equations (the integral form of them) and the material equations.
PEK_W10 has a basic knowledge on the properties of the electromagnetic waves (including the light) and their applications, in particular, knows the concept of the flat monochromatic electromagnetic wave and: a) the wave spectrum, b) the dependence of the refration index on the relative electric and magnetic permeabilities of the medium; has knowledge on the energy and momentum transportation with the waves, the Poynting vector, the interaction of the incident wave with a surface; has a basic knowledge concerning: a) dispersion phenomena, the total internal reflection, method of polarizing the light, the Malus law, b) the light interference in thin film systems, c) the light diffraction, d) the resolution efficiency of the optical systems (the Reyleigh criterion), e) aberrations in the optical systems and animal (human) eyes and correction methods.
PEK_W11- has a knowledge on the special theory of relativity and its applications. In particular he/she knows and understands the Einstein's postulates, the Lorentz transformations and resulting consequences (time dilation, length contraction). Has a basic knowledge on the relativistic dynamics, in particular, knows the concepts of the relativistic momentum of the particle, the relativistic kinetic an total energies, knows the relativistic equation of motion and the relativistic momentum and energy relationship, the equivalence of the mass and the energy and the need to apply the results of the special theory of relativity in the global positioning systems.
PEK_W12- has a basic knowledge on the fundamentals of the quantum physics, the physics of the atom, the solid state physics and some applications; has a detailed knowledge on: a) the black-body radiation, b) the Bohr model of the Hydrogen atom (the energy and angular momentum quantization) and quantum energy levels of the electron in the atom (Franck-Hertz experiment), c) the fotoelectric and Compton effects, d) the interaction of the light with the matter and the fundamentals of the laser working, e) particle-wave duality of the light and the elementary particles (de Broglie hypothesis, the matter waves), f) the Heisenberg uncertainty principle, g) the wave function and its interpretation, h) the (stationary and time dependent) Schrodinger equations, i) the Schrodinger equation of the particle in the infinitely-deep potential wall, j) the quantum tunelling and its applications, k) spin and spin magnetic moment of the electron (Stern-Gerlach experiment), m) the Pauli exclusion principle, quantum numbers of the electrons in the atoms, electronic configurations of the elements of the Mendeleev table, n) specific properties of solids
PEK_W13- has a knowledge on the fundamentals of the physics of the atomic nucleus, in particular, knows indicators that characterize the nucleus and the nuclear forces, has a knowledge concerning a) the bound energy of the nucleons and its importance for the nuclear energy generation, nuclear synthesis b) the laws of the the radiative decay, c) date determination using the isotopes, d) physical principles of the imaging with nuclear magnetic resonance.
PEK_W14- has a knowledge on the basics of the elementary-particle physics and astrophysics, in particular, knows: a) the basic types of the fundamental interactions, b) the standard model of the elementary particles

(leptons, quarks, hadrons, Higgs Boson); c) the structure and types of the matter in the Universe and the standard model of the Universe expansion (the big band, the Hubble law, the cosmic background radiation, the dark matter, the predictable future of the Universe).

II. Relating to skills:

PEK_U01 - PEK_U01 - is able to: a) efficiently apply vector calculus used in physics, b) define and use the conceptions of the instantaneous velocity, the tangential, radial and total acceleration and the orientations of them in the space.

PEK_U02 - can: a) prove the law of the momentum conservation, b) correctly formulate the vector equation of motion and its scalar version in the Cartesian coordinate system, c) solve (ie determine time dependence of basic kinematic quantities) scalar equations of motion taking into account the initial conditions, d) solve problems concerning the collision dynamics using the principle of the momentum conservation.

PEK_U03 - is able to; a) verify the conservative nature of the forces, b) derive and apply the law of conservation of the mechanical energy, c) apply the law of conservation of the mechanical energy to solve problems, d) calculate the mechanical work and the power of the fixed and variable forces, the kinetic and potential energies, changes in the kinetic energy of the particle / body with the theorem on the work and the kinetic energy, e) determine the force vector knowing the analytic form of the potential energy.

PEK_U04 – can derive the law of conservation of momentum of the system of material points, correctly write and solve the equation of the rotational motion with fixed rotation axis and of the translational-rotational motion of the rigid body. Can determine: a) torque, b) angular momentum of single particles and rigid bodies, c) kinetic energy of the rotational motion, work and power in the rotational motion, e) change of the kinetic energy of the rotational motion using the theorem on the work and the kinetic energy; moreover can apply the law of the conservation of the angular momentum to writing and solving specific problems in the rigid-body dynamics.

PEK_U05 - is able to properly describe and analyze equations of periodic motion of: a) pendulums: mathematical, physical as well as particles under potential force, performing small oscillations around the position of equilibrium, b) damping oscillations, c) sinusoidal driving force oscillations. Can determine: periods of vibration, time dependencies of kinematic and dynamic quantities of periodic vibrations, characterize the phenomenon of mechanical resonance and explain its importance (positive and negative) in mechanical elements.

PEK_U06 - can: a) write the wave equation for the monochromatic mechanical plane wave, b) determine values of the basic physical quantities of the wave motion (length and frequency, wave vector, repetition rate, phase velocity, velocity of media particles), c) quantitatively characterize the energy transported by the mechanical waves, and the Doppler, interference and beats phenomena, d) interpret and calculate the loudness level of the sound sources.

PEK_U07 – is able to use the first and the second law of thermodynamics for quantitative and qualitative description of different processes of ideal gas and determine values: a) the heat added to the system, the work done by the ideal gas, changes of the internal energy in gas processes, b) the efficiency of the heat engines working in the direct or reverse cycle. Can: analyze and draw graphics representing processes of the ideal gas, derive the Mayer formula and the equation of the adiabatic process, calculate the heat transfer between materials. He/she can: a) evaluate the dependence of the pressure on the height using the Bolzmann distribution function, b) derive the mean square value of the velocity of the particles in an ideal gas, c) derive the state equation of the ideal gas, d) apply the principle of the equal partition of the heat energy, e) explain the microscopic nature of the temperature and pressure of the ideal gas.

PEK_U08 – can efficiently use mathematical tools of the vector-field analysis to solve simple problems of the electromagnetism.

PEK_U09 – is able to: a) point out the sources of the gravitational and electromagnetic fields, b) derive the Newton and Coulomb laws from the Gauss laws and show the potential character of the gravitational/electrostatic field, c) apply the knowledge of the gravitational field for quantitative and qualitative characteristics of the field, produced by the mass or the system of masses. In particular has skills enabling the calculation of the vectors of the gravitational field intensity for the spherically symmetric mass distribution and the gravitational potential energy, the potential energy of electric/magnetic dipole and torque that acts on the dipole in an external electromagnetic field, the density of energy of the electromagnetic field, on the basis of the Gauss law. He/she is able to describe: a) the magnetostatic field quantitatively (determine the magnetic induction and intensity using the Biot-Savart and Ampere laws) for specific sources of the field (linear and circular current carrying conductor, the coil), b) the motion of the electric charges in the magnetic field (the cyclotron, a selector of the particle velocity, the mass spectrometer), c) determine the force that acts on the conductor with the current placed in the magnetic field, d) to determine the unit of the electric current intensity; has skills enabling the application of the knowledge on the electromagnetic induction to the qualitative and quantitative characterization of the current generators; is able to clarify the non-potential character of the electric field induced by the variable magnetic field; to explain the

meaning of the Lenz rule and to characterize the phenomenon of the electromagnetic induction in the context of the energy conservation law; is able to correctly and precisely explain the meaning of the Maxwell equations (in the integral form) and material equations.
PEK_U10 – is able to apply the knowledge on the physics of the electromagnetic waves and optics (the laws of the geometric optics) to explain and quantitatively analyze specific optical phenomena (the total internal reflection, the interference, the diffraction, the polarization, the dispersion) as well as to quantitatively characterize the resolution ability of optical instruments, wave field, and the energy transportation by waves.
PEK_U11 – is able to apply the knowledge of the special theory of relativity for interpretation of its consequences, in particular to characterize relationships between kinematic and dynamic quantities, measured in two moving relative to each other inertial frames of reference. In particular can a) explain longitudinal, relativistic Doppler effect, b) explain the physical meaning of the formula E = mc2, c) quantitatively analyze the kinematics and dynamics of the linear motion of body under influence of constant force, d), justify the need of applying the special theory of relativity in the global positioning satellite systems.
PEK_U12 – can apply the knowledge on the fundamentals of the quantum physics to the analysis of simple problems and to the quantitative interpretation of specific topics and physical effects which take place on the nanometer or subnanometer scale of the lengths. In particular he/she is able to: a) present the quantization of the energy levels in the Bohr model of the Hydrogene atom, b) explain the importance of the fotoelectric effect and of the experiments by Compton, Franck-Hertz, Stern-Gerlach in the development of the quantum mechanics, c) explain the particle nature of the light, d) explain the particle-wave duality of the light and of the elementary particles, e) explain the wave-function interpretation, f) solve one-dimensional stationary Schrodinger equation of the particle in an infinite potential wall, g) point out the applications of the tunneling effect.
PEK_U13 – can: a) explain physics of the energy generation in the nuclear reactors and tokomaks on the basis of the nucleon-bounding energy, b) indicate and characterize positive and negative aspects of the nuclear energetics, c) characterize the types of the radiative decays, d) characterize the fusion of light nuclea insight the Sun, e) estimate the age of the materials on the basis of the radiative decay law, f) explain physical aspects of imaging the tissues and organs using the magnetic resonance
PEK_U14 – can characterize: a) types of the fundamental interactions, b) the standard model of the elementary particles, c) structure and types of the matter in the Universe, e) the standard model of the expanding Universe.
PEK_U15 – can use simple apparatus to measure values of physical quantities and perform simple and complex measurements of physical quantities using the manual of the test-bench.
PEK_U16 – can elaborate the results of measurements, perform the analysis of the measurement uncertainties

and edit the report of the measurements made in the Laboratory of the Fundamentals of Physics using the knowledge PEK_W01 - PEK_W14, skills PEK_01 - PEK_U14, and computational tools (the text editors, office packages, computational environments).

III. Relating to social competences:
PEK_K01 - PEK_K01 – Searching and objective and critical analysis of information or arguments, rational explanation and justification of their point of view using the knowledge of physics.
PEK_K02 – understanding the need for self- assessment and self-education, including improvement of attention concentration on important issues, developing the capacity for self-knowledge and acquired skills and ability to self- assessment, self-control and responsibility for the results of actions taken.
PEK_K03 – independent and creative thinking
PEK_K04 – work in a team and relying on improving methods for the selection of a strategy to optimally solve the tasks assigned to the group.

PROGRAMME CONTENT		
Form of classes – Lecture		Number of hours
Lec1	Lec 1 Organizational matters. The physical quantities, their role in everyday life and in civilization progress. The bases of kinematics, reference frames, curvilinear motion. (1h) Lec 1,2 Physical quantities. Bases of kinematics and Newton's dynamics. Equations of motion (2h) Lec 2 Work and mechanical energy. The law of conservation of mechanical energy (1h) Lec 3 Dynamics of the material points system. The principle of conservation of momentum. Collisions.(2h) Lec 4,5 Kinematics and dynamics of rotational motion of the rigid body. The principle of conservation of the angular momentum. (4h) Lec 6,7 Oscillations around stable equilibrium state. (3h) Lec 7,8 Basic properties of mechanical waves. Elements of acoustics. Wave energy. (2h) Lec 8,9 First and second principles of thermodynamics. Ideal gas conversions. Entropy. Real gases (2h) Lec 9,10,11 Gravitational interactions, central field, potential and energy of gravitational field. (2h) Lec 11,12 Magnetostatic field. Interaction of magnetic field with current currying conductor. (2h) Lec 12,13 Electromagnetic induction. Maxwell equations. Electromagnetic waves. (3h) Lec 14 Elements of relativistic kinematics and dynamics. (2h) Lec 15 Physics of the atom, atomic nucleus, elementary particles. Elements of astrophysics (2h)	30
		Total hours: 30
Form of classes – Classes		Number of hours

Cl1	Cl. 1, 2, 3,4 Solving selected problems of dynamics of the linear, curvilinear, and rotary motion, with use of mechanical work, kinetic and potential energy, and laws of conservation of mechanical energy, momentum and angular momentum. (4h) Cl. 5 Test - evaluation of educational effects relating to skills: PEK_U01, PEK_U06, PEK_K01, PEK_K03 (1h) Cl. 6,7,8 Analyzing and solving problems of kinematics and dynamics of oscillations and wave movement.(3h) Cl. 9,10 Solving problems of thermodynamics. (2h) Cl. 11,12 Analyzing and solving problems of electrodynamics and theory of relativity. (2h) Cl. 13,14 Analyzing and solving problems of quantum physics. (2h) Cl. 15 Test – evaluation of educational effects relating to skills: PEK_U07, PEK_U12, PEK_K01, EK_K03 (1h)	15
		Total hours: 15
Form of classes – Laboratory		Number of hours
Lab1	Lab 1 Introduction to LPF: issues of organization and conducting of classes, introduction of student with: a) the safety rules for measurements (short health and safety training), b) how to prepare writing reports, c) the basics of the measurement uncertainty analysis. Performance of simple measurements.(2h) Lab 2 Making measurements using analog and digital gauges. Statistical processing of simple and complex results of measurements, estimation of simple and complex measurement uncertainty, graphical presentation of the results of measurements and measurement uncertainty, preparation of the report.(2h) Lab 3 Making measurements of selected mechanical quantities +++, developing reports (2h) Lab 4 Making measurements of selected thermodynamical quantities +++, developing reports (2h) Lab 5 Making measurements of selected electromagnetic quantities +++, developing reports (2h) Lab 6 Making measurements of selected optical or quantum quantities +++, developing reports (2h) Lab 7 Supplementary classes, crediting test concerning principles of calculation of measurements uncertainties (2h) Lab 8 Crediting of laboratory exercises. (1h)	15
		Total hours: 15

TEACHING TOOLS USED

N1. N1. Lecture with multimedia presentations (Power Point), demonstrations and showing physical phenomena. N2. Exercises - solving and discussing physical problems. N3. Laboratory exercises - performance and discussion of measurements. Processing of measurements results and estimation of their uncertainties. Evaluation of reports from performed laboratory measurements. N4. Own work - solving problems in frames of preparation to exercises. N5. Own work - preparation of laboratory experiments and measurements. N6. Own work - individual studies of material presented during lecture. N7. Consultations. N8. Laboratory exercises and problems solving - written tests.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_W14, PEK_U01, PEK_U16, PEK_K01, PEK_K04	Written/oral exam.
P = f1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Classes)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U16; PEK_K01, PEK_K04	Oral answers, discussions, written tests.
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U16; PEK_K01, PEK_K04	Oral answers, written tests and reports of laboratory exercises.
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] D. Halliday, R. Resnick, J. Walker, Podstawy fizyki, tomy 1.2., Wydawnictwo Naukowe PWN, Warszawa 2003; J. Walker, Podstawy fizyki. Zbiór zadań, PWN, Warszawa 2005 i 2011.
[2] Paul A. Tipler, Ralph A. Llewellyn, Fizyka współczesna, Wydawnictwo Naukowe PWN, Warszawa 2012;
[3] I.W. Sawieliew, Wykłady z fizyki, tom 1. i 2., Wydawnictwa Naukowe PWN, Warszawa, 2003.
[4] W. Salejda, Fizyka a postęp cywilizacyjny (45,35 MB), Metodologia fizyki (1,1MB); available at http://www.if.pwr.wroc.pl/index.php?menu=studia&left_menu=jkf

SECONDARY LITERATURE

[1] J. Massalski, M. Massalska, Fizyka dla inżynierów, cz. 1. i 2., WNT, Warszawa 2008.
[2] J. Orear, Fizyka, tom 1. i 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;
[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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[3] R.A. Serway, Physics for Scientists and Engineers with Modern Physics, 8th Ed., Brooks/Cole, Belmont 2009;
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Physics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01÷PEK_W14	K1TR_W03	C1, C2, C4		N1, N6
PEK_U01÷PEK_U14	K1TR_U01	C2		N2, N4, N6, N7
PEK_U01÷PEK_U16	K1TR_U06	C1, C2, C3, C4		N4, N5, N6
PEK_K01÷PEK_K04	K1TR_K01, K1TR_K02, K1TR_K03, K1TR_K04, K1TR_K05, K1TR_K06	C4		N1÷N8
PEK_U06, PEK_U07	K1TR_U18	C2		N2, N4, N7, N8
PEK_U09	K1TR_U18	C2		N3, N5, N7, N8
PEK_K01-PEK_K08	K1TR_K01	C1, C2, C3		N1 - N7

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **BLOK JĘZYKI OBCE**
Name in English:
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **JZL100655BK**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					
Number of hours of total student workload (CNPS)					
Form of crediting					
Group of courses					
Number of ECTS points					
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes					

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

TEACHING TOOLS USED

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT

AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U01, PEK_U02	K1TR_U02, K1TR_U25, K1TR_U26, K1TR_U28	wg kart przygotowanych przez SJO		wg kart przygotowanych przez SJO
PEK_K01	K1TR_K01	wg kart przygotowanych przez SJO		wg kart przygotowanych przez SJO

SUBJECT SUPERVISOR

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Algebra z geometrią analityczną**
Name in English: **Algebra and Analytic Geometry**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **MAP001039**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	15			
Number of hours of total student workload (CNPS)	60	60			
Form of crediting	Examination	Crediting with grade			
Group of courses					
Number of ECTS points	2	2			
including number of ECTS points for practical (P) classes		2			
including number of ECTS points for direct teacher-student contact (BK) classes	1.5	1.0			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1		4
Lec2		4
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		2
Lec9		3
Lec10		2
Lec11		2
Lec12		3
		Total hours: 30
Form of classes – Classes		Number of hours
Cl1		2
Cl2		2
Cl3		2
Cl4		3
Cl5		2
Cl6		3
Cl7		1
		Total hours: 15

TEACHING TOOLS USED
N1. N2. N3. tutorials N4.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01-PEK_W3 PEK_K02	

P = F1

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Classes)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01-PEK_U03 PEK_K01-PEK_K02	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Algebra and Analytic Geometry
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W01	C1, C4		N1, N3, N4
PEK_W02	K1TR_W01	C2, C4		N1, N3, N4
PEK_W03	K1TR_W01	C3, C4		N1, N3, N4
PEK_U01	K1TR_U08, K1TR_U09	C1, C4		N2, N3, N4
PEK_U02	K1TR_U08, K1TR_U09	C2, C4		N2, N3, N4
PEK_U03	K1TR_U08, K1TR_U09	C3, C4		N2, N3, N4
PEK_K01_K02	K1TR_K01	C1-C4		N1-N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Analiza matematyczna**
Name in English: **Mathematical analysis**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **MAP001091**
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			
Group of courses					
Number of ECTS points	5	3			
including number of ECTS points for practical (P) classes		3			
including number of ECTS points for direct teacher-student contact (BK) classes	3.0	2.0			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1		3
Lec2		2
Lec3		4
Lec4		2
Lec5		2
Lec6		3
Lec7		4
Lec8		3
Lec9		3
Lec10		3
Lec11		3
Lec12		2
Lec13		4
Lec14		2
Lec15		3
Lec16		2
		Total hours: 45
Form of classes – Classes		Number of hours
Cl1		8
Cl2		3
Cl3		2
Cl4		2
Cl5		3
Cl6		2
Cl7		4
Cl8		4
Cl9		2
		Total hours: 30

TEACHING TOOLS USED

N1.
N2.
N3.
N4.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01-PEK_W03 PEK_K02	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Classes)		
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	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mathematical analysis
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W01	C1, C4		N1, N3, N4
PEK_W02	K1TR_W01	C2, C4		N1, N3, N4

PEK_W03	K1TR_W01	C3, C4		N1, N3, N4
PEK_U01	K1TR_U08, K1TR_U09	C1, C4		N2, N3, N4
PEK_U02	K1TR_U08, K1TR_U09	C2, C4		N2, N3, N4
PEK_U03	K1TR_U08, K1TR_U09	C2, C4		N2, N3, N4
PEK_U04	K1TR_U08, K1TR_U09	C3, C4		N2, N3, N4
PEK_K01-02	K1TR_K01	C1-C4		N1 - N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Infrastruktura transportu**
Name in English: **Transport Infrastructure**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRB031001**
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
Group of courses					
Number of ECTS points	3				2
including number of ECTS points for practical (P) classes					2
including number of ECTS points for direct teacher-student contact (BK) classes	1.8				1.4

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Ability to use computer equipment as well as using the program for multimedia presentations

SUBJECT OBJECTIVES

C1. Understanding the elements forming the transport systems, the relationship between them and the general principles for their design.
C2. Learning how to analyze and formulate assumptions about transport infrastructure.
C3. Strengthening the team collaboration skills and an awareness of the need to search for new theoretical and practical solutions in the field of transport infrastructure.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - He knows the existing types of transport systems and the structure of the relationship between them, called and identifies infrastructure, classifies and describes their structures.

PEK_W02 - has a basic knowledge of the principles of design of road motor transport, airports, lines and junctions, waterways and ports as well as the principles of selection of their functional parameters.

PEK_W03 - Understands social, economic and non-technical conditions of operation of transport systems.

II. Relating to skills:

PEK_U01 - Gains and interprets by himself literature informations, databases and other sources in aspect of transport systems

PEK_U02 - Analyzes and makes assumptions about transport infrastructure.

PEK_U03 - Selects the necessary information, the links between them, explains actions of construction as well as transport systems and shall discuss their application.

III. Relating to social competences:

PEK_K01 - is creative and is aware of the continuing vocational training

PEK_K02 - works well both individually and in a team.

PEK_K03 - is aware of the consequences of the decisions in the field of engineering.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Transport infrastructure in spatial planning. Infrastructure development of individual modes of transport in Poland and Europe.	2
Lec2	The classification and categorization of roads and streets. General conditions for design of roads and streets	2
Lec3	Characteristics and classification of road pavements. Research and technology of road pavements. Road pavement structure design. Drainage of roads and streets.	2
Lec4	Intersections of the roads. Highways and motorway junctions.	2
Lec5	Aviation. Air transport infrastructure.	2
Lec6	Railway infrastructure. Classification and categorization of railway lines. Elements of railway roads.	2
Lec7	Types and components of the rail surface structure. Principles of geometry of the railways.	2
Lec8	The railway network. Classification of operating points. Traffic stations and trading posts - the types and equipment.	2
Lec9	Traffic control devices. Internal and external infrastructure of traffic control devices.	2
Lec10	Network of waterways, their division and classification.	2
Lec11	Methods of regulation of navigable rivers, regulation and canalization systems rivers.	2
Lec12	Navigable channels, division, design and construction. Water management channels. Hydrotechnical structures of maritime activities.	2
Lec13	Floating fleet. Inland ports and seaports. Ferry Terminals.	2

Lec14	Infrastructure of freight, intermodal terminals.	2
Lec15	Directions of infrastructure development - global trends	2
		Total hours: 30
Form of classes – Seminar		Number of hours
Sem1	Classes organizational principles of assessment and credit. The choice of topics and terms of presentation.	2
Sem2	The history of the development of road construction. Basic terms related to the road construction. Classification of means of transport . Pedestrian traffic. Cycling. Visibility conditions in the design of roads. Traffic safety.	2
Sem3	Research carried out on the materials used in road construction. Classification of road pavements. Earthworks in road construction. Maintenance of road pavements.	2
Sem4	Types of intersections and road junctions. Service area. Toll stations. The impact of road traffic on the environment. Means of public transport.	2
Sem5	The history of aviation. Airfield construction. Elements of the airline. Advantages and disadvantages of air transport.	2
Sem6	The history of railway construction.	2
Sem7	Modern railways in the world and in Poland.	2
Sem8	Unconventional railways.	2
Sem9	Trams and subway.	2
Sem10	Rivers and sailing channels in Poland and abroad.	2
Sem11	Hydrotechnical nodes and shipping lock	2
Sem12	Construction and use of the lift and ramps.	2
Sem13	Inland ports, wharves structures, handling facilities.	2
Sem14	Sea ports, terminals, handling facilities.	2
Sem15	Infrastructure of freight, intermodal terminals. Global trends of development of transport infrastructure.	2
		Total hours: 30

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. multimedia presentation
N3. tutorials

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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	Final exam
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U02	on the basis of the discussion on the issues presented
F2	PEK_U03	developed on the basis of the paper and its thesis defense
P = 0.3F1+0.7F2)		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] 1. Basiewicz T., Gołaszewski A., Rudziński L.; Infrastruktura transportu. Politechnika Warszawska, 2007
[2] Gaca S., Suchorzewski W., Tracz M.: Inżynieria ruchu drogowego. Teoria i praktyka. Wydawnictwa Komunikacji i Łączności, Warszawa 2008.
[3] M. Leśko – Porty lotnicze, pola wzlotów i urządzenia nawigacyjne, Dział Wydawnictw Politechniki Śląskiej, Gliwice 1987.
[4] R. Krystek, praca zbiorowa – Węzły drogowe i autostradowe, Wydawnictwa Komunikacji i Łączności, Warszawa 2008.
[5] Maria Bałuch - Podstawy dróg kolejowych, Politechnika Radomska, Radom 2001.
[6] Towpik K.; Infrastruktura transportu kolejowego. Politechnika Warszawska, 2004.
[7] Stanisław Sancewicz - Nawierzchnia kolejowa, PKP PLK S.A. Warszawa 2010.
[8] Eugeniusz Skrzyński - Podtorze kolejowe, PKP PLK S.A. Warszawa 2010.
[9]Kulczyk J., Winter J., Śródlądowy transport wodny. Oficyna Wyd. Politechniki Wroc. Wrocław 2003.
[10] R. Edel – Odwodnienie dróg, Wydawnictwa Komunikacji i Łączności, Warszawa 2009.

SECONDARY LITERATURE

[1] M. Klabińska, J. Piłat, P. Radziszewski – Technologia materiałów i nawierzchni drogowych, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2003.
[2] B. Stefańczyk, P. Mieczkowski – Mieszanki mineralno-asfaltowe (wykonawstwo i badania), Wydawnictwa Komunikacji i Łączności, Warszawa 2008, 2009.
[3] A. Szydło – Nawierzchnie drogowe z betonu cementowego, Polski Cement 2004
[4] P. Nita – Budowa i utrzymanie nawierzchni lotniskowych, Wydawnictwa Komunikacji i Łączności, Warszawa 1999,2008.
[5] Tadeusz Basiewicz, Leszek Rudziński, Marianna Jacyna - Linie kolejowe, Politechnika Warszawska, Warszawa 2003.
[6] S. J. Cieślakowski - Stacje kolejowe, WKiŁ, Warszawa 1992.
[7] Instrukcje i poradniki z zakresu projektowania konstrukcji nawierzchni drogowych i kolejowych.
[8] Czasopisma: Świat Kolei, Technika Transportu Szynowego, Gospodarka Wodna.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Transport Infrastructure
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_K06, K1TR_K07, K1TR_K08, K1TR_W06	C1	lec1-15	N1
PEK_W02	K1TR_K02, K1TR_K05, K1TR_K07	C1,C2	lec2,3,4,5,6,7,8,9,11,12,13	N1
PEK_W03	K1TR_K02	C1	lec1,15	N1
PEK_U01	K1TR_U01, K1TR_U04	C1	Se2,3,4,5,6,7,8,9,10,11,12,13,14,15	N2,N3
PEK_U02	K1TR_U01, K1TR_U04	C2	Se2,3,4,5,6,7,8,9,10,11,12,13,14,15	N2,N3
PEK_U03	K1TR_U01, K1TR_U04	C2, C3	Se2,3,4,5,6,7,8,9,10,11,12,13,14,15	N2,N3
PEK_K01	K1TR_K01	C2, C3	Se2,3,4,5,6,7,8,9,10,11,12,13,14,15	N2,N3
PEK_K02	K1TR_K03, K1TR_K11, K1TR_U06	C2, C3	Se2,3,4,5,6,7,8,9,10,11,12,13,14,15	N2,N3
PEK_K03	K1TR_K07	C2, C3	Se2,3,4,5,6,7,8,9,10,11,12,13,14,15	N2,N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Grafika inżynierska - geometria wykreślna**
Name in English: **Engineering graphics - descriptive geometry**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031001**
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			
Group of courses					
Number of ECTS points	1	2			
including number of ECTS points for practical (P) classes		2			
including number of ECTS points for direct teacher-student contact (BK) classes	0.6	1.4			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student has knowledge of the fundamental theorems of Euclidean geometry
2. Student has ability to use of the drawing utensils.
3. Student has ability to draw basic geometric structures, such as division of a line's segment into n equal parts, plotting a regular hexagon.

SUBJECT OBJECTIVES

C1. Knowledge of the theoretical and practical basis of the Monge descriptive projection method of the geometric structures on the drawing's plane as the basis for design recording (engineering drawing).
C2. Knowledge in the field of the geometric structures restitution based on Monge's projections.
C3. Preparation for the design recording (engineering drawing) application.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Student has ordered knowledge on geometric structure mapping onto drawing's plane using Monge's projection method and elementary knowledge in the field of axonometry.

PEK_W02 - Student knows an appropriate solution algorithm of mapping of the position and the relationship of the geometric formations in the space, as well as identifying the measures relationship.

PEK_W03 - Student knows the rules for drawing, using Monge's method, showing localization of the element or geometric structure in the space.

II. Relating to skills:

PEK_U01 - Student can practically apply the principles of the Monge's projection method to map the elements and geometric structures (including solids) on the drawing plane.

PEK_U02 - Student can set the size of the dimensions characterized measuring tasks of geometry.

PEK_U03 - Student can provide restitution of the geometric structure on the basis of Monge's projection and submit the result by axonometric projection.

III. Relating to social competences:

PEK_K01 - Student is able to work independently and solve problems involving Monge projection method.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Basic definitions and principles of the parallel, rectangular projection by Monge's projection, the mapping of basic geometric elements (points, line, plane).	2
Lec2	Common elements - edges and breakdown points; parallel and perpendicular elements.	2
Lec3	Transformation of the position (rotation, revolved section, increasing of the revolved section) and the reference system transformation (additional projection plane).	2
Lec4	Solids - definitions; solid section as a set of common elements of the solid cutting plane, solid's breakdown points by a straight line.	2
Lec5	Cutting of the solids with projecting planes set - a modification of the initial solid's view, developed views.	2
Lec6	Penetration of the solids - transmission lines definition, the use of auxiliary cutting planes and reference system transformation.	2
Lec7	Projection in the three orthogonal planes; axonometry basis; completion of the missing solid projection - use of the axonometric projection.	2
Lec8	Final test.	1
		Total hours: 15
Form of classes – Classes		Number of hours
Cl1	Information on the drawing utensils and principles of the geometric structures drawing. Projection of a point and straight line, the mapping of a plane using her traces, identification of the basic elements localization in space using two orthogonal projection planes.	2

Cl2	Belonging of the basic geometric elements, completion of the missing projection; particular localization of the geometric elements.	2
Cl3	Edge as common element of two planes. Breakdown point as common element of straight line and plane. Particular cases of a common elements.	2
Cl4	Edge between flat figures (auxiliary projection planes application); breakdown point of the flat figure by straight line. Identification and construction of the parallel and orthogonal relationship between basic geometrical elements.	2
Cl5	Rotation and revolved section of the basic geometrical elements (rotation of a line's segment and plane); application of the localization transformation for measuring tasks (determination of the real size of a line's segment, angle, flat figure).	2
Cl6	Determination of the projections of plane geometrical structures with selected parameters and the desired position in space (increasing of revolved section of a plane figure). Application of the reference system transformation in measuring tasks and identification of the position (angle relative to the projecting plane, distance of the point from the plane, setting the points projections at a set distance from the plane).	2
Cl7	Test K1 (includes classes's 1 - 6 material)	2
Cl8	The mapping of the elementary solids using Monge's projection, points and lin's segments belonging to the solid's walls identification; determination of the cross sections of polyhedra with projection planes.	2
Cl9	Determination of the polyhedra cross sections cutted by arbitrary planes. Determination of the cross section of the solids with surfaces. Solid's breakdown points by lines (use of auxiliary cutting planes containing penetrating straight line) determination.	2
Cl10	Developed view of a polyhedron and solid containing ruled surface. Cutting of the solid with projection planes as a modification of the initial form of solid - cutting of the polyhedron.	2
Cl11	Cutting of a solid of revolution. Polyhedra transmission lines determination.	2
Cl12	Solids (containing surfaces) transmission lines determination.	2
Cl13	Solid mapping onto three orthogonal projectionl planes. Solid modification using projection plane.	2
Cl14	Solid mapping using axonometric projection. Determination of the missing solid projection modified by cutting planes. Relationship between Monge's projection and axonometric projection.	2
Cl15	Test K2 (includes classes's 8 - 14 material)	2
		Total hours: 30

TEACHING TOOLS USED

N1. problem lecture
N2. problem exercises
N3. tutorials
N4. self study - preparation for project class

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_W03	Final test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Classes)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W02, PEK_U01, PEK_U02	test no. 1, good rating is nedeed (min. 3.0)
F2	PEK_W02, PEK_U01, PEK_U02, PEK_U03	test no. 1, good rating is nedeed (min. 3.0)
F3	PEK_K01	evaluation of n projects (sheets), n = min. 4 - max. 8, good rating of each project is nedeed, F3 = (P1 +...+ Pn)/n
P = [(F1+F2)/2]*4/5+F3*1/5		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Lewandowski Z., Geometria wykreślna, PWN, Warszawa 1980 (i późniejsze wydania),
[2] Otto F., Otto E., Podręcznik geometrii wykreślnej, PWN, Warszawa 1998,
[3] Zbiór zadań z geometrii wykreślnej, red. Nowakowski T., Oficyna Wyd. Politechniki Wrocławskiej, Wrocław 2001,
[4] Bieliński A., Geometria wykreślna, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005

SECONDARY LITERATURE

[1] Szerszeń S., Nauka o rzutach, PWN, Warszawa 1974 (i późniejsze wydania),
[2] Przewłocki S., Geometria wykreślna w budownictwie, Wyd. Arkady, Warszawa 1997,
[3] Bogaczyk T., Romaszkiewicz-Białas T., 13 wykładów z geometrii wykreślnej, Oficyna Wyd. Politechniki Wrocławskiej, Wrocław 1997,
[4] Błach A., Geometria. Przegląd wybranych zagadnień dla uczniów i studentów. Arkady, Warszawa 1998.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Engineering graphics - descriptive geometry
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01, PEK_W02, PEK_W03	K1TR_W07	C1, C2, C3	Lec1-Lec7	N1, N3
PEK_UO1, PEK_UO2, PEK_UO3	K1TR_U03	C1-C3	Cl1-Cl6, Cl8-Cl14	N2. N3. N4
PEK_K01	K1TR_K05	C1-C3	Lec1-Lec7, Cl1-Cl6, Cl8-Cl14	N4

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **PRAKTYKA**
Name in English:
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031001**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					
Number of hours of total student workload (CNPS)				90	
Form of crediting				Crediting with grade	
Group of courses					
Number of ECTS points				3	
including number of ECTS points for practical (P) classes				3	
including number of ECTS points for direct teacher-student contact (BK) classes				3.0	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

TEACHING TOOLS USED

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT

AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U	K1TR_U03, K1TR_U17, K1TR_U22, K1TR_U24			
PEK_K	K1TR_K03, K1TR_K04			

SUBJECT SUPERVISOR

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Technologie informacyjne**
Name in English: **Information Technology**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031003**
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				
Group of courses					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture	Number of hours

Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		2
Lec9		2
Lec10		2
Lec11		2
Lec12		2
Lec13		2
Lec14		2
Lec15		2
		Total hours: 30

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01	
F2	PEK_W02	
F3	PEK_W03	
F4	PEK_K01	
F5	PEK_K02	
P = F1+F2+F3+F4+F5		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Information Technology
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W05	C1		N1, N2
PEK_W02	K1TR_W12	C2		N1, N2
PEK_W03	K1TR_W16, K1TR_W20	C4		N1, N2
PEK_K02	K1TR_K09	C4		N1, N2

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Metrologia wielkości geometrycznych**
Name in English: **Metrology of geometrical quantites**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031004**
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				
Group of courses					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student has a basic knowledge of mathematics and physics at secondary school level.
2. Student has the ability to read drawings and diagrams contained in the technical documentation.
3. Student has basic knowledge in the design of machine elements. It has a basic knowledge of manufacturing techniques of machine parts.

SUBJECT OBJECTIVES

C1. Acquisition of knowledge about quantities and units of measurement associated with the geometry of the product description.
C2. Acquisition of knowledge about the types and characteristics of equipment for the measurement of geometrical quantities.
C3. Gaining skills in the selection of test equipment, analyze test results, evaluation of measurement errors and the expression of measurement uncertainty.
C4. Wyszukiwanie istotnych informacji oraz ich krytyczna analiza.
C5. The acquisition and consolidation of social skills including emotional intelligence, involving the cooperation among students with a view to effective problem solving. Responsibility, honesty and fairness in the academic society life.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - It can identify the quantity associated with of the geometrical description of the product, can name units of measure used to describe them, know diferences between universal and dedicated equipment for the measurement of geometrical quantities, know how to describe its metrological characteristics. He knows and is able to explain the terms used in metrology of geometrical quantities.

PEK_W02 - Able to define the elements of the measurement process and their impact on the result of the measurement.

PEK_W03 - Knows the specific, standardized quantities are subject of measurements of a different typical machine manufacturing techniques.

II. Relating to skills:

III. Relating to social competences:

PEK_K01 - Search for information and its critical analysis

PEK_K02 - Team collaboration on improving the method of selection of strategies aimed at optimal solution entrusted of problems to a group.

PEK_K03 - Objective evaluation of arguments, the rational explanation of his own point of view using the knowledge of metrology.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Sprawy organizacyjne. Podstawowe pojęcia metrologii. Wielkości i jednostki miar. Układy jednostek miar. Układ SI, wzorce jednostek miar, układ hierarchiczny wzorców jednostek miar.	2
Lec2	Measurement, measurement types, method and measurement principle.	2
Lec3	Errors and their sources. The types of errors. Distributions of errors variability. Methods of estimation and expression of uncertainty in measurement.	2
Lec4	Dimensions, tolerance of linear dimensions nad fits.	3
Lec5	GPS - geometrical tolerance according to ISO 1101. Geometrical deviations mesurements.	3
Lec6	Description of geometric structure of surfaces - roughness and waviness, and their measurement.	2
Lec7	Tolerance and machine parts measurement.	6
Lec8	Tolerating and measurements of machines parts manufactured in the process of: casting, plastic forming, welding, plastics processing.	2
Lec9	Classification of the measuring equipment, the metrological characteristics and methods of assessment.	2
Lec10	Mehods and means of mechanization and automation of measurements.	2
Lec11	Analysis of dimension. Fundamentals of statistical control of dimensions.	2
Lec12	Fundamentals of coordinate measurement techniques.	2
		Total hours: 30

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. self study - self studies and preparation for examination
N3. tutorials

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01; PEK_K02; PEK_K03;	test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Jakubiec W., Malinowski J.: "Metrologia wielkości geometrycznych". WNT, Warszawa 2007.

SECONDARY LITERATURE

[1] Adamczak S., Makieła W.: " Metrologia w budowie maszyn. Zadania z rozwiązaniami. Wydanie II, zmienione". WNT, Warszawa 2007.[2] Adamczak S., Makieła W.: "Pomiary geometryczne powierzchni". WNT, Warszawa 2009.[3] Humenny Z. i inni: " Specyfikacje geometrii wyrobów (GPS)". WNT, Warszawa 2004[4] Jakubiec W., Malinowski J., Płowucha W.: "Pomiary gwintów w budowie maszyn". WNT, Warszawa 2008.[5] Jezierski J., Kowalik H., Siemiątkowski Z., Warowny R.:" Analiza tolerancji w konstrukcji i technologii maszyn". WNT, Warszawa 2009.[6] Ochęduszko K., "Koła zębate. Tom 3. Sprawdzanie". WNT Warszawa 2007 (dodruk 2012)[7] Ratajczyk E.: "Współrzędnościowa technika pomiarowa". Oficyna Wydawnicza PW, Warszawa 2005

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Metrology of geometrical quantites
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01; PEK_W02; PEK_W03;	K1TR_W12	C1; C2; C3; C4; C5	Wy1-Wy12	N1; N2; N3

PEK_K01; PEK_K02; PEK_K03;	K1TR_K09	C1; C2; C3; C4; C5	Wy1-Wy12	N1; N2; N3

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Statystyka inżynierska**
Name in English: **Statistics for Engineers**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031006**
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	
Group of courses					
Number of ECTS points	1			2	
including number of ECTS points for practical (P) classes				2	
including number of ECTS points for direct teacher-student contact (BK) classes	0.6			1.4	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Have basic knowledge in mathematics confirmed positive assessments on the certificate of completion of secondary school

SUBJECT OBJECTIVES

C1. The acquisition of basic knowledge of probability and mathematical statistics, taking into account the aspects of the application.
C2. Acquiring the ability exploration figures in the field of transport services market, the location means of distribution, organization and management, and optimization of design, technology and systems.
C3. Skills in data reduction with the use of specialized statistical software (STATISTICA, MatLab, Gretl, R) and the possibility of a spreadsheet (Excel).
C4. Acquisition and consolidation of social competencies including emotional intelligence skills involving the cooperation in the group of students aiming to effectively solve problems, taking into account the responsibility, honesty and fairness in the proceedings.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - It has a basic knowledge of statistical methods for analyzing databases knows the basic descriptive statistics characterizing the results of measurements of engineering, knows the principle of grouping data and creating a series of distribution

PEK_W02 - Knows basic theoretical distributions of discrete and continuous features, it has a basic knowledge of rules of estimation of confidence intervals for the average value characteristics and its dispersion.

PEK_W03 - He has knowledge of the methods for verifying parametric statistical hypotheses about the mean value, of the equality of two values of the average of the value of variance and the homogeneity of many of variance, you know the basic methods of verification nonparametric statistical hypotheses concerning the significance of differences in the data structure and independence of random variables categorized knows methods of correlation analysis and regression for two or more continuous variables and methods of analysis of time series.

II. Relating to skills:

PEK_U01 - Unable to correctly carry out a statistical analysis of the results of research, formulate hypotheses and, based on tests carried out to draw the appropriate conclusions: able to perform data reduction on the prior corresponding selection of statistics describing the average value, its dispersion and shape of the distribution, it can from raw data to create a series of distribution and illustrate collection of data using the histogram, empirical distribution and graph frameset

PEK_U02 - Able to fit empirical data and theoretical distribution on the basis of the estimate quantile values for given probabilities, and estimate the probability for given quantile, unable to correctly select the type of statistical test and perform testing hypotheses about the average and distribution features

PEK_U03 - He can analyze the correlation characteristics in multivariate categorical data table can perform regression analysis and correlation of two and more variables to estimate the values of parameters characterizing the strength and shape of the relationship

III. Relating to social competences:

PEK_K01 - Acquisition and consolidation of competence in the field: finding information and its critical analysis, teamwork cooperation on improving the methods for the selection of a strategy to optimally solving problems assigned to the group.

PEK_K02 - He understands the need for self-education, including improving the skills of attention and focus on important things, and develop the ability to independently apply their knowledge and skills, develop self-esteem and self-control ability and the responsibility for the results of the actions undertaken.

PEK_K03 - Respect the customs and rules in academia, independent and creative thinking.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Statistical methods of data analysis - the essence of statistical modeling. Descriptive analysis of data: forms of representation of statistical data, measures of association, variability, asymmetry and concentration.	2
Lec2	Preparation and presentation of statistical material. The grouping of data - ranks easy and distribution. Histogram and empirical cumulative distribution.	2
Lec3	Random variables and their distributions. Numerical characteristics of the distribution. Selected discrete and continuous distributions. Inequality Czybyszewa. Elements of the theory of estimation - the point estimate. Interval estimation of the mean value and variance. The confidence intervals.	2

Lec4	Parametric statistical hypothesis. Testing hypotheses about the mean value, of the equality of two average values. Testing hypotheses about the rate structure and the equality of two indicators structure. Testing hypotheses about the variance and the equality of two variances.	2
Lec5	Nonparametric hypothesis testing. Chi-squared test, Kolmogorov-Smirnov. Test of independence Pearson chi-square. Depending measures based on chi-square. The odds ratio. Non-parametric tests: test the Wald-Wolfowitz, Wilcoxon signed-rank test Mann-Whitney.	2
Lec6	Analysis of correlation and regression. The method of least squares. Pearson correlation coefficients and Spearman. Linear regression function. Multivariate regression analysis and correlation. Estimation of linear multiple regression function. Test of significance for multiple regression coefficients. Estimation of multiple correlation coefficient. The coefficient of determination.	2
Lec7	Jednoczynnikowa analiza wariancji i testy post-hoc: Tukey'a, Duncana i najmniejszych istotnych różnic. Test Kruskala-Wallisa i test post-hoc: test Dunna. Metody analizy dynamiki zjawisk – szeregi czasowe. Metody wygładzania szeregu czasowego. Analiza wahań okresowych. Prezentacja wybranych programów komputerowych wspomagających analizę statystyczną: STATISTICA, R, Gretl.	3
		Total hours: 15
Form of classes – Project		Number of hours
Proj1	Organizational matters. Introduction to using a spreadsheet. Mathematical and statistical functions Excel. Generating the vector of continuous variables with normal distribution. Descriptive statistics - calculating measures of association, variability, asymmetry and concentration.	2
Proj2	Construction ranks distribution. Graphical presentation of data collection - Histogram and empirical cumulative distribution and box plot.	2
Proj3	Basic distributions encountered in mathematical statistics: the normal distribution, Student, chi-square, F Snedecor. The probability density function and cumulative distribution.	2
Proj4	Point and interval estimation of the expected value, the rate structure (faction), variance and standard deviation.	2
Proj5	Verification of statistical hypotheses. Parametric tests of significance to the expected value and the variance of the general population. Test for two variances, two medium and two indicators of the structure.	2
Proj6	Student test for paired test the homogeneity of many of variance Bartlett's test of homogeneity of many medium-sized (ANOVA).	2
Proj7	Non-parametric tests of significance - Pearson 2 compatibility test, compatibility test Kolmogorov,. Test of independence 2 - kontyngencyjne boards. Mann-Whitney test. Median test and Wilcoxon signed-ranks test. Rank-sum test Kruskal-Wallis	2
Proj8	To assess the relationship between the two zmiennymiDwuwymiarowa regression analysis and correlation. A scatterplot. The strength of the correlation relationship - the correlation coefficient estimation, test of significance for the correlation coefficient, parameter estimation of linear regression function, significance test for the regression coefficient (slope of the regression line), the confidence interval for the regression coefficient.	2
Proj9	Multivariate analysis of correlation and regression. The estimation of multiple regression function. Test of significance for multiple regression coefficients. Estimation of the coefficient of determination and correlation of multiple	2

Proj10	Curvilinear regression. Logistic regression. Maximum likelihood estimation. Interpretation of the results of logistic regression.	2
Proj11	One-way analysis of variance (ANOVA). Table analysis of variance of one variable for the jednoczynnikowego.	2
Proj12	Analysis of the dynamics. Time series without any periodicity and periodicity. Methods of prediction. Development trend - a trend.	2
Proj13	Analysis of the history of the event. The distribution, density function, survival function, hazard function. Life tables. Kaplan-Meier curves. Cox proportional hazards model.	2
Proj14	Rating overall uncertainty of the measurement result. Disclosure of systematic errors. Disclosure errors (errors thick). Assessment of overall uncertainty resulting from the impact of random and systematic effects	2
Proj15	Sampling methods. Stratified sampling, collaborative, systematic. Non-random selection of trial and error load.	2
		Total hours: 30

TEACHING TOOLS USED

N1. informative lecture
N2. tutorials
N3. case study
N4. self study - preparation for project class
N5. project presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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	test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U02	test
F2	PEK_U03, PEK_K01-PEK_K03	presentation
P = 0,5*F1 + 0,5*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Bobrowski D: Probabilistyka w zastosowaniach technicznych. Warszawa 1986, WNT[2] Nowak R.: Statystyka dla fizyków. Warszawa 2002, Wydawnictwo Naukowe PWN[3] Ostasiewicz W. (red.): Statystyczne metody analizy danych. Wrocław 1999, Wydawnictwo AE we Wrocławiu[4] Zeliaś A., Pawełek B., Wanat S.: Metody statystyczne. Zadania i sprawdziany. Warszawa 2002, PWE

SECONDARY LITERATURE

[1] Bąk I., Markowicz I., Mojsiewicz M., Wawrzyniak K.: Statystyka w zadaniach. Część I i II. Warszawa 2001. Wydawnictwo Naukowo-Techniczne[2] Cieciura M., Zacharski J.: Metody probabilistyczne w ujęciu praktycznym. Warszawa 2007, VIZJA PRESS&IT Sp. z o. o.[3] Dobosz M.: Wspomagana komputerowo statystyczna analiza wyników badań. Warszawa 2001, Akademicka Oficyna Wydawnicza EXIT.[4] Frątczak E., Gach-Ciepiela U., Babiker H.: Analiza historii zdarzeń. Elementy teorii, wybrane przykłady zastosowań. Warszawa 2005, Szkoła Główna Handlowa w Warszawie.[5] Kukiełka L: Podstawy badań inżynierskich. Warszawa 2002, Wydawnictwo Naukowe PWN. [6] Maliński M.: Statystyka matematyczna wspomagana komputerowo. Gliwice 2000, Wydawnictwo Politechniki Śląskiej [7] Paleczek W.: Metody analizy danych na przykładach. Częstochowa 2004, Politechnika Częstochowska[8] Turzeniecka D.: Ocena niepewności wyniku pomiarów. Poznań 1997, Wydawnictwo Politechniki Poznańskiej

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Statistics for Engineers
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W01	C1, C2, C4	Wy1, Wy2, Wy3	N1, N2
PEK_W02	K1TR_W01, K1TR_W15	C1, C2, C3	Wy4, Wy5	N1, N2
PEK_W03	K1TR_W01	C1, C3	Wy6, Wy7	N1, N2
PEK_U01	K1TR_U01, K1TR_U07, K1TR_U09	C1, C2, C3	Pr01, Pr02, Pr3, Pr4, Pr5	N3, N4
PEK_U02	K1TR_U01, K1TR_U07, K1TR_U09	C1, C2, C3	Pr6, Pr7, Pr8, Pr9, Pr10	N3, N4
PEK_U03	K1TR_U01, K1TR_U07, K1TR_U09	C1, C2, C3	Pr11, Pr12, Pr13, Pr14, Pr15	N3, N4, N5
PEK_K01	K1TR_K01	C4	Wy1, Pr15	N5
PEK_K02	K1TR_K03	C4	Wy1, Pr15	N5
PEK_K03	K1TR_K05	C4	Wy1, Pr15	N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Grafika inżynierska - zapis konstrukcji**
Name in English: **Engineering Graphics: Engineering Drawing**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031007**
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	
Group of courses				X	
Number of ECTS points	1			2	
including number of ECTS points for practical (P) classes				2	
including number of ECTS points for direct teacher-student contact (BK) classes	0.6				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		1
		Total hours: 15
Form of classes – Project		Number of hours
Proj1		2
Proj2		2
Proj3		2
Proj4		2
Proj5		2
Proj6		2
Proj7		2
Proj8		2
Proj9		2
Proj10		2
Proj11		2
Proj12		2
Proj13		2
Proj14		2
Proj15		2
		Total hours: 30

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2.
N3.
N4.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)		
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	
F2	PEK_U01, PEK_U02	
F3	PEK_U01-PEK_U03	
P = 0.25*F1+0.5*F2+0.25*F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Engineering Graphics: Engineering Drawing
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01 - PEK_W03	K1TR_W07	C1, C2		N1
PEK_U01 -PEK_U03	K1TR_U03, K1TR_U24	C2, C3		N2, N3, N4
PEK_K01	K1TR_K06	C3		N1, N2, N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Chemia**
Name in English: **Chemistry**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031008**
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				
Group of courses					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. high school level

SUBJECT OBJECTIVES

C1. Introduction with chemistry sections usable over study of related courses (meterial scicnce, metallurgy, polymers)
C2. Introduction with basic chemical knowledge enabling of chemical rules and physicochemical properties of technical materials particularly metals, alloys and polymers
C3. Providing opportunities for students to combine their knowledge of chemistry with other disciplines (ecology, physics, meterial scicnce)

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - The student should have basic chemical knowledge associated with structure of matter, states of matter.

PEK_W02 - The student should have basic inorganic chemistry knowledge associated with the structure of metals, alloys,

electron conductivity as well as basic organic chemistry knowledge associated with fuels and polymers

PEK_W03 - The student should have basic knowledge associated with the optics and constructional, functional materials.

II. Relating to skills:

III. Relating to social competences:

PEK_K01 - Student can think and act in imaginative way.

PEK_K02 - Student obeys academic rules.

PEK_K03 - Student can relate effects of industry with the environmental impact.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	The structure of atom, matter,	2
Lec2	Elements, compounds	2
Lec3	Periodic table of elements, structure, groups of elements.	2
Lec4	Characteristics of chosen elements, allotropy, concentration	2
Lec5	Chemical bond- covalent, ionic.	2
Lec6	Chemical bond- metals. Molecular Interactions.	2
Lec7	The states of matter - liquids, gases.	2
Lec8	Crystalline and amorphous solids	2
Lec9	Basic crystallography, unit cell.	2
Lec10	Symmetry elements, crystallographic defect	2
Lec11	Solid state band theory.metals and alloys structure	2
Lec12	Selected topics of organic chemistry - hydrocarbonates and polymers.	2
Lec13	Crude oil and natural gas - refining process and application of products.	2
Lec14	Basic optics - the effects of electromagnetic waves on matter	2
Lec15	Qualifying class –test	2
		Total hours: 30

TEACHING TOOLS USED

N1. informative lecture
N2. traditional lecture with the use of transparencies and slides
N3. tutorials
N4. self study - self studies and preparation for examination

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01 - PEK_W03 PEK_K01 - PEK_K03	test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE
Chemical Principles, Atkins Peter William, Jones Loretta, Palgrave Macmillan

SECONDARY LITERATURE
Chemistry, Michell J. Sienlo and Robert A. Plane, both of Cornell University, Ithaca, New York.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Chemistry
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01, PEK_W02, PEK_W03	K1TR_W03	C1, C2, C3	Lec1-Lec14	N1,N2,N3,N4
PEK_K01, PEK_K02, PEK_K03	K1TR_K02, K1TR_K04, K1TR_K05	C1, C2, C3	Lec1-Lec14	N1,N2,N3,N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Materiałoznawstwo I**
Name in English: **Materials Science I**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031009**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	60		30		
Form of crediting	Examination		Crediting with grade		
Group of courses					
Number of ECTS points	2		1		
including number of ECTS points for practical (P) classes			1		
including number of ECTS points for direct teacher-student contact (BK) classes	1.2		0.7		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture	Number of hours

Lec1		2
Lec2		2
Lec3		3
Lec4		2
Lec5		2
Lec6		2
Lec7		3
Lec8		2
Lec9		2
Lec10		2
Lec11		2
Lec12		2
Lec13		2
Lec14		2
Lec15		0
		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1		2
Lab2		2
Lab3		2
Lab4		2
Lab5		2
Lab6		2
Lab7		3
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. self study - self studies and preparation for examination
N3. self study - preparation for laboratory class
N4. laboratory experiment
N5. report preparation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01 - PEK_W03 PEK_K01 - PEK_K03	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01 - PEK_U03 PEK_K01 - PEK_K03	
F2	PEK_U01 - PEK_U03 PEK_K01 - PEK_K03	
P = 0,5F1+0,5F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Materials Science I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01 - PEK_W03 PEK_K01 - PEK_K03	K1TR_K02, K1TR_K03, K1TR_W03	C1, C2, C3		N1, N2

PEK_U01 - PEK_U03 PEK_K01 - PEK_K03	K1TR_K02, K1TR_K03, K1TR_U01, K1TR_U03, K1TR_U17, K1TR_U18	C1, C2, C3		N3, N4, N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Mechanika I**
Name in English: **Mechanics I**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031010**
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)	90	60			
Form of crediting	Examination	Crediting with grade			
Group of courses					
Number of ECTS points	3	2			
including number of ECTS points for practical (P) classes		2			
including number of ECTS points for direct teacher-student contact (BK) classes	1.8	1.4			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The knowledge, skills and competences on the level after Mathematics I and Linear algebra

SUBJECT OBJECTIVES

C1. Solving technical problems on the basis of mechanics rules
C2. Making statical strength analysis of machines elements.
C3. Acquisition and consolidation of social skills including emotional intelligence relying ability to work in a group of students with a view to effective problem solving. Responsibility, honesty and fairness in behaviour; observance of customs in academic community and society

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - He is able to define basic quantities in Mechanics (Force and momentum). He knows conditions of static equilibrium of forces system.

PEK_W02 - He knows the solving methods of beams and frames

PEK_W03 - He knows the Centroid of Area, the center of Gravity of a Mass, Moments of inertia

II. Relating to skills:

PEK_U01 - He is able to calculate the inner forces in the beams and frames with their diagrams

PEK_U02 - He can calculate the joints constructures (strusses)

PEK_U03 - He can determine the centroidal and principal Moments of inertia,

III. Relating to social competences:

PEK_K01 - He can search information and is able to review it critically.

PEK_K02 - He can objectively evaluate the arguments as well as rationally explain and justify the own point of view on the base of knowledge from Mechanics

PEK_K03 - He can observe customs and rules of academic community

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Curriculum. Requirements. Literature.Theory of vectors algebra, statics, degrees of freedom, supports of the rigid body	2
Lec2	Force and momentum. Principal vector and principal momentum of forces system. Statics. Conditions of static equilibrium of forces system. The change of momentum point.	2
Lec3	The resultant of any set of forces.	2
Lec4	Plane forces system. Reactions in the statically determinate systems (Beams, Trusses, Frames).	2
Lec5	Concurrent forces system.Trusses. Method of Joints.	2
Lec6	Conditions of static equilibrium of forces system. Plane forces system reduction.	2
Lec7	Trusses. Method of Joints.	2
Lec8	Internal forces in Beams (analytical methods, diagrams).	2
Lec9	Centroid of Area. The center of Gravity of a Mass.	2
Lec10	Moments of inertia. Product of inertia. Parallel–axis theorem. Rotation transformation of Moments of inertia	2
Lec11	Iinertia tensor, inertia ellipsoid. Principal axes.	2
Lec12	Kinematics, motion of particle, trajectory, one–dimensional model. Velocity, acceleration.	2
Lec13	Velocity and acceleration in natural coordinates. Classification of motions	2
Lec14	Velocity and acceleration in the plane motion.	2
Lec15	Test	2
		Total hours: 30

Form of classes – Classes		Number of hours
Cl1	The examples for Conditions of static equilibrium of forces system. Plane forces system. Determination of reactions in the supports.	2
Cl2	Analytical methods of trusses solving. Ritter's methods.	2
Cl3	Internal forces in beams (analytical methods, diagrams).	2
Cl4	Internal forces in beams (analytical methods, diagrams). Beams with Joints.	1
Cl5	Internal forces in Frames (analytical methods, diagrams).	1
Cl6	Centroid of Area. The center of Gravity of a discrete Multi-mass structures.	1
Cl7	Determination of Moments of inertia & inertia products. Parallel–axis theorem.	2
Cl8	Kinematics of particle in orthogonal coordinates.	2
Cl9	Test.	2
		Total hours: 15

TEACHING TOOLS USED

N1. Traditional lecture with the use of transparencies and slides
N2. Calculation exercises
N3. Self study - preparation for project class
N4. tutorials
N5. Self study - self studies and preparation for examination

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01, PEK_K02, PEK_K03.	test
F2	PEK_W01, PEK_W02, PEK_W03, PEK_K01, PEK_K02, PEK_K03.	oral-writing exam
P = F2		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Classes)

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_U03, PEK_K01, PEK_K02, PEK_K03.	test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. J.L. Meriam, L.G. Kraige, Engineering Mechanics, volume 1, Statics, John Wiley & Sons, Inc., New York, 1998
2. J.L. Meriam, L.G. Kraige, Engineering Mechanics, volume 2, Dynamics, John Wiley & Sons, Inc., New York, 1998

SECONDARY LITERATURE

1. Mary Lunn, A First Course in Mechanics, Oxford Science Publications, Oxford 1991
2. Philip Dyke, Roger Whiteworth, Guide to Mechanics, MacMillan Press, London 1992
3. Herbert Goldstein, Classical Mechanics, Addison-Wesley Publishing Company, London

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mechanics I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01, PEK_W02, PEK_W03,	K1TR_W03	C1	Lec1 - Lec15	N1, N4, N5
PEK_U01, PEK_U02, PEK_U03,	K1TR_U01	C2	Cl1 - Cl9	N2, N3, N4
PEK_K01, PEK_K02, PEK_K03.	K1TR_K07	C3	Lec1 - Lec15, Cl1 - Cl9	N4, N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy zarządzania**
Name in English: **Management Essentials**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031011**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	15				
Number of hours of total student workload (CNPS)	30				
Form of crediting	Crediting with grade				
Group of courses					
Number of ECTS points	1				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	0.6				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture	Number of hours

Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		3
Lec7		2
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01, PEK_K02, PEK_K03	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Management Essentials
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number

PEK_W01, PEK_W02, PEK_W03, PEK_K01, PEK_K02, PEK_K03	K1TR_K05, K1TR_W02, K1TR_W21	C1-C3		N1

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy projektowania środków transportu I**
Name in English: **Basics of engineering design in transport I**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031013**
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	
Group of courses					
Number of ECTS points	2			2	
including number of ECTS points for practical (P) classes				2	
including number of ECTS points for direct teacher-student contact (BK) classes	1.2			1.4	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. knowledge of mathematics, physics and mechanics
2. ability to solve basic problems of mathematical analysis and the ability to describe the basic physical phenomena

SUBJECT OBJECTIVES

C1. Understanding the basic principles of construction and methods of analysis, modeling and design mechanisms used in transport
C2. Understanding the properties of selected groups of planar and spatial mechanisms use in transport (linkages, gears, cams and manipulators)

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - has a theoretical knowledge of analysis of mechanisms used in transport
PEK_W02 - has a theoretical knowledge of design of mechanisms used in transport

II. Relating to skills:
PEK_U01 - The ability to define the basic elements of mechanism
PEK_U02 - The ability to build a computer model of the mechanism and ability to perform simulation researches
PEK_U03 - Ability to analyze of kinematics and kinetostatics of mechanisms using vector, analytical and computer methods

III. Relating to social competences:
PEK_K01 - a sense of responsibility for their own work and the willingness to comply with the rules work in a team and to take responsibility for collaborative tasks
PEK_K02 - Understands the impact of engineering

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Overview of functional machines and mechanisms for transport, basics of structural analysis	2
Lec2	Structural analysis of mechanisms - mobility, local mobility, constraints	2
Lec3	Methods for the type synthesis of mechanisms	2
Lec4	Kinematic analysis of mechanisms - methods for determining the new positions, centers of rotation	2
Lec5	Kinematic analysis of mechanisms - methods for determining the velocity and acceleration	2
Lec6	Elements of dynamic analysis - forces in kinematic systems (inertial forces, the active forces, the forces in joints)	2
Lec7	Elements of dynamic analysis - Kinetostatics (vector method)	2
Lec8	Linkage mechanisms in transport - property characterization, analysis and application	2
Lec9	Manipulators (serial, parallel) - construction, characteristics, applications	2
Lec10	Manipulators (serial, parallel) - kinematics manipulators	2
Lec11	Gears, planetary gears mechanisms - construction, characteristics, applications	2
Lec12	Planetary gear mechanisms - analysis. Cam mechanisms in vehicles - characteristics, applictions	2
Lec13	Cam mechanisms in vehicles - analysis and design	2
Lec14	The geometric synthesis of linkage mechanisms	2
Lec15	Test	2
		Total hours: 30
Form of classes – Project		Number of hours

Proj1	Structural analysis of mechanisms (class of joints, rules of schematization, mobility of mechanisms (project and short test)	3
Proj2	Basics of computer modeling of mechanisms in program SAM (Simulation and Analysis of Mechanism)	2
Proj3	Advanced modeling of mechanisms in the program SAM (dimensions, drives)	2
Proj4	Linkages mechanisms - kinematic analysis (vector method), (project and short test)	2
Proj5	Modeling and computer simulations of linkage mechanisms (project)	2
Proj6	Linkages mechanisms - kinetostatic analysis (vector method), (project and short test)	2
Proj7	Modeling and computer simulations of planetary gear mechanisms (project)	2
		Total hours: 15

TEACHING TOOLS USED

N1. multimedia presentation
N2. tutorials
N3. self study - preparation for project class
N4. problem lecture

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_W02	Test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01-PEK_U03	Evaluation of the project, Evaluation of the short test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Basics of engineering design in transport I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01, PEK_W02	K1TR_W07	C1-C2	Le1-Le14	N1-N4
PEK_U01-PEK_U03	K1TR_U08, K1TR_U09	C1-C2	Pr1-Pr7	N1-N3
PEK_K01,PEK_K02	K1TR_K03, K1TR_K09	C1-C2	Le1-Le14	N1-N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Transport w miastach**
Name in English: **Transport in cities**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031014**
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				
Group of courses					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of subjects showed in course "History of Transport:
2. no prerequisites for skills
3. no prerequisites for competence

SUBJECT OBJECTIVES

C1. Understanding the issues of urban infrastructural conditions for functioning the transport in city
C2. Understanding the issues of society conditions for functioning the transport in city
C3. Understanding the issues of costs of transport in city

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - It has an extended knowledge of the extended knowledge about history and present trends of developing of the transport in cities
PEK_W02 - Can identify cooperation and integration of social aspects of management of transport in cities

II. Relating to skills:
PEK_U01 - Can use a properly chosen information and communication technologies in order to analyze and assess the transport in cities aspects
PEK_U02 - Has the ability to use methods of improving the efficiency of the transport in city

III. Relating to social competences:
PEK_K01 - During the course is as awareness of the importance and understanding of non-technical aspects and implications of activities of the engineer of transport, including its impact on the environment and the associated responsibility for decisions.
PEK_K02 - Able to interact and work in a group

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Implementation lecture, definition of settlement, part of city, town, agglomeration, conurbation	2
Lec2	City, functions	2
Lec3	Space in city	2
Lec4	City transport infrastructure, modes of passengers transport in city	2
Lec5	Modes of good transport in city	2
Lec6	Distribution of cargo in city	2
Lec7	Public space in city, role of green spaces	2
Lec8	Services in city	2
Lec9	Pedestrian in city	2
Lec10	The role of services in the creation of public space	2
Lec11	City transport policy	2
Lec12	Future of cities	2
Lec13	Law aspects, regulations and urbanity planning	2
Lec14	role of society in city planing	2
Lec15	concluding	2
		Total hours: 30

TEACHING TOOLS USED

N1. problem lecture
N2. multimedia presentation
N3. problem discussion
N4. case study

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01	
P = 100%*F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Chmielewski J. M.: Teoria urbanistyki w projektowaniu i planowaniu miast. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2001.
[2] Zabłocka-Kos A.: Zrozumieć miasto - centrum Wrocławia na drodze ku nowoczesnemu city 1807-1858. Via Nova, Wrocław 2006.
[3] Sokołowska-Moskwiak J.: Idea "miasta-ogrodu" na przykładach osiedli miast górnośląskich. Politechnika Śląska 2011.
[4] Adamczewska-Wejchert H., Wejchert K.: Jak powstawało miasto. Pergamon, Tychy 1995.
[5] Krier L.: Architektura - wybór czy przeznaczenie. Arkady, Warszawa 2001.
[6] Szolginia W.: Estetyka miasta. Arkady, Warszawa 1981.
[7] Malasek J.: Obsługa komunikacyjna centrów miast. WKŁ Warszawa 1981.
[8] Podoski J.: Transport w miastach. WKŁ Warszawa 1977.
[9] Wesołowski J.: Miasto w ruchu. Dobre praktyki w organizowaniu transportu miejskiego. Instytut Spraw Obywatelskich, Łódź 2008.
[10] Lewandowski K. (red). Miasto Wrocław - przestrzeń komunikacji i transportu, Oficyna Wydawnicza Politechniki Wrocławskiej, 2004, ISBN8370858112, 9788370858117

SECONDARY LITERATURE

[11] miesięcznik Transport Miejski i Regionalny

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Transport in cities
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number

PEK_W01	K1TR_W13	C1	Lect1-Lect15	N1-N4
PEK_W02, PEK_K01	K1TR_K02, K1TR_W18	C2	Lect1-lect15	N1-N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Materiałoznawstwo II**
Name in English: **Materials Science II**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031015**
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)	90		60		
Form of crediting	Examination		Crediting with grade		
Group of courses					
Number of ECTS points	3		2		
including number of ECTS points for practical (P) classes			2		
including number of ECTS points for direct teacher-student contact (BK) classes	1.8		1.4		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture	Number of hours

Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		3
Lec7		2
Lec8		2
Lec9		2
Lec10		2
Lec11		2
Lec12		3
Lec13		2
Lec14		2
		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1		2
Lab2		2
Lab3		2
Lab4		2
Lab5		2
Lab6		2
Lab7		3
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. self study - preparation for laboratory class
N3. laboratory experiment
N4. report preparation
N5. self study - self studies and preparation for examination

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement

F1	PEK_W01 - PEK_W03 PEK_K01 - PEK_K03	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01 - PEK_U03 PEK_K01 - PEK_K03	
F2	PEK_U01 - PEK_U03 PEK_K01 - PEK_K03	
P = 0,5F1+0,5F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Materials Science II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01 - PEK_W03 PEK_K01 - PEK_K03	K1TR_K02, K1TR_W03	C1, C2, C3		N1, N5
PEK_U01 - PEK_U03 PEK_K01 - PEK_K03	K1TR_K02, K1TR_K03, K1TR_U01, K1TR_U03, K1TR_U17, K1TR_U18	C1, C2, C3		N2, N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Mechanika II**
Name in English: **Mechanics II**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031016**
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	90			
Form of crediting	Crediting with grade	Crediting with grade			
Group of courses					
Number of ECTS points	2	3			
including number of ECTS points for practical (P) classes		3			
including number of ECTS points for direct teacher-student contact (BK) classes	1.2	2.1			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The knowledge, skills and competences on the level after Mechanics I.

SUBJECT OBJECTIVES

C1. Resolving some technical problems using Mechanics rules.
C2. Making kinematical and dynamical analysis of machines elements.
C3. Acquisition and consolidation of social skills including emotional intelligence relying ability to work in a group of students with
a view to effective problem solving. Responsibility, honesty and fairness in behaviour; observance of customs in academic community and society.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - He knows kinematics & dynamics mass particle & rigid body.

PEK_W02 - He knows the basic concepts in the field of free and forced vibration of mechanical system with one degree of freedom (natural frequency, frequency characteristics, resonance).

PEK_W03 - He knows the basic principles of dynamic (move of the center of mass, momentum, angular momentum, d'Alembert's principle).

II. Relating to skills:

PEK_U01 - He is familiar with energy conservation law. He can use it to the dynamics equations of motion of rigid body.

PEK_U02 - He can use linear momentum & angular momentum rules to description dynamics of motion.

PEK_U03 - He is familiar with static & dynamic balance under rotation over fixed axis.

III. Relating to social competences:

PEK_K01 - He can search information and is able to critical review it.

PEK_K02 - He can objectively evaluate the arguments and rationally explain and justify own point of view on the base of knowledge from Mechanics.

PEK_K03 - He can observe the customs and rules of the academic community.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Kinematics of rigid body. Translation & rotation about a fixed axis.	2
Lec2	Plane motion, velocity, temporary center of rotation.	2
Lec3	Centroids, accelerations in plane motion.	2
Lec4	Kinematics of rigid body rotation about a fixed point, Euler's angles, velocity, aksoids.	2
Lec5	Angular acceleration, acceleration in rotation about a fixed point, regular precession.	2
Lec6	Relative motion, general motion of rigid body.	2
Lec7	Dynamics, force, d'Alembert rule.	2
Lec8	Examples of the tasks of the dynamics, the vibrations of the one-mass single degree of freedom system.	2
Lec9	The definition of work. Elementary work. Gravity forces, stiffness forces. The kinetic and potential energy. Power.	2
Lec10	Potential energy. The principle of work and kinetic energy equivalence.	2
Lec11	Dynamics of systems of particles, principle of motion of the mass center, linear & angular momentum.	2
Lec12	Dynamics of rigid body in rotary motion.	2
Lec13	Linear & angular momentum of rigid body in general motion.	2
Lec14	Determination of the dynamic responses in rotation. The method of linear & angular momentum rules.	2
Lec15	Test.	2

		Total hours: 30
Form of classes – Classes		Number of hours
Cl1	Calculation of velocity & acceleration vectors in particle motion.	2
Cl2	Plane motion, velocity, temporary center of rotation.	2
Cl3	Accelerations in plane motion.	2
Cl4	Kinematics of relative motion.	2
Cl5	Examples of the tasks of the dynamics of particle.	2
Cl6	Test 1.	2
Cl7	Examples of tasks from vibrations of simple mechanical systems with one degree of freedom.	2
Cl8	Relative motion of rigid body examples.	2
Cl9	The definition of work. Elementary work. Gravity forces, stiffness forces. The kinetic and potential energy. Power.	2
Cl10	Potential energy. The principle of work and kinetic energy equivalence.	2
Cl11	The principle of the center of mass motion.	2
Cl12	Dynamics of rigid body,	2
Cl13	Linear & angular momentum of rigid body in rotary motion.	2
Cl14	Determination of the dynamic responses in rotation. The method of linear & angular momentum rules.	2
Cl15	Test 2.	2
		Total hours: 30

TEACHING TOOLS USED

N1. Traditional lecture with the use of transparencies and slides.
N2. Calculation exercises.
N3. Self study - preparation for project class.
N4. Tutorials.
N5. Self study - self studies and preparation for examination.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01 - PEK_W03, PEK_K01 - PEK_K03.	Test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Classes)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01 - PEK_U03, PEK_K01 - PEK_K03.	Oral answers, test 1, test 2.
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. J.L. Meriam, L.G. Kraige, Engineering Mechanics, volume 1, Statics, John Wiley & Sons, Inc., New York, 1998
2. J.L. Meriam, L.G. Kraige, Engineering Mechanics, volume 2, Dynamics, John Wiley & Sons, Inc., New York, 1998

SECONDARY LITERATURE

1. Mary Lunn, A First Course in Mechanics, Oxford Science Publications, Oxford 1991
2. Philip Dyke, Roger Whiteworth, Guide to Mechanics, MacMillan Press, London 1992
3. Herbert Goldstein, Classical Mechanics, Addison-Wesley Publishing Company, London

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mechanics II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01, PEK_W02, PEK_W03	K1TR_W03	C1	Lec1 - Lec15	N1, N4, N5
PEK_U01, PEK_U02, PEK_U03	K1TR_U01	C2	Cl1 - Cl15	N2, N3, N4
PEK_K01, PEK_K02, PEK_K03	K1TR_K07	C3	Lec1 - Lec15, Cl1 - Cl15	N4, N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Metrologia wielkości geometrycznych**
Name in English: **Metrology of geometrical quantites**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031017**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)			15		
Number of hours of total student workload (CNPS)			60		
Form of crediting			Crediting with grade		
Group of courses					
Number of ECTS points			2		
including number of ECTS points for practical (P) classes			2		
including number of ECTS points for direct teacher-student contact (BK) classes			1.4		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student has a basic knowledge of mathematics and physics at secondary school level
2. Student has the ability to read drawings and diagrams contained in the technical documentation.
3. Student has basic knowledge in the design of machine elements. It has a basic knowledge of manufacturing techniques of machine parts.

SUBJECT OBJECTIVES

C1. Acquisition of knowledge about quantities and units of measurement associated with the geometry of the product description.
C2. Acquisition of knowledge about the types and characteristics of equipment for the measurement of geometrical quantities.
C3. Learning how to use the equipment for measurement of geometrical quantities.
C4. Gaining skills in the selection of test equipment, analyze test results, evaluation of measurement errors and the expression of measurement uncertainty.
C5. Wyszukiwanie istotnych informacji oraz ich krytyczna analiza.
C6. The acquisition and consolidation of social skills including emotional intelligence, involving the cooperation among students with a view to effective problem solving. Responsibility, honesty and fairness in the academic society life.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

PEK_U01 - Understands the dimensional requirements imposed to products included in the technical documentation. Can use standards for tolerances and fits linear and geometric tolerances. It can calculate the value of measurement errors, estimated measurement uncertainty for the different measurements.
PEK_U02 - Umie dokonać doboru odpowiedniego sprzętu pomiarowego oraz dokonać jego konfiguracji w zależności od postawionego zadania pomiarowego. Potrafi korzystać z sprzętu pomiarowego stosowanego w przemyśle maszynowym do pomiaru wielkości geometrycznych.
PEK_U03 - Able to solve the basic problems of the practical use of the tools and of measuring. Able to recognize sources of error, their values, and estimate the uncertainty of measurement.

III. Relating to social competences:

PEK_K01 - Search for information and its critical analysis
PEK_K02 - Team collaboration on improving the method of selection of strategies aimed at optimal solution entrusted of problems to a group.
PEK_K03 - Objective evaluation of arguments, the rational explanation of his own point of view using the knowledge of metrology.

PROGRAMME CONTENT

Form of classes – Laboratory		Number of hours
Lab1	Organizational matters. General principles for the use of measuring equipment.	2
Lab2	Measurements of linear dimensions.	2
Lab3	Measurements of angular dimensions, direct and indirect measurements of cones.	2
Lab4	Identification and measurement of threads.	2
Lab5	Assessment of the geometrical structure of the surface.	2
Lab6	Identification and measurement of cylindrical gears.	2
Lab7	Measurements of selected shape deviations and displacements.	3
		Total hours: 15

TEACHING TOOLS USED

N1. laboratory experiment
N2. report preparation
N3. self study - preparation for laboratory class
N4. tutorials

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)

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_U03; PEK_K01; PEK_K02; PEK_K03;	report on laboratory exercises, test, oral answer
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Jakubiec W., Malinowski J.: "Metrologia wielkości geometrycznych". WNT, Warszawa 2007.[2] Instrukcje do ćwiczeń laboratoryjnych.

SECONDARY LITERATURE

[1] Adamczak S., Makieła W.: " Metrologia w budowie maszyn. Zadania z rozwiązaniami. Wydanie II, zmienione". WNT, Warszawa 2007.[2] Adamczak S., Makieła W.: "Pomiary geometryczne powierzchni". WNT, Warszawa 2009.[3] Humenny Z. i inni: " Specyfikacje geometrii wyrobów (GPS)". WNT, Warszawa 2004[4] Jakubiec W., Malinowski J., Płowucha W.: "Pomiary gwintów w budowie maszyn". WNT, Warszawa 2008.[5] Jezierski J., Kowalik H., Siemiątkowski Z., Warowny R.:" Analiza tolerancji w konstrukcji i technologii maszyn". WNT, Warszawa 2009.[6] Ochęduszko K., "Koła zębate. Tom 3. Sprawdzanie". WNT Warszawa 2007 (dodruk 2012)[7] Ratajczyk E.: "Współrzędnościowa technika pomiarowa". Oficyna Wydawnicza PW, Warszawa 2005

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Metrology of geometrical quantites
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U01; PEK_U02; PEK_U03;	K1TR_U01	C1; C2; C3; C4; C5; C6	La1 - La7	N1; N2; N3; N4;
PEK_K01; PEK_K02; PEK_K03;	K1TR_K03, K1TR_K09	C1; C2; C3; C4; C5; C6	La1 - La7	N1; N2; N3; N4;

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Wytrzymałość materiałów**
Name in English: **Strength of materials**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031018**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	2	2	1		
Number of hours of total student workload (CNPS)	90	60	60		
Form of crediting	Examination	Crediting with grade	Crediting with grade		
Group of courses					
Number of ECTS points	3	2	2		
including number of ECTS points for practical (P) classes		2	2		
including number of ECTS points for direct teacher-student contact (BK) classes	1.8	1.4	1.4		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of higher mathematics
2. Knowledge of the elements of material engineering
3. Knowledge of rigid body mechanics

SUBJECT OBJECTIVES

C1. Learning the elements and scope of application of the mechanics of uniform and non-uniform deformable bodies
C2. Acquiring the skills of calculating tension
C3. Acquiring the skills of experimental determination of the mechanical properties of materials and their application to determine permissible stresses

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - The students are able to recognise the type of loading and calculate the tensions for simple instances of loads and/or a determined length of fracture

PEK_W02 - The students are able to propose the basic criteria for evaluating material resistance to damage manifested in excessive strain and/or fracture caused by overloading or subcritical fracture development

PEK_W03 - The students are able to specify the basic options for preventing and/or controlling the fracture of material both during the production and processing, and its exploitation relating to skills

II. Relating to skills:

PEK_U01 - The students know how to calculate strain, stress, and the critical fracture length for simple method of loading

III. Relating to social competences:

PEK_K01 - The students know how to experimentally determine the values of basic mechanical properties and use them to determine the admissible load level

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Basic concepts of strength of materials. Types of defects and the criteria of their classification. The subject matter of the studies. External and internal forces. Definition of stress. The Saint-Venant's principle. The system of units applied in strength-related calculations. Simple cases of loading: tension and compression. Basic concepts of strength of materials. Types of defects and the criteria of their classification. The subject matter of the studies. External and internal forces. Definition of stress. The Saint-Venant's principle. The system of units applied in strength-related calculations. Simple cases of loading: tension and compression.	2
Lec2	Simple cases of loading. Stress and strain analysis	2
Lec3	Simple cases of loading: shearing. Torsion of rods of circular section	2
Lec4	Simple cases of loading. Free torsion of rods of any cross-section shape. Moments of inertia of plain figures	2
Lec5	Bending	2
Lec6	Complex strength. Strength hypothesis	2
Lec7	Complex strength. Basic examples of complex strength	2
Lec8	Bending line of beams	2
Lec9	Statically indeterminate and complex instances of bending beams	2
Lec10	Buckling. Fatigue	2
Lec11	Fracture of materials. Introduction to fracture mechanics. Testing resistance to unstable crack development in the plane strain condition. The advantages of the knowledge of KIC	2
Lec12	The criteria and principles of applying fracture mechanics to design safe high-pressure devices	2

Lec13	Creep fracture. Testing resistance to creep fracture. The principles of evaluating and predicting the life (durability) of materials working in the creep condi	2
Lec14	Testing resistance to ductile/shear fracture. Introduction to shear fracture mesomechanics. The criteria for preventing and/or controlling shear fracture development.	2
Lec15	The principles of material selection depending on their function, the imposed requirements (restrictions) and the aim. The material indices. The diagrams of properties and their application during the selection of materials	2
		Total hours: 30
Form of classes – Classes		Number of hours
Cl1	Statistically determinate rod systems, thermally loaded and loaded with axial forces	2
Cl2	Statistically indeterminate systems during tension and compression	2
Cl3	Torsion of rods of circular section. Calculating helical springs	2
Cl4	Pure and technological shearing. Calculating rivet, welded, clevis and key fasteners	2
Cl5	Bending, determining normal stre	2
Cl6	Calculating obliquely bent beams	2
Cl7	Determining tangent stress in the beams bent by cross-section forces.	2
Cl8	Test	2
Cl9	Determining normal stress during the axial bending of rods with typical cross-section	2
Cl10	Determining the deflection of rods with typical cross-section	2
Cl11	Application of effort hypotheses	2
Cl12	Calculating the columns subjected to compressive loads (buckling)	2
Cl13	Calculating the critical fracture length. Determining the time of inspection of the structures exposed to catastrophic fracture development	2
Cl14	Calculating the admissible pressure according to the yield and the leak-before-break criterion	2
Cl15	Test	2
		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1	Introduction	2
Lab2	Metals and plastics tension test	2
Lab3	Measurement of strains using the electric resistance wire strain gauge	2
Lab4	Testing fatigue strength	2
Lab5	Testing fatigue strength	2
Lab6	Buckling – experimental determination of the critical force of columns. Compression test	2
Lab7	Simple and oblique bending. Summary and crediting the laboratory classes	3
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. calculation exercises
N3. laboratory experiment

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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	Test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Classes)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01	Oral answers, (written) test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_K01	entrance test, report on laboratory classes
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Niezgodziński M. E., Niezgodziński T.: Wytrzymałość materiałów. PWN, Warszawa`1998. Niezgodziński M. E., Niezgodziński T.: Wzory, wykresy i tablice wytrzymałościowe. WNT, Warszawa 1996.Niezgodziński M. E., Niezgodziński T.: Zadania z wytrzymałości materiałów. WNT, Warszawa 1997. Neimitz A.: Mechanika pękania. PWN, Warszawa 1998.Dzidowski E. S.: Mechanizm pękania poślizgowego w aspekcie dekohezji sterowanej metali. Wyd.PWr., Wrocław 1990.Dzidowski E. S.: Physical concept of shear fracture mesomechanism and its applications. Central European Journal of Engineering, 2011, nr 1(3), s. 217-233.Dzidowski E. S.: Jak projektować, wytwarzać i eksploatować rury do bezpiecznej pracy pod ciśnieniem. Rudy i Metale, 2008, nr 11, s. 714-721.

SECONDARY LITERATURE

Broek D.: Elementary engineering - fracture mechanics. Noordhoff Int. Publishing, Leyden, 1974.Ashby M. F.: Jones D. R.: Materiały inżynierskie. Własności i zastosowania. WNT, Warszawa 1995.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Strength of materials
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01, PEK_W02, PEK_W03	K1TR_W03	C1	lec1-lec15	N1
PEK_U01	K1TR_U13	C2	Cl1-Cl14	N2
PEK_K01	K1TR_K01, K1TR_U13	C3	Cl1-Cl14	N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Badania operacyjne**
Name in English: **Operations research**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031019**
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	
Group of courses					
Number of ECTS points	3			2	
including number of ECTS points for practical (P) classes				2	
including number of ECTS points for direct teacher-student contact (BK) classes	1.8			1.4	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Have basic knowledge in mathematics confirmed positive assessments on the certificate of completion of secondary school

SUBJECT OBJECTIVES

C1. The acquisition of basic knowledge of linear programming takes into account the aspects of the application
C2. Acquiring the ability to formulate optimization problems in decision-making in the field of transport services market, the location means of distribution, organization and management, and optimization of design, technology and systems.
C3. Acquiring the ability to solve optimization problems using specialized software.
C4. Acquisition and consolidation of social competencies including emotional intelligence skills involving the cooperation in the group of students aiming to effectively solve problems, taking into account the responsibility, honesty and fairness in the proceedings.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - It has a basic knowledge of linear programming methods and decision support optimal

PEK_W02 - He knows the basics of linear programming, knows the principle of the simplex algorithm has knowledge of the construction of dual models, knowledgeable about methods of sensitivity analysis, the optimal solution, knows the basis of a comprehensive analysis of the optimal solution

PEK_W03 - He has knowledge of programming discrete and basic algorithms, knows basic algorithms for solving transport balanced, he knows the basics of formulating and solving problems related to minimizing empty runs, he knows the basics of graph theory and apply it to solving issues related to project management

II. Relating to skills:

PEK_U01 - Can properly formulate decision models of engineering and solve them using computer programs, able to formulate a simple task of making and using the geometric method to solve them, and interpret the results correctly, is able to formulate a complex task decision-making in the form of classic and canonical and solve them using the simplex algorithm

PEK_U02 - He can formulate the dual problem, solve it and move to the task results prymalnego, it can be analyzed postoptymalizacyjną optimal solution, able to find the optimum solution in integers, is able to formulate and solve the transport task in balance.

PEK_U03 - Able to correctly use graph theory, he can draw a decision tree to solve the problem of maximizing the flow on the network, he can divide the project into component tasks, draw a network of connections, find the critical path, an analysis of the time-cost and calculate the probability of completing the project within the given time.

III. Relating to social competences:

PEK_K01 - Acquisition and consolidation of competence in information retrieval and its critical analysis, capacity building self-esteem and self-control and responsibility for the results of the activities undertaken

PEK_K02 - He understands the need for self-education, including improving the skills of attention and focus on important things, and develop the ability to independently apply their knowledge and skills

PEK_K03 - Acquisition and consolidation of competence in the field of team cooperation on improving the methods for the selection of a strategy to optimally solving problems assigned to a group, independent and creative thinking, respect the customs and rules in academia

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Operational research as a tool for decision-making processes - classification decision-making processes. Methods of decision making under conditions of uncertainty. Linear Programming (PL) - linear model of decision-making, decisions acceptable and optimal. Methods of solving GB. Graphic solving PL.	2
Lec2	Linear programming models. Formulating and solving EN - interpretation of the results. Simplex algorithm.	2
Lec3	Dualism in linear programming. Matrix calculus in solving PL. The dual problem, dual pricing and their interpretation.	2
Lec4	Analysis postoptymalizacyjna (sensitivity solutions). Change the parameters of the objective function and the words available in the restrictions. Add or remove decision variables.	2
Lec5	Comprehensive analysis of the optimal solution	2
Lec6	Integer linear programming (discrete). Method planes shut off.	2

Lec7	Classic transport tasks - algorithms. Transportation tasks with the criterion of time.	2
Lec8	Transportation tasks (unbalanced, with limited bandwidth routes). The problem of manufacturing location.	2
Lec9	Examples of issues capable of being reduced to the transportation problem (the problem of optimal allocation). The tasks of transport and production and transport and storage.	2
Lec10	Minimizing empty runs. Blocking routes. The multi-phase transport task.	2
Lec11	Introduction to graph theory. Project management (network programming). The maximum flow in the network. Ford-Fulkerson algorithm. Decision trees.	2
Lec12	Minimum spanning tree. The shortest route in the graph - algorithms.	2
Lec13	Depending on the network - deterministic (CPM, PERT) and stochastic (GERT). Analysis of time-cost. Create Gantt charts. Optimisation of resources based networks.	2
Lec14	Travelling Salesman Problem. Little's algorithm. Problem loading (knapsack). The problem of production and inventory control.	2
Lec15	Optimizing Multi-criteria and selected non-linear decision models solvable methods EN	2
		Total hours: 30
Form of classes – Project		Number of hours
Proj1	Organizational matters. The principles of linear programming. Construction of mathematical models of linear programming tasks. The objective function, decision variables, constraints inequality, Boundary conditions. Geometric method of solving two decision variables.	2
Proj2	Form the base of the linear programming. Simplex algorithm. Solving linear equations using matrix calculus.	2
Proj3	Sensitivity analysis solutions. The coefficients of the objective function. Vector words free of restrictions.	2
Proj4	Formulation of the dual problem. The use of the dual geometric method for solving tasks EN with two restrictions.	2
Proj5	The dual simplex method - using computer programs WinQSB and the module SOLVER EXCEL spreadsheet.	2
Proj6	Parametric linear programming.	2
Proj7	Discrete linear programming (integer). Rounding solutions. And bound method. Method cuts.	2
Proj8	Task transport - algorithm. The first base basic solution. Method minimum element of the cost matrix. VAM method. Method angle N-W.	2
Proj9	Transportation tasks - a method of potentials. Balancing open transport task. Degeneration in the task of transport.	2
Proj10	Network programming - the minimum spanning tree, shortest path in the network, the maximum flow in the network.	2
Proj11	Project management. Network graph construction activities. Critical path method (PCM).	2
Proj12	Project management. PERT method. Acceleration of the project. Minimizing the cost of the project at a given time of execution. Minimize the duration of the project at a given cost curve.	2
Proj13	Scheduling tasks. Gantt charts.	2

Proj14	The issue of a Salesman. Little's algorithm.	2
Proj15	Presentation and defense of project	2
		Total hours: 30

TEACHING TOOLS USED

N1. informative lecture
N2. self study - preparation for project class
N3. calculation exercises
N4. project presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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	test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U02,	test, defense computational part of the project
F2	PEK_U03, PEK_K01-PEK_K03	test, defense computational part of the project
P = 0,5*F1+0,5*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Ignasiak E. (red.): Badania operacyjne. Warszawa 2001, PWE[2] Kukuła K. (red.): Badania operacyjne w przykładach i zadaniach. Warszawa 2002, PWN[3] Trzaskalik T.: Wprowadzenie do badań operacyjnych z komputerem. Warszawa 2008, PWE

SECONDARY LITERATURE

[1] Stadnicki J.: Teoria i praktyka rozwiązywania zadań optymalizacji z przykładami zastosowań technicznych. Warszawa 2006, WNT[2] Szapiro T. (red.): Decyzje menadżerskie z Excelem. Warszawa 2000, PWE[3] Guzik B.: Ekonometria i badania operacyjne. Wydawnictwo AE Poznań, Poznań 1999[4] Krawczyk S.: Badania operacyjne dla menadżerów. Wydawnictwo AE Wrocław 1996[5] Lipiec-Zajchowska M. (red.): Wspomaganie procesów decyzyjnych. Tom III. Badania operacyjne. Wydawnictwo C.H. Beck, Warszawa 2003[6] Anholcer M., Gaspras H., Owczarkowski A.: Przykłady i zadania z badań operacyjnych i ekonometrii. Wydawnictwo AE Poznań, Poznań 2003

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Operations research
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W01, K1TR_W12	C1, C2. C3	Wy1, Wy2, Wy3, Wy4,	N1, N2, N3
PEK_W02	K1TR_W01, K1TR_W10	C1, C2, C3	Wy5, Wy6, Wy7, Wy8, Wy9,	N1, N2, N3
PEK_W03	K1TR_W01	C1, C2, C3	Wy10, Wy11, Wy12, Wy13, Wy14, Wy15	N1, N2, N3, N4
PEK_U01	K1TR_U01, K1TR_U07, K1TR_U08, K1TR_U20	C1, C2, C3, C4	Pr1, Pr2, Pr3, Pr4	N1, N2, N3
PEK_U02	K1TR_U01, K1TR_U07, K1TR_U08	C1, C2, C3	Pr5, Pr6, Pr7, Pr8	N1, N2, N3
PEK_U03	K1TR_U01, K1TR_U07, K1TR_U08	C1, C3, C4	Pr9, Pr10, Pr11, Pr12, Pr13, Pr14, Pr15	N2, N3, N4
PEK_K01	K1TR_K03, K1TR_K05	C4	Wy1, Pr15	N2, N4
PEK_K02	K1TR_K01	C4	Wy1, Pr15	N4
PEK_K03	K1TR_K03, K1TR_K04	C4	Wy15, Pr15	N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Mechanika płynów**
Name in English: **Fluid Mechanics**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031020**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	15			
Number of hours of total student workload (CNPS)	60	30			
Form of crediting	Crediting with grade	Crediting with grade			
Group of courses	X				
Number of ECTS points	2	1			
including number of ECTS points for practical (P) classes		1			
including number of ECTS points for direct teacher-student contact (BK) classes	1.2	0.7			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student has a structured knowledge of mathematics, including algebra and analysis.
2. Student has a structured knowledge of physics, mechanics.
3. Student has a structured knowledge of basis of machine design and production of means of transport.

SUBJECT OBJECTIVES

C1. Understanding the basic laws of mechanics in relation to flows of liquids and gases.
C2. Gaining ability to use basic laws of fluid mechanics in the construction and design of means of transport
C3. Gaining ability to use basic laws of fluid mechanics in the means of transport operation.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Student is able to define basic laws of fluid mechanics.

PEK_W02 - Student is able to explain the principles of means of transport operation and the phenomena utilized in their construction.

PEK_W03 - Student is able to Indicate the relationship between the fundamental laws of fluid mechanics and principles of operation of means of transport equipment.

II. Relating to skills:

PEK_U01 - Student is able to analyse the process of the phenomena associated with the flows in the means of transport operation.

PEK_U02 - Structured knowledge of the theory of motion and operation of means of transport.

PEK_U03 - Student is able to combine law of fluid mechanics with the problems of means of transport design and operation.

III. Relating to social competences:

PEK_K01 - Student understands the legal aspects and effects of engineering activities.

PEK_K02 - Student understands and is aware of the non-technical aspects and impacts of engineering activities in transport.

PEK_K03 - Student is aware of the necessity of individual and group activities that go beyond the engineering operation.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction. Properties of liquids and gases, forces and stresses in fluids,basic concepts of field theory.	2
Lec2	Newtonian and non-Newtonian fluids, fluid motion analysis method, streamlines , potential and rotational flow.	2
Lec3	The basic equations of fluid mechanics, the continuity equation, the conservation of momentum equation for the ideal and real fluids (Euler equation and Navier-Stokes equations).	2
Lec4	Hydrostatic equations, communicating vessels, the pressure forces of the liquid on the walls.	1
Lec5	Buoyancy and stability of floating bodies. Impact on the operational safety of waterway transport.	2
Lec6	Euler equation integrals - Bernoulli's equation, examples of applications: measurements of velocity, the flow of liquid through the holes.	2
Lec7	The equations of momentum and moment of momentum equation, hydrodynamic reaction, principles of turbo-machinery and propellers.	2
Lec8	Real fluids, laminar and turbulent flow, the Bernoulli's equation for real fluids.	1
Lec9	Flow in open channels, the critical speed.	1
Lec10	The flow similitude, the dimensionless numbers in fluid dynamics, examples of applications.	2
Lec11	Examples of solutions of N-S equations , flows in the axially-symmetric pipes , major losses and their calculation, the effect of roughness.	2

Lec12	Flow in pipes, pipelines characteristics, the unsteady phenomena - water hammer.	2
Lec13	The theory of the boundary layer, laminar and turbulent layer, the phenomenon of flow separation, flows around means of transport.	1
Lec14	Flow around bodies, drag forces. Classification of resistance of body motion between the two fluids. The methods of determining the motion resistance.	2
Lec15	Aerofoil, hydrodynamic characteristic of aerofoil and hydrofoil. Methods of calculation of forces on aerofoil.	2
Lec16	Numerical methods in fluid mechanics, examples of use in the analysis of external flows.	2
		Total hours: 28
Form of classes – Classes		Number of hours
Cl1	Exercises illustrating the application of the Euler equation and Pascal's law.	2
Cl2	Calculation of pressure forces on the walls.	2
Cl3	Application of the Bernoulli's equation and the continuity equation for calculating ideal fluid flow.	2
Cl4	Calculation of the buoyancy and stability of floating bodies.	2
Cl5	Application of the conservation of momentum equation and moment of momentum equation to calculate the hydrodynamic forces.	2
Cl6	Calculation of the pressure loss in closed in pipelines. Determination of pipeline characteristics.	2
Cl7	Calculation of the motion resistance and hydrodynamic forces on aerofoils and hydrofoils.	2
Cl8	Final Test	1
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. problem lecture
N3. calculation exercises

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_U02, PEK_U03	test
P = 0.5*F1+0.5*FC		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Classes)		
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_U03	test
P = F1=FC		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Bukowski J., Kijkowski P.; Kurs mechaniki płynów, PWN, 1980.
Orzechowski Z., Prywer J., Zarzycki R.: Mechanika płynów w inżynierii środowiska. PWN, Warszawa 1998.
Jeżowiecka-Kabsch K., Szewczyk H.: Mechanika płynów. Oficyna Wydawnicza PWr, Wrocław 2001.

SECONDARY LITERATURE

Burka S.E., Nałęcz T.J.: Mechanika płynów w przykładach. PWN, Warszawa 1994.
Zieliński A.: Wybrane zagadnienia z mechaniki płynów. Oficyna Wydawnicza PWr, Wrocław 2011.
Dudziak J. Teoria okrętu, Gdańsk, 2007.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Fluid Mechanics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W03	C1	Lec1-Lec16	N1, N2
PEK_W02	K1TR_W07, K1TR_W10, K1TR_W12	C2, C3	Lec7, Lec9, Lec12, Lec14, Lec15	N1, N2
PEK_W03	K1TR_W07, K1TR_W10, K1TR_W12	C2, C3	Lec7, Lec9, Lec12, Lec14, Lec15, Lec16	N1, N2
PEK_U01	K1TR_U01, K1TR_U06, K1TR_U18	C1, C2, C3	Cl1-Cl7	N3
PEK_U02	K1TR_U10, K1TR_U14	C1, C2, C3	Cl1-Cl7	N3
PEK_U03	K1TR_U03, K1TR_U06, K1TR_U07	C1, C2, C3	Cl1-Cl7	N3

PEK_K01, PEK_K02, PEK_K03	K1TR_K01, K1TR_K03, K1TR_K05, K1TR_K07	C1, C2, C3	CI1-CI7	N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy logistyki**
Name in English: **Fundamentals of logistics**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031021**
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)	90	60			
Form of crediting	Examination	Crediting with grade			
Group of courses					
Number of ECTS points	3	2			
including number of ECTS points for practical (P) classes		2			
including number of ECTS points for direct teacher-student contact (BK) classes	1.8	1.4			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of the organization and operation of the production enterprise

SUBJECT OBJECTIVES

C1. To familiarize students with the basic tasks of logistics business processes.
C2. Some specific models and methods used in the design and evaluation of logistics systems.
C3. Characterization of core technology and material flow logistics information systems.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - He knows the structure of the logistics system, its components and the relationships between them.
PEK_W02 - He knows the methods and strategies of managing logistics processes in the enterprise

II. Relating to skills:
PEK_U01 - It can be used for selected models and methods for the design, management and evaluation of logistics system.
PEK_U02 - He can choose the material flow technology and information flow

III. Relating to social competences:
PEK_K01 - Able to present opinions on the social and environmental impact of the operation of the supply chain

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	History of the development of logistics. Basic concepts and definitions.	2
Lec2	System and logistics process, structure. classification criteria	2
Lec3	Strategies for managing logistics processes; Just In Time.	2
Lec4	Logistics supply. Inventory management.	2
Lec5	Logistics of production. Range of computer support: MRP I, MRP II, ERP.	2
Lec6	Logistics distribution. Demand forecasting	2
Lec7	Reverse logistics. Ecologistics	2
Lec8	Information technology, automatic identification method.	2
Lec9	Information Technology, Electronic Data Interchange.	2
Lec10	Packaging. Basic functions. Logistic label.	2
Lec11	Technologies of storage.	2
Lec12	Handling technology	2
Lec13	Transport technologies. Linear infrastructure .	2
Lec14	Logistics centers. Point infrastructure .	2
Lec15	Logistics optional; examples: peacekeeping, health, public events.	2
		Total hours: 30
Form of classes – Classes		Number of hours
Cl1	Introduction to exercise. Overview of the exemplary embodiment of the supply chain	2
Cl2	Zarządzanie zapasami. Klasyfikacja ABC / XYZ.	2
Cl3	Prognozowanie popytu	2
Cl4	Selection of inventory control system	2
Cl5	Simulation of a Kanban production system	2
Cl6	Transport management in the context of supply chain	2

Cl7	Storage. Summary of activities.	3
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. problem exercises
N3. tutorials

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01	Written exam - test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Classes)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U02	test, oral answer
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Ballou R.H. Business :ogistics / Supply Chain Management. Pearson Education Inc. 2004.
Logistyka. Red. D. Kisperska_Moroń, S. Krzyżaniak. ILiM, Poznań 2009.
Logistyka. Teoria i praktyka.Tom I i II. Red. S. Krawczyk. Difin, Warszawa 2011.

SECONDARY LITERATURE

Zając P.: CRM - Zarządzanie relacjami z klientem w logistyce dystrybucji. Navigator 17. Oficyna Wydaw. Politechniki Wrocławskiej, Wrocław 2007.
Kwaśniowski S., Nowakowski T., Zając M.: Trasnport intermodalny w sieciach logistycznych. Navigator 18. Oficyna Wydaw. Politechniki Wrocławskiej, Wrocław 2008.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Fundamentals of logistics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W02	C1, C2	Lec1, Lec2, Lec8 - Lec15	N1
PEK_W02	K1TR_W21	C2	Lec2 - Lec7	N1
PEK_U01	K1TR_U09	C2	Cl1 - Cl7	N2, N3
PEK_U02	K1TR_U10	C3	Cl1 - Cl7	N2, N3
PEK_K01	K1TR_K02	C1	Cl1 - Cl7	N1

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy projektowania środków transportu II**
Name in English: **Fundamentals of Means of Transport Design II**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031022**
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	
Group of courses	X				
Number of ECTS points	3			2	
including number of ECTS points for practical (P) classes				2	
including number of ECTS points for direct teacher-student contact (BK) classes	1.8			1.4	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of issues related to mechanics, strength of materials and theory of machines and mechanisms.
2. Knowledge of rules in engineering graphics.

SUBJECT OBJECTIVES

C1. Acquiring knowledge of the basics of the designing and operation of transportation means.
C2. Acquiring ability to select computational models for basic machinery elements in the fields of supporting structures and connections, bearing components and elastic elements in general engineering applications.
C3. Acquiring basic skills in the field of designing of simple machinery components basing on knowledge of the structure and the ability to analyze selected solutions and designing, as well as the operation of these objects.
C4. Acquiring of an ability to organize work in a team and to fulfil own specified tasks.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Has a detailed knowledge on principles of designing of elements, subassemblies and assemblies in means of transportation.

PEK_W02 - Has a detailed knowledge on built of machinery elements (e.g. connectors, transmissions and supporting structures) used in transportation means.

PEK_W03 - Has a detailed knowledge on operation and reliability of transportation means.

II. Relating to skills:

PEK_U01 - Can compile reports from performed engineering works.

PEK_U02 - Can search information available in the literature in the field of designing of elements of the transportation means.

PEK_U03 - Can formulate guidelines for the process of operation of selected transporation equipment.

III. Relating to social competences:

PEK_K01 - Can think creatively.

PEK_K02 - Can organize work for others in a project group, as well as fulfil the assigned tasks in the group.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Scope of the lecture, rules ofssessment and literature. Basic issues of designing methods in elements of transportation means. Methods, methodologies, processes, technical projects.	2
Lec2	Elements of transportation means - evaluation criteria.	2
Lec3	Manufacturability of mechanical structures in transportation means.	2
Lec4	Standardization in designing. Accuracy of technologies used for production of machinery elements.	2
Lec5	Selected tribological issues - operation as a source of information about construction of transportation means' elements.	2
Lec6	Steel constructions, permanent and non-permanent joints.	2
Lec7	Basic mechanical and energy phenomena in parts of transportation means.	2
Lec8	Machinery shaft, axles, joints. Analysis of shaft's vibrations.	2
Lec9	Sliding and rolling bearings. Determination of characteristics of sliding bearing. Seals.	2
Lec10	Elastic elements. Importance of deformations in designing of machinery parts. Spring suspension in transportation means.	2
Lec11	Clutches and brakes. Thermal processes in machinery parts.	2
Lec12	Mechanical transmissions in transportation means. Gears (law of gearing, characteristics of cycloid and involute gearing, correction of meshing, tooth model in strength analysis, helical and bevel gears).	2
Lec13	Epicyclic gearing and harmonic drive in transportation means.	2
Lec14	Worm and screw drives. Construction and operation of chain and friction drives.	2
Lec15	Summary of the lectures, review of exam problems, additional explanations.	2

		Total hours: 30
Form of classes – Project		Number of hours
Proj1	Scope of the project, rules of assessment and literature. Assignment of individual designing topics.	2
Proj2	Reonstruction of a simple transportation mean, such as bicycle, car jack. Mechanical model and physical principle of operation.	2
Proj3	Simplified drawings and dimensioned drawings of selected simple transportation mean.	2
Proj4	Construction of models of transportation mean's parts.	2
Proj5	Methods for detailing the goal of designing of transportation mean's parts.	2
Proj6	A practical usage of heuristic and algorithmic methods (morphological table, tree of solutions for own project).	2
Proj7	Synthesis - example and practice of designing of transportation mean's parts.	2
Proj8	Classifying significance of criteria of evaluation. Generating and clasifying initial solutions.	2
Proj9	Technical documentation of the project. Assembly drawing - more detailed presentation of selected solution of power transmission.	2
Proj10	Technical documentation of the project. Assembly drawing - more detailed presentation of selected nodes.	2
Proj11	Technical documentation of the project. Dimensioned drawing of selected part of transmissions.	2
Proj12	Technical documentation of the project. Dimensioned drawing of selected part of brake unit.	2
Proj13	Technical documentation of the project. Dimensioned drawing of selected part of power transmission unit.	2
Proj14	Remodelling of an own algorithm of designing. Synthesis of project popularising (optional).	2
Proj15	Presentation and project acceptance.	2
		Total hours: 30

TEACHING TOOLS USED

N1. informative lecture
N2. traditional lecture with the use of transparencies and slides
N3. problem discussion
N4. project presentation
N5. Computer stands with AutoCAD (for project classes)

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01 - PEK_W03	Participation in problem discussions. Oral-written exam.
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01 - PEK_U03, PEK_K01 - PEK_K03	Evaluation of computational part of the project. Evaluation of project preparation. Presentation of the project.
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Dietrich M. (red), Fundamentals of Machinery Design, PWN, Warszawa, after 2000 (in Polish).
[2] Kurmaz L. et al. Fundamentals of Machinery Design, PWN, Warszawa, after2000 (in Polish).
[3] Miller S.: Kinematic structures. WNT Warszawa 1988 (in Polish).
[4] Rydzanicz I.: Engineering drawing. Wroclaw University of Technology Publishing House, Wrocław, 2005 (in Polish).
[5] Fundamentals of Machinery Design (different authors) over 20 volumes (in Polish).

SECONDARY LITERATURE

[1] Avallone E. A., Baumeister III T., Sadegh A. M. Marks, Standard Handbook for Mechanical Engineers. The McGraw-Hill Companies, 2007.
[2] Dziama A. i inni (red), Fundamentals of Machinery Design, PWN, Warszawa, 2002 (in Polish).
[3] Kurmaz L. i inni. Fundamentals of Machinery Design. Designing, PWN, Warszawa, after 2000 (in Polish).
[4] Pahl G., Beitz W.: Engineering Design, WNT, Warszawa 1984.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Fundamentals of Means of Transport Design II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number

PEK_W01	K1TR_W07	C1	Lec1 - Lec4, Lec15	N1, N2, N3
PEK_W02	K1TR_W07	C1	Lec6 - Lec15	N1, N2, N3
PEK_W03	K1TR_W14	C1	Lec3 - Lec5, Lec7, Lec15	N1, N2, N3
PEK_U01	K1TR_U03	C2, C3	Proj3, Proj4, Proj14, Proj15	N4, N5
PEK_U02	K1TR_U01, K1TR_U06	C2, C3	Proj9 - Proj13	N3
PEK_U03	K1TR_U13	C3	Proj1 - Proj6	N3, N4
PEK_K01	K1TR_K05	C2, C3	Proj6 - Proj8	N3, N4
PEK_K02	K1TR_K03	C4	Proj5 - Proj8	N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Środki transportu I**
Name in English: **Transport vehicles I**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031023**
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
Group of courses					
Number of ECTS points	2				2
including number of ECTS points for practical (P) classes					2
including number of ECTS points for direct teacher-student contact (BK) classes	1.2				1.4

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		2
Lec9		2
Lec10		2
Lec11		2
Lec12		2
Lec13		2
Lec14		2
Lec15		2
		Total hours: 30
Form of classes – Seminar		Number of hours
Sem1		2
Sem2		2
Sem3		2
Sem4		2
Sem5		2
Sem6		2
Sem7		2
Sem8		2
Sem9		2
Sem10		2
Sem11		2
Sem12		2
Sem13		2
Sem14		2
Sem15		2
		Total hours: 30

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. problem discussion
N3. multimedia presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)		
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_K01-PEK_K03	
P = 100%*F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)		
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_U03,	
F2	PEK_U01, PEK_U02, PEK_U03,	
P = 50%*F1+50%*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Transport vehicles I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number

PEK_W01	K1TR_W07	C1, C2, C3		N1
PEK_W02	K1TR_W15	C1, C2, C3		N2, N3
PEK_W03	K1TR_W17	C1, C2, C3		N1, N2, N3
PEK_U01	K1TR_U01	C1, C2, C3		N2, N3
PEK_U02	K1TR_U01, K1TR_U18	C1, C2, C3		N2, N3
PEK_U03	K1TR_U10	C1, C2, C3		N2, N3
PEK_K01	K1TR_K10	C1, C2, C3		N1
PEK_K02	K1TR_K09	C1, C2, C3		N1
PEK_K03	K1TR_K10	C1, C2, C3		N1

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Termodynamika techniczna**
Name in English: **Technical thermodynamics**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031024**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	30		60		
Form of crediting	Crediting with grade		Crediting with grade		
Group of courses					
Number of ECTS points	1		2		
including number of ECTS points for practical (P) classes			2		
including number of ECTS points for direct teacher-student contact (BK) classes	0.6		1.4		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. knowledge of matter cover according to the physics education program in the range of Physics module
2. Ability of individual performance of laboratory experiments, enhanced by elementary manual dexterity
3. Awareness of the team working necessity and ability of its execution

SUBJECT OBJECTIVES

C1. Understanding of gas processes and possibility of its usage in technique basing onthe laws of thermodynamic
C2. Knowledge and understanding of the engines air standard cycles and ability to evaluate its efficiency
C3. Familiarisation with the practical realisation of air standard cycle for combustions engines and piston compressors

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Names and describes the laws of thermodynamics and thermodynamic processes
PEK_W02 - Characterises and explains air standard cycles and is able to evaluate its efficiency
PEK_W03 - Names and describes the procedures of the air standard cycles realization in combustion engines and piston compressors

II. Relating to skills:
PEK_U01 - Is able to calculate the level of imperfection of the adiabatic, isothermal process as an example of polytropic process
PEK_U02 - Calculates values of specific heat for gasses and volumetric efficiency of a piston compressor
PEK_U03 - Calculates and verifies coefficient of heat transfer through a plat plate as well as conductive coefficient for forced and natural convection

III. Relating to social competences:
PEK_K01 - technical thermodynamics (studies II and III degree),
PEK_K02 - Is aware of the importance, responsibility and the effects of engineer work from Mechanical Engineering faculty in terms of responsibility for the environment, resulting from the proper use of the knowledge of technical thermodynamics
PEK_K03 - Recognizes the need to improve professional skills, personal and social

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Basic definitions: mass, the amount of pressure, temperature, volume	2
Lec2	I Law of Thermodynamics - work, heat, internal energy, power, thermodynamic system open – closed	2
Lec3	I Law of Thermodynamics for open thermodynamic systems - enthalpy, volume and technical work	2
Lec4	Thermodynamic processes calculation of heat and work variations	2
Lec5	Cycles, entropy, the efficiency of cycles	2
Lec6	Carnot Cycle, Second Law of Thermodynamics, reversible processes, irreversible entropy relationship of the Second Law of Thermodynamic	2
Lec7	The flow of gas through the nozzles, the energy balance for open movable systems, dynamic stream performance	2
Lec8	Basic air standard cycles for engine, efficiencies and comparison	2
Lec9	Combustion, the calorific value of the fuel, combustion control charts	2
Lec10	Internal and external combustion piston and gas turbine engines	2
Lec11	Stirling engine air standard cycle and its practical realisation	2
Lec12	Piston and rotodynamic; energy balance, an indicator diagram and operation of the compressor	2
Lec13	Basic laws of heat transfer by convection, radiation and conduction	2
Lec14	Compressible fluid flow	2
Lec15	Diaphragm, convective heat exchangers	2

		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1	Determination of the specific heat of the gas	2
Lab2	Practical realization of adiabatic process	2
Lab3	Examination of the adiabatic flow through a Bendemann nozzle	2
Lab4	Determination of volumetric efficiency of a piston compressor	2
Lab5	The study of isothermal process	2
Lab6	Determination of heat transfer coefficients for forced and natural convection	2
Lab7	Examination of the process of heat transfer through a flat barrier with: a) the occurrence of convection and radiation, b) applying a debilitating radiation screen	2
Lab8	Isobaric heating using heat regeneration	1
		Total hours: 15

TEACHING TOOLS USED

N1. multimedia presentation
N2. problem lecture
N3. laboratory experiment
N4. self study - preparation for laboratory class
N5. report preparation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01-PEK_K03	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)

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_U03	quiz, a report from the laboratory

F2	PEK_U01 PEK_U02 PEK_U03	quiz, a report from the laboratory
F3	PEK_U01 PEK_U02 PEK_U03	quiz, a report from the laboratory
F4	PEK_U01 PEK_U02 PEK_U03	quiz, a report from the laboratory
F5	PEK_U01 PEK_U02 PEK_U03	quiz, a report from the laboratory
F6	PEK_U01 PEK_U02 PEK_U03	quiz, a report from the laboratory
F7	PEK_U01 PEK_U02 PEK_U03	quiz, a report from the laboratory
P = (F1+F2+F3+F4+F5+F6+F7)/7		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Technical thermodynamics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W03	C1	Lec1 Lec2 Lec3 Lec4	N1. N2.
PEK_W02	K1TR_W03	C2	Lec5 Lec6 Lec7 Lec8	N1. N2.
PEK_W03	K1TR_W03	C3	Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N1. N2.
PEK_U01	K1TR_U01, K1TR_U18	C1	La2 La5	N3. N4. N5.
PEK_U02	K1TR_U01, K1TR_U18	C2	La1 La4	N3. N4. N5.
PEK_U03	K1TR_U01, K1TR_U18	C3	La3 La6 La7 La8	N3. N4. N5.
PEK_K01	K1TR_K01	C1 C2 C3	Lec1 Lec2 Lec3 Lec4	N1. N2.
PEK_K02	K1TR_K02	C1 C2 C3	Lec7 Lec8 Lec9 Lec10 Lec11	N3. N4.
PEK_K03	K1TR_K04	C1 C2 C3	Lec15 La8	N4. N5.

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy automatyki**
Name in English: **Fundamentals of Automatic Control**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031025**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	30		30		
Form of crediting	Crediting with grade		Crediting with grade		
Group of courses					
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	0.6		0.7		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Fundamentals of mathematical analysis

SUBJECT OBJECTIVES

C1. Knowledge of the basic problems of automation.
C2. Knowledge of the construction, operation and application principles of automation equipment.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - The student knows the basic concepts of the theory of automatic control systems and control.
PEK_W02 - The student knows the principles of mathematical modeling of linear dynamical systems, methods of analysis and synthesis of control systems in different domains: time, operators and frequency.
PEK_W03 - The student has the knowledge to evaluate the quality of linear control systems as well as the design of digital control systems.

II. Relating to skills:

PEK_U01 - The student is able to analyze and design basic circuits automatic adjustment.
PEK_U02 - The student is able to analyze digital programmable automation systems.

III. Relating to social competences:

PEK_K01 - Students can interact and work in a group.
PEK_K02 - The student is able to think and act in a creative way.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction, basic concepts, the structure of control systems and their classification.	2
Lec2	Description of linear automation systems: differential equations, transfer function characteristics time.	2
Lec3	Description of linear automation systems: spectral transmittance, the frequency characteristics.	2
Lec4	Dynamic element: proportional, inertial differentiat	2
Lec5	Dynamic element: Integral, oscillating delay	2
Lec6	Stability. Theorem stability properties of stable and unstable systems.	2
Lec7	Description of discrete systems. The difference equation, transmittance, spectral transmittance characteristics time.	2
Lec8	Automatic adjustment. Requirements. Static control. Floating control.	2
Lec9	Regulators: PI, PD, PID.	2
Lec10	Nonlinear Systems. Methods of description and analysis.	2
Lec11	Discrete automatic control.	2
Lec12	oolean algebra	2
Lec13	Logic combination	2
Lec14	Sequential logic	2
Lec15	Test	2
		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1	Training of health and safety, organizational matters. Static and dynamic characteristics of automation components.	3

Lab2	Simulation testing of components and automation systems in Matlab-Simulink	2
Lab3	Components and systems jointed relay	2
Lab4	Combinatorial synthesis of control systems	2
Lab5	Modeling and programming sequential processes	2
Lab6	PLC programming languages	2
Lab7	Two-sided control	2
		Total hours: 15

TEACHING TOOLS USED
N1. traditional lecture with the use of transparencies and slides N2. self study - preparation for laboratory class

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01-PEK_W03	test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U02	grade point average of all laboratories
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. J. Awrejcewicz, W. Wodzicki, Fundamentals of Automatic Control. Theory and Examples. Publishing Politechnika Łódzka, 2012.
2. Marek Żelazny, Fundamentals of Automatic Control, Publishing, PWN, 1963
3. T. Mikulczyński. Laboratory fundamentals of automatic and automation. Publishing PWr. 2005

SECONDARY LITERATURE

1. M. Werszko, R. Werszko, Fundamentals of Automatic Control. Selected topics. Publishing DWSP iT, 2011

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Fundamentals of Automatic Control
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01 - PEK_W03	K1TR_W09	C1, C2	Lec1-Lec15	N1
PEK_U01, PEK_U02	K1TR_U09	C1,C2	Lab1-Lab7	N2
PEK_K01, PEK_K02	K1TR_K03	C1,C2	Lab1-Lab7, Lec1-Lec15	N1, N2

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Środki transportu II**
Name in English: **Means of transport II**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031026**
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
Group of courses	X				
Number of ECTS points	2				2
including number of ECTS points for practical (P) classes					2
including number of ECTS points for direct teacher-student contact (BK) classes	1.2				1.4

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Ordered knowledge of core subjects: physics, mathematics
2. Ordered knowledge of specialized subjects: solid mechanics, fluid mechanics, transportation systems
3. Able to prepare and make a presentation on a chosen topic and lead the discussion.

SUBJECT OBJECTIVES

C1. Learning the bases for the construction of means of transport: water, hydro, air transport
C2. Learning the basics of operating modes of transportation: water, hydro, air transport
C3. Learning the safety rules and regulations in force in transport: water and air transport

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Able to characterize and describe in detail the construction, design and calculation rules for means of transport: pipeline, water and air transport.

PEK_W02 - Able to characterize and describe in details operating on transport means: pipeline, water and air transport.

PEK_W03 - Student can discuss the safety rules of means of transport: pipeline, water and air transport.

II. Relating to skills:

PEK_U01 - Able to analize the construction, design and calculation rules for means of transport: pipeline, water and air transport.

PEK_U02 - Able to perform basic construction-exploitation calculations of transport means: pipeline, water and air transport.

PEK_U03 - Able to make a presentation, conduct public speech and establish a discussion on means of transport: pipeline, water and air transport.

III. Relating to social competences:

PEK_K01 - Understands the need and knows the possibility of constant learning

PEK_K02 - Knows the regulations and safety rules of transport means: pipeline, water and air transport

PEK_K03 - Is aware of the importance and understanding of the environmental aspects of the technical activities

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	The division and classification of the goods fleet, rules of dimensioning, the role of classification societies in the construction and operation	2
Lec2	Basics of ship construction, spatial distribution, systems of hull structure, classification of loads	2
Lec3	Rules of hydrostatic calculations	2
Lec4	Propulsion systems, marine propellers, principles of selection	2
Lec5	Steering systems, the maneuverability	2
Lec6	The propulsion characteristics of ship, motion resistance	2
Lec7	The division and classification of means of inland waterway transport	2
Lec8	Effect of navigational and meteorological conditions for the operation of means of water transport.	2
Lec9	Means of maritime transport	2
Lec10	Stability issues of vessels while operating	2
Lec11	Components of water transport costs, energy consumption, ecology in water transport	2
Lec12	Elements of hydro infrastructure, pipelines, pumps, fittings	2
Lec13	Energy losses, the cost of transportation	1
Lec14	Air transport, infrastructure, means of transportat, basic operating parameters, safety	2
Lec15	Operating rules for air transport, transport costs	2

Lec16	Final test	1
		Total hours: 30
Form of classes – Seminar		Number of hours
Sem1	Basic physical and chemical characteristics of crude oil, natural gas, the rules for determining losses in hydrotransport, pumps and compressors in hydrotransport.	2
Sem2	Classification of airports and passengers aircrafts, safety systems in air transport	2
Sem3	Construction of aircraft hulls, types of engines used in aerospace, alternative energy sources	2
Sem4	The division and classification of sea and river ports, standard equipment	2
Sem5	Propulsion systems in shipbuilding (engines, propellers), the rules for determining the parameters of propulsion systems (model tests, approximate methods)	2
Sem6	Classification societies on the construction and operation of water transportation means: classification, stability, registered capacity.	2
Sem7	Detailed characterization, construction, operation, method of transport on water and air.	2
Sem8	The greatest maritime disasters, aviation, their causes and effects	1
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. multimedia presentation
N3. tutorials

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01-PEK_K03	Final test
P = 0.6*F1+0.4*FS		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)

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_U03, PEK_K01-PEK_K03	presentation, speech, draft, participation in discussions of problem
P = F1=FS		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Żylicz A.; Statki śródlądowe, Wydawnictwo Morskie, Gdańsk, 1979.
2. Buczkowski L. Podstawy budownictwa okrętowego, Politechnika Gdańska, Gdańsk 1970.
3. Wright P.H.; Ashford N.J.; Tranportation Engineering, John Wiley &Sons, New Yrok, 1998

SECONDARY LITERATURE

1. Rydzykowski Wł.; Wojewódzka – Król K.; Transport, Wydawnictwa Naukowe PWN, Warszawa 1997

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Means of transport II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01,PEK_W02,PEK_W03, PEK_K01,PEK_K02,PEK_K03	K1TR_K02, K1TR_K04, K1TR_K06, K1TR_K07, K1TR_K08, K1TR_K09, K1TR_W06, K1TR_W07	C1,C2,C3	Lec1-Lec16	N1,N3
PEK_U01,PEK_U02,PEK_U03, PEK_K01,PEK_K02,PEK_K03	K1TR_K02, K1TR_K04, K1TR_K06, K1TR_K07, K1TR_K08, K1TR_K09, K1TR_U01, K1TR_U04, K1TR_U06, K1TR_U10, K1TR_U16	C1,C2,C3	Se1-Se15	N2,N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Teoria ruchu pojazdów**
Name in English: **Theory of vehicle movement**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031027**
Group of courses: **yes**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15	15	
Number of hours of total student workload (CNPS)	90		30	30	
Form of crediting	Examination		Crediting with grade	Crediting with grade	
Group of courses	X				
Number of ECTS points	3		1	1	
including number of ECTS points for practical (P) classes			1	1	
including number of ECTS points for direct teacher-student contact (BK) classes	1.8				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The ability to carry out mathematical calculations and knowledge of the physical laws known in higher education institutes of technology
2. The ability to group work, the ability to conduct research and use of basic measuring equipment
3. Has the ability to independently solve the tasks of design, interpretation of results and preparation of proposals/conclusions

SUBJECT OBJECTIVES

C1. The aim of the course is to broaden the knowledge of vehicle movement theory. The student becomes familiar with the types of land transportation vehicles of their principles of operation of the application. Students can draw the energy balance of movement, knows and is able to calculate the thermal motion of various wheeled and tracked vehicles. He can discuss the different vehicle suspension systems and understands the concept of stability.
C2. The aim of the course is the acquisition of practical skills experiment planning, conducting it and interpreting the results. The student is aware of the impact of selected environmental solutions and is able to use the correct terminology. Purchasing responsibility for own work and group.
C3. The aim of the course is to analyze individual problem of transportation in rail traffic, and the acquisition of practical knowledge in the design of the railway traffic

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - student is able to explain the functional diagrams wheeled and tracked vehicles, carry out a comparative analysis, familiar areas of their application
PEK_W02 - student is able to define and describe the mechanics of the movement of the wheels meningeal and how to move different categories of vehicles, to make a balance of power. Student distinguishes phenomena occurring during linear motion and curvilinear
PEK_W03 - The student is able to explain and compare the impact of different chassis structures the stability of the vehicle. Recognizes different suspension systems of vehicles both tracked and wheeled. It also has a knowledge of the operation of vehicles.

II. Relating to skills:
PEK_U01 - student can obtain information from the literature and to interpret them in terms of issues related to the theory of motion wheeled and tracked vehicles
PEK_U02 - student is able to analyze the results of the experiment and verify them with the literature and to interpret and formulate conclusions
PEK_U03 - student is able to calculate the energy costs of selected transport vehicles

III. Relating to social competences:
PEK_K01 - student is able to make decisions as a responsible engineer transport taking into account their impact on the environment
PEK_K02 - student is responsible for self and group work
PEK_K03 - student is aware of the legal action taken as an engineer

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Types of transport in land transport vehicles - functional diagrams, basic concepts of traffic engineering unconventional, analogies bionic	2
Lec2	chassis systems of wheeled vehicles - Functional diagrams, application areas, comparative analysis	2
Lec3	Mechanical movement of the wheel - turning, traction-slip, driven inhibition	2
Lec4	Differentials and No Spin- kinematics and dynamics	2

Lec5	Rectilinear motion - motion resistance, traction calculation for different substrates, the balance of power	2
Lec6	Curvilinear motion - side drift tires, the impact of the abolition of the rolling resistance and adhesion, oversteer, understeer, resistance to motion, impact on vehicle motion ESP	2
Lec7	Multi-axis drives Issues - non-compliance, kinematic, circulating power, the balance of power	2
Lec8	Braking - the kinetic energy of the vehicle, braking traction to surfaces, braking distance, control systems skidding when braking	2
Lec9	The stability of wheeled vehicles of various chassis structures systems, static stability, dynamic, passive and active safety systems	2
Lec10	Suspension systems for wheeled transport vehicles - aspects of operational stability, driver comfort	2
Lec11	Integrated chassis tracked vehicles - Functional diagrams, application areas, comparative analysis	2
Lec12	Caterpillars steel and elastomer - construction defects ways to bring the advantages of drive tracks	2
Lec13	Suspension systems tracked transport vehicles - construction aspects of the operating	2
Lec14	Rectilinear motion - motion resistance, traction calculation for arbitrary substrates, the balance of power	2
Lec15	Curvilinear motion systems - turning motion resistance steel tracks and elastomeric power balance	2
		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1	Classes organizational procedures for obtaining laboratory safety, laboratory presentation of content	1
Lab2	Operational tests of wheel load distribution and kinematic parameters and dynamic of tyres vehicles	2
Lab3	Experimental research process of articulated vehicle snaking	2
Lab4	The study of kinematics and resistance of an articulated vehicle turning on a wheeled chassis	2
Lab5	Research vehicle braking efficiency	2
Lab6	Research unbalance forces and moments of the wheels	2
Lab7	The test vehicle's steering system	2
Lab8	Stability tests of working vehicle on wheel chassis	2
		Total hours: 15
Form of classes – Project		Number of hours
Proj1	Each student receives an individual topic to explore consists in performing the calculations traction minimally-time passing train at a predetermined route. During the course the project is successfully solved. Each class consists of two parts: Introductory (host) and the calculated (performed by the students). The classes include:	1
Proj2	Introduction, edition of topics to discuss the scope of the calculation. Individual calculations.	2

Proj3	The rules for determining resistance of rail traffic. The calculation of the resistance movement for selected trains and locomotives	2
Proj4	Reduction rules railway line in order to prepare her for the calculation of traction. Performing reduction for selected routes	2
Proj5	Analysis of selected locomotive traction characteristics. Calculations of individual train drivers	2
Proj6	The characteristics of the train brakes. Calculation of the braking characteristics of the various degrees of inhibition	2
Proj7	Rules of solving the equations of motion of trains. Traction calculations	2
Proj8	Rules of calculation of energy consumption for the purpose of traction. Calculation of energy consumption for the considered cases: without a stop in front of the semaphore at the entry and retention	2
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. multimedia presentation
N3. laboratory experiment
N4. self study - preparation for project class

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01-PEK_W03, PEK_K01-PEK_K03	written-oral exam
P = ocena z egzaminu		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01-PEK_U03, PEK_K01-PEK_K03	short test, oral response, the report
P = ocena średnia wszystkich pozytywnych ocen z laboratoriów		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01-PEK_U03, PEK_K01-PEK_K03	evaluation of project preparation
P = ocena przygotowania projektu		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Dudziński P., Theorie der Lenksysteme fur industrielle Radfahrzeuge, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2007
2. Mitschke M., Dynamika samochodu. Tom I. Napęd i hamowanie, WKiŁ, Warszawa, 1987
3. Arczyński S., Mechanik ruchu samochodu, WNT, Warszawa, 1994
4. Siłka W., teoria ruchu samochodu, WNT Warszawa, 2002
5. Prochowski L., Mechanika ruchu, WKIŁ, Warszawa, 2005
6. Madej J., Teoria ruchu pojazdów szynowych, Oficyna Wydawnicza Politechniki Warszawskiej, Wrocław, 2005
7. Andrzejewski R., Dynamika pneumatycznego koła jezdnego, WNT Warszawa, 2010

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Theory of vehicle movement
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W10	C1	Lec1, Lec2, Lec7-Lec9, Lec14, Lec15	N1, N2
PEK_W02	K1TR_W19	C1	Lec3-Lec6	N1, N2
PEK_W03	K1TR_W14	C1	Lec10-Lec13	N1, N2
PEK_U01	K1TR_U01	C2	Lab1-Lab8	N3
PEK_U02	K1TR_U01, K1TR_U09	C2	Lab1-Lab8	N3
PEK_U03	K1TR_U15	C2	Proj8-Proj11	N3, N4
PEK_K01	K1TR_K02	C1-C3	Lec1-Lec15, Lab1-Lab8, Proj1-Proj8	N1-N4

PEK_K02	K1TR_K03	C1-C3	Lab1-Lab8	N3
PEK_K03	K1TR_K09	C1-C3	Lec1-Lec15, Lab1-Lab8, Proj1-Proj8	N1-N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Techniki wytwarzania środków transportu I**
Name in English: **Manufacturing techniques of means of transport I**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031028**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	90		90		
Form of crediting	Crediting with grade		Crediting with grade		
Group of courses					
Number of ECTS points	3		3		
including number of ECTS points for practical (P) classes			3		
including number of ECTS points for direct teacher-student contact (BK) classes	1.8		2.1		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has knowledge of the basic mechanical properties of engineering materials, and has ordered knowledge about the types of metallic materials engineering - their construction, properties, applications and selection rules. He has adequate knowledge of the structure of steel and cast iron, the principles of classification and labeling and has a basic knowledge of heat and thermo-chemical treatment, has a knowledge of alloy steels and non-ferrous metals and alloys.
2. Is able to analyze macroscopic breakthroughs, microstructure of materials, the origin of technological defects , is able to determine the characteristics of the microstructure of metallic materials; is able to identify phases on the basis of equilibrium diagrams, can distinguish between the microstructure in terms of carbon content in steel, the influence of heat treatment, is able to characterize the transport systems and have a basic knowledge about the designing of transport means.
3. Is able to read and interpret drawings and diagrams used in the technical documentation, is able to do the technical documentation. Is able to characterize the transport systems and have a basic knowledge about the designing of transport means.

SUBJECT OBJECTIVES

C1. Familiarization of students with the processes and techniques of production from the liquid metal, the plastic molding and welding techniques used in the production of of transport means.
C2. Acquisition of knowledge about the basic techniques and skills chipless machining for selection of these processes.
C3. The acquisition and consolidation of social skills including ability to work in a group of students with a view to effective problem solving. Responsibility, honesty and fairness in the procedure observance existing in academia and society.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Knows the basic technologies of casting
PEK_W02 - Knows the basics of plastic forming technologies of elements and their relevance and application in the production of means of transport
PEK_W03 - Knows the basic methods of welding and process parameters, and has knowledge of the applications of welding processes, resistance welding and soldering in the manufacture of products

II. Relating to skills:
PEK_U01 - Is able to choose a suitable casting technology and define the basic parameters of the process
PEK_U02 - Is able to choose the technology of plastic forming and defining the basic parameters of the process
PEK_U03 - Is able to choose the appropriate method of joining the elements of the product and to determine the basic parameters of the process

III. Relating to social competences:
PEK_K01 - Searches of information and its critical analysis
PEK_K02 - Objective evaluation of arguments and rational explanations and justifications own point of view using the knowledge of casting, plastic forming and welding
PEK_K03 - Respects the customs and rules of the academic community.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Organizational matters. Overview the specific manufacturing techniques, basic concepts and algorithms for the manufacture of cast	2
Lec2	The materials used for the production of molding and core as well as methods for producing and testing the properties of these masses	2
Lec3	Methods for manual and automatic production of foundry molds and cores. Production of molds and cores with masses of chemo-and thermohardenable	2
Lec4	Production of castings in durable molds	2
Lec5	Smelting of alloys and heat treatment of castings. Test of knowledge	2
Lec6	Influence of deformation on the structure and properties of the material.	2
Lec7	Cold and hot plastic processing	2
Lec8	Forming of sheets	2

Lec9	Volumetric processing	2
Lec10	Devices for plastic treatment. Test of knowledge	2
Lec11	The types of joints and welds, welding positions, oxy fuel welding	2
Lec12	Arc welding with coated electrodes, in protective gases (TIG, MIG, MAG) and under fluxing agent	2
Lec13	Soldering and brazing	2
Lec14	Resistance welding and friction welding	2
Lec15	Thermal Cutting and welding stress. Test of knowledge	2
		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1	Cold deformation and annealing of materials	2
Lab2	Tests sheets Drawability	2
Lab3	Rolling of sheets and profiles	2
Lab4	Extrusion machine components	2
Lab5	Production of metal products by drawing	2
Lab6	Cutting, bending and sheet metal stamping	2
Lab7	Forging machine components	2
Lab8	Organizational matters. Welding safety. Gas welding of steel.	2
Lab9	Soldering and brazing of steel, copper and aluminum	2
Lab10	Electric resistance welding. Friction welding.	2
Lab11	Manual welding with coated electrodes	2
Lab12	Gas-shielded welding TIG, MIG, MAG	2
Lab13	The stress and strain of welding. Submerged arc welding.	2
Lab14	Thermal cutting - oxygen and plasma	2
Lab15	Robotic welding	2
		Total hours: 30

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. self study - preparation for laboratory class
N3. laboratory experiment
N4. report preparation
N5. self study - self studies and preparation for examination

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_K01, PEK_K02	partial final test
F2	PEK_W02, PEK_K01, PEK_K02	partial final test
F3	PEK_W03, PEK_K01, PEK_K02	partial final test
P = średnia z F1+F2+F3		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_U01, PEK_K01 - PEK_K03	short test
F2	PEK_W03, PEK_U02, PEK_K01 - PEK_K03	short test
F3	PEK_W03, PEK_U03, PEK_K01 - PEK_K03	short test
P = średnia z F1+F2+F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Perzyk M. et al; Foundry. WNT Warszawa 2000. Granat K. Laboratory of casting. Script WUT., Wroclaw, 2007. Gronostajski J., Plastic forming of metals. Wroclaw 1974, http://www.metalplast.pwr.wroc.pl/instrukcje.html. Ambroziak A. (ed.): manufacturing techniques. Welding. Laboratory. Pwr, Pretoria 2011, http://www.Dbc.Wroc.Pl

SECONDARY LITERATURE

Handbook Engineer - Foundry. WNT Warszawa 1986. Romanowski P., Handbook of cold working, Publishing House of Science and Technology, Warsaw, 1976. Pilarczyk, J. (eds.Handbook Engineer. Welding. Vol I and II, WNT Warszawa, 2003, 2005. Klimpel A: Welding, Resistance Welding and Cutting Metals., WNT, Warsaw, 1999. Klimpel A: Surfacing and thermal spraying. WNT Warszawa 2003

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Manufacturing techniques of means of transport I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number

PEK_W01 - PEK_W03	K1TR_W07	C1, C2	Le1 - Le15	N1, N5
PEK_U01 - PEK_U03	K1TR_U01, K1TR_U06	C1, C2	Lab1 - Lab15	N2, N3, N4
PEK_K01 - PEK_K03	K1TR_K03, K1TR_K07	C3	Le1-Le15, Lab1-Lab15	N1 - N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy inżynierii ruchu**
Name in English: **Basis of traffic engineering**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031030**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15		30
Number of hours of total student workload (CNPS)	60		60		30
Form of crediting	Examination		Crediting with grade	Crediting with grade	Crediting with grade
Group of courses					
Number of ECTS points	2		2		1
including number of ECTS points for practical (P) classes			2		1
including number of ECTS points for direct teacher-student contact (BK) classes	1.2		1.4		0.7

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of the issues presented in the context of courses "transport infrastructure", "Transportation in the cities," "traffic theory".
2. Ability to carry out measurements and making a statistical analysis of the results.
3. Competence in the preparation of (the presentation) and develop a written, respecting copyright.

SUBJECT OBJECTIVES

C1. The acquisition and ordering of knowledge in the basics of traffic engineering and control in transport systems.
C2. Acquisition of knowledge in the field of devices and techniques for traffic control in transport networks.
C3. The acquisition of skills in the tests and measurements of phenomena in the field of traffic engineering.
C4. Acquiring skills in finding and implementing solutions to the problems in the field of traffic engineering.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - As a result, held the course the student is able to identify and describe the basic phenomena and problems in the field of traffic engineering.
PEK_W02 - As a result of the course the student is able to choose the types and basic parameters of traffic control devices.

II. Relating to skills:
PEK_U01 - Following the course, the student is able to organize and conduct measurements of phenomena in motion in transport systems.
PEK_U02 - As a result of the course the student is able to analyze the problem of engineering and adopted the method of solving it, develop a presentation on the topic and prepare a written elaboration on this subject.

III. Relating to social competences:
PEK_K01 - As a result of the course the student is aware of the impact of decisions in the field of traffic engineering for the behavior of society, resulting in an improvement or deterioration in security. It also has knowledge of defining and delivering public opinion about the consequences of actions taken in the field of transport policy.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction (definitions of traffic engineering, conceptual ranges: security, control, traffic management, concepts associated with the movement - bandwidth and maneuvers; man as an element of the human - vehicle - road; senses and stimuli).	2
Lec2	The research, measurement and traffic analysis (for research, history test and measurement, types of research, research stages, ways of conducting research, simple and comprehensive traffic study, a meaningful amount of traffic, the relationship between speed, intensity and density of traffic, levels of freedom of movement).	2
Lec3	Throughput of traffic systems (definition of bandwidth, the genesis of methods of determining the bandwidth, the issue of border intervals, the effect of damping, conversion factors, bandwidth at intersections).	2
Lec4	Traffic signs and signals (legal considerations traffic, international conventions, road signs vertical, horizontal signs, variable message signs, signals for vehicle drivers, pedestrians and cyclists, osygnalizowanie transitions, crossings and intersections).	2
Lec5	Project traffic light at the intersection (of traffic lights, traffic efficiency, traffic program design, project phases, calculating times międzyzielonych, determine the length of the enabling signals and transient).	2
Lec6	Modelling of traffic (deterministic and stochastic modeling, assembly modeling used in traffic, microscopic and macroscopic models, modeling simulation - milestones, discussion of sample solutions).	2
Lec7	Railway signaling (absolute issue a detention order before the signal stand, braking, maximum speed on the line, the speed limit on the line and stations, traffic shaping, traffic lights, speed limits at level crossings).	2

Lec8	Traffic on the railway line (traffic interval, roads and visibility; methods of traffic on the line: one locomotive, the pilot, scepter, rigid timetable, announcing telephone, lock line, the dispatcher episodes, dispatching setting devices; ways to check the busy route: signals the end of the train, electrical control unoccupied, axle counters, automatic lock line).	2
Lec9	Traffic on the railway station (track layout, numbering tracks, platforms, waveforms draft, switches and their location essential, semaphores entry, semaphores away, maneuvers, signaling maneuver).	2
Lec10	Types of adjustment devices (devices: key, centralized mechanical, electromechanical relay, relay with a desktop computer, computer; the effect of a throughput: traffic on the line - spacing consequences, movement on the station - distance crossing).	2
Lec11	Educational trip to the train station (the process of adopting a train station and a train station tanning devices to the control room and equipment in the field).	2
Lec12	Rail traffic modeling (assessment of the duration of the operation of motor, model traffic on the railway line and the railway station, estimating the capacity of the railway line, railway stations modeling problems).	2
Lec13	Transport policy (comparison occupation of land by communicating individual and collective ability to increase fillings in individual vehicles, alternative car, the vicious circle of urban transport, a review of transport policies, sustainable development strategy).	2
Lec14	Pedestrian and bicycle traffic (pedestrian and cyclist in the road traffic and the need to maintain pedestrian traffic, pedestrian and road system: level crossings, passages in another level, the traffic conditions on the crossing with traffic, pedestrians blind, cycling: routing, road cycling , bicycle lanes, locks and unconventional solutions; the restricted zone, speed and area of residence).	2
Lec15	Priorities for public transport (prioritizing targets, legal requirements, signs and signaling, sensors and actuators, speed and spacing in motion, examples of solutions in a road traffic automation capabilities).	2
		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1	Discussion topics laboratory measurement methods and principles of safety when making measurements in the field.	2
Lab2	Measuring and traffic (foot traffic, maintain pedestrian crossing with traffic lights, the functioning of signaling for pedestrians, traffic congestion, structure by type of vehicles in the stream - laboratory Field).	2
Lab3	Analysis and traffic (pedestrian traffic at the crossing, "green wave" for pedestrians, traffic at the inlet junction, the length of the opening movement of the belt and reserve capacity - a computer lab).	2
Lab4	Calculation times międzyzielonych (analysis of the intersection and the program signaling streams analysis of collision calculating times międzyzielonych - computer lab).	2
Lab5	Measuring movement of public transport (time synchronization between checkpoints measuring traffic urban transport, passenger transfer times - the lab Field).	2
Lab6	Traffic Analysis of public transport (punctuality departures, the stop time, travel time between stops - a computer lab).	2
Lab7	Signalling (handling simulator traffic control devices - computer lab, supererogatory).	2

Lab8	term correction	1
		Total hours: 15
Form of classes – Seminar		Number of hours
Sem1	Discussion of the topic of the seminar to the preparation of presentation and editorial work, the division of topics.	2
Sem2	Exemplary motion studies (sample survey of traffic, parking sample survey or pedestrian traffic study sample public transport).	2
Sem3	Levels of freedom of movement (PSR determination for individual motorists and pedestrian lanes).	2
Sem4	Throughput episodes of interstitial (dwupasowa two-way road, the way a multilane highway).	2
Sem5	Multilevel junction and roundabout (road junctions and motorway, roundabout, a small roundabout and "The Magic Roundabout")	2
Sem6	Signs and signaling (comparison of signs and road markings in Poland and in the United States or Australia, an overview of changes in the Road Signs and Signals).	2
Sem7	Management of speed in traffic (effect of speed on the effects of accidents, speed limits in urban areas, traffic calming measures).	2
Sem8	Railway signaling (signaling on railways in Poland and abroad, the traditional railway signaling and ERTMS and ETCS railway signaling and signaling in the subway).	2
Sem9	Securing rail traffic (signaling maneuvering, security crossings).	2
Sem10	Power drivers (protection shortened braking distances, the automatic braking of the train, cab signaling and czuwaki).	2
Sem11	Automation of rail traffic (control and speed control with ETCS, railways maintenance-free).	2
Sem12	Engineering pedestrian and bicycle traffic (traffic engineering and disabilities, conflict pedestrians - cyclists).	2
Sem13	Errors in controlling the movement of vulnerable road (errors in the control pedestrian traffic, faults in the organization of cycling).	2
Sem14	Errors in controlling the movement of vehicles (errors in traffic organization, traffic control errors in public transport).	2
Sem15	Elements of a modern transport policy - based on selected cities and comparisons with Wroclaw (fee for entrance to the city center - London, elimination of urban highways - Seoul, support traffic on public transport - Portland, city bike system - Paris).	2
		Total hours: 30

TEACHING TOOLS USED

N1. problem lecture
N2. case study
N3. multimedia presentation
N4. report preparation
N5. self study - preparation for laboratory class

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)		
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_K01	test
P = 100%*F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01	Estimate the average of the marks of individual laboratories, all of the La2-LA6 must be classified (permissible is to improve one laboratory); La7 credit raises a final evaluation of half a degree
P = 100%*F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U02	Evaluation of oral - presentation dedicated to the successful issue
F2	PEK_U02	develop a written assessment of discussing the selected issue
F3	PEK_U03	assessment of student activity during the discussion presented at the seminar topics
P = 33%*F1+33%*F2+34%*F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Gaca S., Suchorzewski W., Tracz M.: Inżynieria ruchu drogowego. Teoria i praktyka. WKŁ, Warszawa 2008.
[2] Datka S., Suchorzewski W., Tracz M.: Inżynieria ruchu. WKŁ, Warszawa 1999.
[3] Tracz M. (red.): Pomiary i badania ruchu drogowego, WKŁ, Warszawa 1984.
[4] Szczuraszek T. (red.): Bezpieczeństwo ruchu miejskiego, WKŁ, Warszawa 2005.
[5] Leśko M., Guzik J.: Sterowanie ruchem drogowym, Politechnika Śląska, Gliwice 2000.
[6] pr. zb.: Symulacja ruchu potoku pojazdów - wybrane zagadnienia, WKŁ, Warszawa 1980.
[7] Dąbrowa-Bajon M.: Podstawy sterowania ruchem kolejowym, Politechnika Warszawska, Warszawa 2002.
[8] Woch J.: Podstawy inżynierii ruchu kolejowego, WKŁ, Warszawa 1983.
[9] Wesołowski J.: Miasto w ruchu. Dobre praktyki w organizowaniu transportu miejskiego, Instytut Spraw Obywatelskich, Łódź 2008.
[10] Molecki B.: Ruch drogowy - uwarunkowania prawne. Politechnika Wrocławska, Wrocław (corocznie uaktualniane opracowanie dla studentów kierunku Transport, dostępne pod adresem: http://www.molecki.pl/r00/prawoord/).

SECONDARY LITERATURE

[11] miesięcznik "Transport Miejski i Regionalny".
[12] kwartalnik "Inżynieria Ruchu Drogowego".

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Basis of traffic engineering
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W09, K1TR_W17	C1	Wy1-Wy15	N1, N2, N3, N4, N5
PEK_W02	K1TR_W04, K1TR_W09	C2	Wy4, Wy5, Wy7, Wy8, Wy10, Wy11, Wy15	N1, N2, N3, N4, N5
PEK_U01	K1TR_U08, K1TR_U09, K1TR_U17	C3	Se2, La1-La7	N1, N2, N5
PEK_U02	K1TR_U01, K1TR_U03, K1TR_U04	C4	Se1-Se15	N3, N4
PEK_K01	K1TR_K08	C1, C4	Wy1-Wy5, Wy13-Wy15, Se2-Se7, Se12-Se15, La1-La6	N1, N2, N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Techniki wytwarzania środków transportu II**
Name in English: **Manufacturing Processes of Transport Means II**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031031**
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		
Group of courses					
Number of ECTS points	1		2		
including number of ECTS points for practical (P) classes			2		
including number of ECTS points for direct teacher-student contact (BK) classes	0.6		1.4		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		1
Lec7		3
Lec8		1
		Total hours: 15
Form of classes – Laboratory		Number of hours
Lab1		2
Lab2		2
Lab3		2
Lab4		2
Lab5		2
Lab6		2
Lab7		2
Lab8		2
Lab9		2
Lab10		2
Lab11		2
Lab12		2
Lab13		2
Lab14		2
Lab15		2
		Total hours: 30

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. laboratory experiment
N3. report preparation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_W03PEK_K01; PEK_K02; PEK_K03	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)		
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_U03PEK_K01; PEK_K02; PEK_K03	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Manufacturing Processes of Transport Means II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01; PEK_W02; PEK_W03	K1TR_W07	C1; C2; C3		N1
PEK_U01; PEK_U02; PEK_U03	K1TR_U03, K1TR_U15	C1; C2; C3		N2; N3

PEK_K01; PEK_K02; PEK_K03	K1TR_K01, K1TR_K03, K1TR_K11	C1; C2; C3		N1; N2; N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Informatyka I**
Name in English: **Computer science I**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031032**
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	
Group of courses					
Number of ECTS points				2	
including number of ECTS points for practical (P) classes				2	
including number of ECTS points for direct teacher-student contact (BK) classes	0.6			1.4	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of the course "Mathematical Analysis I".
2. Knowledge of the course "Algebra and Analytic Geometry".
3. Basic skills of computer hardware.

SUBJECT OBJECTIVES

C1. Presentation of the applicability of programs Excel and Matlab for solving the engineering and scientific problems.
C2. Ability to use the IT tools for solving the engineering and scientific problems.
C3. Ability to build algorithms and the creation of procedures for solving the engineering and scientific problems.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

PEK_U01 - Is able use IT tools for solving the engineering and scientific problems.
PEK_U02 - Is able create algorithms and procedures for solving the engineering and scientific problems.

III. Relating to social competences:

PEK_K01 - Is able formulate the problem, make a plan and develop a procedure to solve it using IT tools.

PROGRAMME CONTENT

Form of classes – Project		Number of hours
Proj1	A spreadsheet - calculation form , the function wizard , nesting functions.	4
Proj2	A spreadsheet - the use of logical function.	2
Proj3	A spreadsheet - Graphs.	4
Proj4	A spreadsheet - finding the optimal solution - Solver tool.	2
Proj5	A spreadsheet - array procedures, calculations using matrix algebra.	2
Proj6	Test I	2
Proj7	Matlab - the basic operations	4
Proj8	Matlab - functions and scripts	4
Proj9	Matlab - library functions, graphs	4
Proj10	Test II	2
		Total hours: 30

TEACHING TOOLS USED

N1. problem exercises
N2. calculation exercises

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

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	test I test II

P = F1

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Krzysztof Masłowski, Excel 2007/2010 PL. Ćwiczenia zaawansowane.
Bogumiła Mrozek, Zbigniew Mrozek, MATLAB i Simulink. Poradnik użytkownika.

SECONDARY LITERATURE

Maciej Gonet, Excel w obliczeniach naukowych i inżynierskich.
Elżbieta Szymczyk, Matlab dla mechaników

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Computer science I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U01 - PEK_U02	K1TR_U07	C1, C2, C3	Pr 1-5, Pr 7-9	N1, N2
PEK_K01	K1TR_K05	C2, C3	Pr 1-5, Pr 7-9	N1, N2

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Informatyka II CAD**
Name in English: **Computer science II CAD**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031033**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)				30	
Number of hours of total student workload (CNPS)				90	
Form of crediting				Crediting with grade	
Group of courses					
Number of ECTS points				3	
including number of ECTS points for practical (P) classes				3	
including number of ECTS points for direct teacher-student contact (BK) classes	0.6			2.1	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Requirement of knowledge of the course "Engineering Graphics - Descriptive Geometry"
2. Requirement of knowledge of the course "Engineering Graphics: Engineering Drawing "
3. Requirement of handling skills of computer hardware

SUBJECT OBJECTIVES

C1. Knowledge and skills in the field of 3D modeling of the machines parts and assemblies
C2. Knowledge and skills in range of machinery and equipment research and analysis on the virtual models (virtual prototyping)
C3. Knowledge and skills in range of technical drawing based on 3D models

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

PEK_U01 - Students should be able to build 3D models of machine parts
PEK_U02 - Students should be able to build 3D models of the machines parts and assemblies and verify models and their parameters
PEK_U03 - Students should be able to make 2D technical drawing based on a 3D model

III. Relating to social competences:

PEK_K01 - Student gains the skills to take responsibility for their work

PROGRAMME CONTENT

Form of classes – Project		Number of hours
Proj1	Basic solid modeling - rules for creating a 2D sketch, operations on 2D sketches, fittings in the sketch (geometric and dimensional fittings), solid modeling with extrude methods.	4
Proj2	Basic solid modeling - operations on solids: chamfering, rounding, tilting walls, constructions (point, axis, plane), the creation of the ribs, the holes wizard, duplication of the solid operations.	4
Proj3	The project of assembly: the concept, solid modeling with rotation, one and multibody modeling.	6
Proj4	The project of assembly: solid operations - sweep, loft, split.	4
Proj5	The project of assembly: parts assembling, parts editing in an assembly, a library of standard parts.	4
Proj6	The project of assembly: analysis of the functional correctness of the assembly (parameters analysis, kinematic analysis, analysis of collision) rectify design faults.	2
Proj7	The project of assembly: 2D technical drawings of parts - manufacturing parts drawings and assembly drawings.	4
Proj8	Completion of the course: work during classes.	2
		Total hours: 30

TEACHING TOOLS USED

N1. self study - preparation for project class
N2. independent work on the computer under the tutor supervision

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

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_U03	test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE
Stasiak Fabian, Autodesk Inventor. START!, ExpertBooks 2008
Stasiak Fabian, Zbiór ćwiczeń Autodesk Inventor 2012, ExpertBooks 2012

SECONDARY LITERATURE
http://autodesk-inventor-pl.typepad.com/
http://autodesk-inventor-pl.blogspot.com/

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Computer science II CAD
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U01 - PEK_U03	K1TR_U09	C1, C2	Pr1 - Pr7	N1, N2
PEK_K01	K1TR_K03	C3	Pr1 - Pr7	N1, N2

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Systemy transportowe**
Name in English: **Transportation systems**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031041**
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)	30				
Form of crediting	Crediting with grade				
Group of courses					
Number of ECTS points	1				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	0.6				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of mathematics, the laws of physics and chemistry at the secondary level.
2. Ability to use and retrieve information from the literature and the Internet.
3. Understands the need for education and is aware of the social role of an engineer.

SUBJECT OBJECTIVES

C1. Basic information about transport systems, the importance of transport in the economy, transportation and environmental protection.
C2. Transport systems, the components, the operating modes of transport means.
C3. The structure of transport in Poland and the EU, development strategies, new technologies in transport.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Formulates, defines the elements of the transport infrastructure, explains the principles of operation of the systems.

PEK_W02 - Identifies, explains the principles of operation modes on transport means, explains the relationship between the state of transport infrastructure and rules of operation on means of transport.

PEK_W03 - Defines the historical conditions of infrastructure development, explains the latest trends and development in transport, explains the strategies for the development of transport.

II. Relating to skills:

III. Relating to social competences:

PEK_K01 - Understands the need and knows the possibility of constant learning.

PEK_K02 - Understands and is aware of the non-technical aspects and impacts of engineering activities in transport.

PEK_K03 - Is aware of the importance and understanding of the human aspects of technical activities.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Transport systems - basic definitions and classification, the base of the systems assesment.	2
Lec2	Geographical conditions and Polish system of transport, links between the system and systems of European countries.	2
Lec3	Description of the transport system, its characteristics, the principles of assessment.	2
Lec4	The main trends in transport policy for the EU.	2
Lec5	Transport policy in Poland, the directions of transport development.	2
Lec6	The role of transport in the country's economy, the demand for transport services, the role of the state budget for transport activities.	2
Lec7	Road transport, classification of means of transport, infrastructure.	2
Lec8	Rail transport, rolling stock, railway road.	2
Lec9	Water transport: inland, maritime, transport means and infrastructure.	2
Lec10	Pipeline transportation (hydrotransport).	2
Lec11	Air transport, airports, safety.	2
Lec12	Transhipment hubs, tasks of nodes, location.	2
Lec13	Problems of integration of transport, intermodal transport, logistics centers.	2
Lec14	Ecology in transport, external costs, environmental pollution.	1
Lec15	Information technology in the management of transportation systems.	2
Lec16	Final test	1
		Total hours: 30

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. informative lecture

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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	Final test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Rydzykowski Wł.; Wojewódzka – Król K.; Transport, Wydawnictwo Naukowe PWN, Warszawa 1997.
Grzywacz W,; Rydzykowski Wł.; Wojewódzka – Król K.; Polityka transportowa, Wydawnictwa Uniwersytetu Gdańskiego, Gdańsk 2000.

SECONDARY LITERATURE

Wright P.H.; Ashford N.J.; Tranportation Engineering, John Wiley &Sons, New Yrok, 1998

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Transportation systems
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W01, K1TR_W03	C1,C2,C3	Lec1, Lec3, Lec6, Lec15	N1
PEK_W02	K1TR_W06, K1TR_W09, K1TR_W14	C1,C2,C2	Lec7, Lec8, Lec9, Lec10, Lec11, Lec14	N1, N2
PEK_W03	K1TR_W13, K1TR_W18	C1,C2,C3	Lec2, Lec4, Lec5, Lec12l, Lec13	N1, N2
PEK_K01	K1TR_K01, K1TR_K07	C1	Lec2, Lec14	N1, N2

PEK_K02	K1TR_K02	C1, C2	Lec1, Lec14	N1, N2
PEK_K03	K1TR_K07, K1TR_K09	C3	Lec4, Lec5, Lec6	N1,N2

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Eksploatacja techniczna**
Name in English: **Operation of technical systems**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031042**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			15	15
Number of hours of total student workload (CNPS)	90			30	30
Form of crediting	Crediting with grade		Crediting with grade	Crediting with grade	Crediting with grade
Group of courses					
Number of ECTS points	3			1	1
including number of ECTS points for practical (P) classes				1	1
including number of ECTS points for direct teacher-student contact (BK) classes	1.8			0.7	0.7

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of problems dealing with materials, strength and design.
2. Acquaint students with the role of human in technical objects operation.

SUBJECT OBJECTIVES

C1. Introduction of problems dealing with randomness of processes observed in technical systems operation.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Student should be able to identify and point out the most important factors disturbing right operation and should can assess operation effectivness

II. Relating to skills:
PEK_U01 - Student should get ability of assessing and influencing on operation effectiveness as well as reacting on disturbances.

III. Relating to social competences:
PEK_K01 - Student should know how to organize operational process in relation to other operational actors.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Concepts of machine operation, life cycle, operational costs.	2
Lec2	Description of men and technical object in operational system.	2
Lec3	Definition and assessment of operational process. Operation organization.	2
Lec4	Definition of operational environment and its influence on object operation.	2
Lec5	Description of object technical state. Disturbances in operation.	2
Lec6	Concept and definition of failure and fault. Ageing.	2
Lec7	Failures classification, modes, causes and consequences in the system Man-Machine-Environment	2
Lec8	Object classification due to maintenance. Organization and maintenance methods.	2
Lec9	Randomness in operation, aging and degradation.	2
Lec10	Introduction to operational reliability, measures, assessment.	2
Lec11	Maintenance and spare parts problems.	2
Lec12	Introduction to technical diagnostics.	2
Lec13	Corrective and preventive maintenances.	2
Lec14	Preventive maintenance models. Basics of RCM.	2
Lec15	Object testing in operation. Weak elements.	2
		Total hours: 30
Form of classes – Project		Number of hours
Proj1	Introduction to truck database analysis	2
Proj2	Statistical analysis of database and calculation of availability measures.	2
Proj3	Statistical analysis of database and calculation of effectiveness measures.	2
Proj4	Study on random variables describing failure process (mileage, time). Statistical analysis of given random variables.	2
Proj5	Study on random variables describing maintenance (time, workload). Statistical analysis of given random variables.	2

Proj6		2
Proj7	Operational costs analysis.	1
Proj8	Weak elements analysis.	2
		Total hours: 15
Form of classes – Seminar		Number of hours
Sem1	Introduction and subjects distribution. Description of way of preparation and presentation of subject on chosen subject. Taking into consideration energy consumption, initial and operation cost, failures and maintenance. Each student presents one object.	1
Sem2	Technical and operational characteristics of road vehicles.	2
Sem3	Technical and operational characteristics of rail vehicles.	2
Sem4	Technical and operational characteristics of water-born ships.	2
Sem5	Technical and operational characteristics of airplanes.	2
Sem6	Technical and operational characteristics of fuels.	2
Sem7	Technical and operational characteristics of oils and greases.	2
Sem8	Technical and operational characteristics of supporting materials (fluids, filters, batteries, etc.).	2
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of slides
N2. self study - preparation for project class
N3. multimedia presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_K01	writing test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01	report
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01	study on report and presentation of chosen subject
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Hebda M., Janicki D., Trwałość i niezawodność samochodów w eksploatacji. WKŁ. Warszawa 1977.
Hebda M., Mazur T., Pelc H., Teoria eksploatacji pojazdów. WKŁ. Warszawa 1978.
Konieczny J., Wstęp do teorii eksploatacji urządzeń. WNT. Warszawa 1971.
Olearczuk E., Zarys teorii użytkowania urządzeń technicznych. WNT. Warszawa 1972.
Polska Norma PN-93/N-050191. Słownik terminologiczny elektryki. Niezawodność, jakość usługi.

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Operation of technical systems
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W14	C1	Wy1-Wy15	N1
PEK_U01, PEK_K01	K1TR_K05, K1TR_U10, K1TR_U11, K1TR_U14, K1TR_U15	C2	Pr1-Pr8	N2
PEK_U01	K1TR_U01, K1TR_U04, K1TR_U12, K1TR_U13	C3	Se1-Se8	N1,N2,N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Historia transportu**
Name in English: **History of transport**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031043**
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				
Group of courses					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. lack prerequisites in terms of knowledge
2. lack prerequisites in terms of skills
3. lack prerequisites in terms of competence

SUBJECT OBJECTIVES

C1. To acquaint students with the history of transport and technical and organizational solutions used in the past in vehicles and transport systems.
C2. Provide students with information about humanistic aspects and consequences engineering activities.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - As a result of the course the student versed in historical conditions and the current state and the historical trends of development of transport, including unconventional transport systems.

II. Relating to skills:

III. Relating to social competences:
PEK_K01 - It is aware of the importance and understanding of the humanistic aspects and impacts of engineering. Learns the consequences of the impact of technology on the environment, and the related social responsibility of science and technology.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction to the history of transport. Introduction to the subject. Survey on interests of listeners.	2
Lec2	Routes. The development of transport routes for centuries. Development of urban transport networks.	3
Lec3	Waterways. History and Oder inland waterway.	1
Lec4	The history of railways. Railway history in the world. The history of railways in Lower Silesia. The narrow gauge railway in Central and Eastern Europe.	4
Lec5	High speed rail. The development of high-speed rail. Records-speed rail transport.	2
Lec6	History of Aviation. Acts of civil and military aviation. The development of low-cost airlines	2
Lec7	The development of motion control technology. How far you can control the movement of the vehicle. Traffic control in rail and road transport.	4
Lec8	History of public transport. The history of public transport in the world. The history of public transport in Wroclaw.	3
Lec9	The history of communications equipment. The history of automotive equipment. History of Polish automotive industry.	3
Lec10	The future of transport in cities. Transport land consumption. The carrying capacity of individual and collective communication. Prosamochodowej policy effects. The policy of sustainable development.	2
Lec11	Unconventional solutions in transport. Conventions and the economy. Unconventional solutions during wars and economic crises. Railways unconventional. The role of unconventional solutions in engineering practice.	2

Lec12	Museums and monuments transport technology. Objects documenting the history of transportation in Lower Silesia. Museums transportation.	1
Lec13	The tradition of service in transport. The genesis of the transport service. Uniforms. Compounds service in transport with patriotism. The seniority of service and technology development. The tradition of service and economic transformation.	1
		Total hours: 30

TEACHING TOOLS USED

N1. The first class is conducted a survey in which students choose the detailed program of the course. Some lectures are presented by invited guests - practitioners and experts in the subject matter.

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01	test or paper related to given topics
P = 100%*F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Koziarski S.: Rozwój przestrzenny sieci autostrad na świecie. Uniwersytet Opolski, Opole 2004.[2] Małachowicz E.: Wrocław na wyspach: rozwój urbanistyczny i architektoniczny. ZN im. Ossolińskich, Wrocław 1992.[3] Tanel F.: Historia kolei. PWN, Warszawa 2008.[4] Pisarski M.: Koleje polskie: 1842-1972. WKiŁ, Warszawa 1974.[5] Jerczyński M., Koziarski S.: 150 lat kolei na Śląsku. Instytut Śląski, Opole 1992.[6] Basiewicz T., Łyżwa J., Modras K.: Centralna Magistrala Kolejowa. WKiŁ, Warszawa 1977.[7] Pokropiński B.: Parowozy normalnotorowe produkcji polskiej. WKiŁ, Warszawa 2007.[8] Jackson R.: Historia lotnictwa. Wyd. Olesiejuk, Ożarów Mazowiecki 2010.[9] Niccoli R.: Historia lotnictwa. Carta Blanca, Warszawa 2007.[10] Molecki Б. (red.): Rola samorządu w kształtowaniu transportu regionalnego w Polsce i w Europie. Oficyna Wydawnicza PWr, Wrocław 2010.[11] Lewandowski K., Molecki B.(red.): Tramwaje we Wrocławiu 1877-2006. Oficyna Wydawnicza PWr, Wrocław 2006.[12] Rychter W.: Dzieje samochodu. WKiŁ, Warszawa 1983.[13] Zieliński A.: Polskie konstrukcje motoryzacyjne 1947-1960. WKiŁ, Warszawa 1985.[14] Zieliński A.: Polskie konstrukcje motoryzacyjne 1961-1965. WKiŁ, Warszawa 2008.[15] Połomski W.: Pojazdy samochodowe i przyczepy Jelcz 1952-1970. WKiŁ, Warszawa 2010.[16] Podoski J.: Transport w miastach. WKiŁ Warszawa 1985.[17] Wesołowski J.: Miasto w ruchu. Dobre praktyki w organizowaniu transportu miejskiego. Instytut Spraw Obywatelskich, Łódź 2008.[18] Bahke E.: Systemy transportowe dziś i jutro. WKiŁ, Warszawa 1977.[19] Schneigert Z.: Koleje niekonwencjonalne. WKiŁ, Warszawa 1971.[20] miesięcznik "Świat Kolei".

SECONDARY LITERATURE

[21] Rosset A.: Starożytne drogi i mosty. WKiŁ, Warszawa 1970.[22] Sterner W.: Od Via Appia do autostrady. Iskry, Warszawa 1974.[23] Gan J.W.: Z dziejów żeglugi śródlądowej w Polsce. Książka i Wiedza, Warszawa 1978.[24] Kotlarz G.: Magistrala węglowa. Eurosprinter, Rybnik 2008.[25] Harassek A., Rabsztyn M., Raczyński J.: Pociągi dużych prędkości TGV. Emi-Press, Łódź 1996.[26] Eikhoff D.: Alles über den ICE. Transpress, Berlin 2006.[27] Gottwaldt A.: Der Schienenzeppelin, EK-Verlag, Freiburg 2006.[28] Pokropiński B.: Lux-torpeda PKP. WKiŁ, Warszawa 2007.[29] Krier L.: Architektura - wybór czy przeznaczenie. Arkady, Warszawa 2001.[30] miesięcznik "Automobilista".

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
History of transport
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W13	C1	Wy1-Wy13	N1
PEK_K01	K1TR_K07	C2	Wy1-Wy13	N1

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Bezpieczeństwo bierne pojazdów pasażerskich**
Name in English: **Passive safety of passenger vehicles**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031100**
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			30	
Form of crediting	Crediting with grade			Crediting with grade	
Group of courses					
Number of ECTS points	2			1	
including number of ECTS points for practical (P) classes				1	
including number of ECTS points for direct teacher-student contact (BK) classes	1.2			0.7	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge in the field of strength of materials.
2. Knowledge of transport infrastructure.
3. Design basics of transport means.

SUBJECT OBJECTIVES

C1. The acquisition of knowledge in the filed of passenger vehicles.
C2. Acquisition of knowledge of the design elements providing the passive safety in passenger vehicles.
C3. The acquisition of knowledge in the field of research and design of road infrastructure elements of ensuring passive safety.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - The correct definition of test procedures for passenger vehicles.
PEK_W02 - Rules for calculating biomechanical criteria for determining the level of injury.
PEK_W03 - Ability to propose design changes to improve passive safety.

II. Relating to skills:

PEK_U01 - Ability to carry out simulation studies in the field of passive safety.
PEK_U02 - Ability to interpret the results of studies in the field of passive safety for passenger vehicles.
PEK_U03 - The ability to analyze the results obtained during the tests.

III. Relating to social competences:

PEK_K01 - Acquires teamwork skills.
PEK_K02 - Thinks and works in a creative way.
PEK_K03 - Student deliberately takes some actions and knows their consequences

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction to road safety.	2
Lec2	Road safety with regard to statistical data.	2
Lec3	Studies of passive safety in buses.	2
Lec4	Studies of passive safety in cars.	2
Lec5	compatibility of vehicles.	2
Lec6	Vehicle collisions with pedestrians	2
Lec7	Dummies used for testing of passive safety. Biomechanical criteria in the assessment of passive safety.	2
Lec8	Construction and types of energy consuming components.	1
		Total hours: 15
Form of classes – Project		Number of hours
Proj1	Discussion of design project. Introduction to the FE software	2
Proj2	Principles of construction of computational models of energy-absorbing elements	2
Proj3	Evaluation of the impact of the adopted model on the accuracy of the results.	2
Proj4	Principles of construction of shell models.	2
Proj5	Methods of dynamic analysis taking into account the physical and geometric nonlinearity.	2
Proj6	Analysis of the dynamic process of crushing energy-absorbing components. Example.	2
Proj7	Definition of the analysis results. Determination of basic elements necessary to assess the energy absorption during compression.	2
Proj8	Methodology static analysis taking into account the physical and geometric nonlinearity.	2

Proj9	Analysis of the process of quasi-static bending energy consuming components. Example.	2
Proj10	Working out the analysis results. Definition of basic parameters needed to assess the energy absorption.	2
Proj11	Develop own geometric model construction for energy absorption.	2
Proj12	Design a model for FEM calculations.	2
Proj13	Definition of load and carrying out computer simulation	2
Proj14	Analysis of the results obtained and to determine the basic features of energy-absorbing element.	2
Proj15	Working out the final report.	2
		Total hours: 30

TEACHING TOOLS USED

N1. multimedia presentation
N2. problem exercises
N3. project presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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	writing or oral test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

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_U03	evaluation of the computational part of the project, oral test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Zieliński A., Konstrukcja nadwozi samochodów osobowych i pochodnych, WKiŁ, Warszawa 2008 Wicher J., Bezpieczeństwo samochodów i ruchu drogowego, WKiŁ, Warszawa 2004Rusiński E., Metoda elementów skończonych. System COSMOS/M, WKiŁ Warszawa 1994Rusinski E., Czmochowski J., Smolnicki T.: Zaawansowana metoda elementów skończonych w konstrukcjach nośnych, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2000Zienkiewicz O.C.: Metoda elementów skończonych, Arkady 1972

SECONDARY LITERATURE

Rusiński E.: Zasady projektowania konstrukcji nośnych pojazdów samochodowych. Oficyna Wyd. PWr Wrocław 2002Rakowski G., Kacprzyk Z.: Metoda elementów skończonych w mechanice konstrukcji, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005Szmelter J., Dacko M., Dobrociński S., Wieczorek M.: Metoda elementów skończonych w statyce konstrukcji, Arkady 1979Gawroński W., Kruszewski J., Ostachowicz W., Tarnowski K., Wittbrodt E.: Metoda elementów skończonych w dynamice konstrukcji, Arkady, Warszawa 1984Waszczyszyn Z., Cichoń Cz., Radwańska M.: Metoda elementów skończonych w stateczności konstrukcji, Arkady, Warszawa 1990Kleiber M.: Wprowadzenie do metody elementów skończonych, PWN, Warszawa-Poznań 1989

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Passive safety of passenger vehicles
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W07	C1, C2	Wy1, Wy2, Wy3, Wy4, Wy6, Wy7	N1
PEK_W02	K1TR_W07	C1, C2	Wy3, Wy4, Wy6, Wy7	N1
PEK_W03	K1TR_TP_W03	C1, C3	Wy1, Wy5, Wy8	N1
PEK_U01	K1TR_U01	C1, C2	Pr1, Pr2, Pr3, Pr4, Pr5, Pr8, Pr11, Pr12, Pr13	N2
PEK_U02	K1TR_U10	C1, C2		N2
PEK_U03	K1TR_U04, K1TR_U09	C1, C2	Pr7, Pr10, Pr 14, Pr15	N3
PEK_K01	K1TR_K03	C1, C3	Pr1, Pr2, Pr3, Pr4, Pr5, Pr6,	N2
PEK_K02	K1TR_K05, K1TR_K09	C1, C3	Pr6, Pr7, Pr9, Pr10,	N2
PEK_K03	K1TR_K09	C1, C3	Pr7, Pr8, Pr13, Pr14, Pr15	N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Dworce i przystanki pasażerskie**
Name in English: **Stations and stops for passengers**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031102**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30				15
Number of hours of total student workload (CNPS)	30				60
Form of crediting	Crediting with grade				Crediting with grade
Group of courses					X
Number of ECTS points	1				2
including number of ECTS points for practical (P) classes					2
including number of ECTS points for direct teacher-student contact (BK) classes	0.6				1.4

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of the issues presented in the context of courses "History of transport", "Transport cities" and "transport infrastructure".
2. Knowledge of copyright law and the principles of the texts based on literature review.
3. lack prerequisites in terms of competence

SUBJECT OBJECTIVES

C1. To acquaint the student with the design principles of stations and stops in passenger transport, meeting the needs of travelers (including the disabled).
C2. Manufacturing ability to analyze the functioning of the railway station facilities for suitability to serve travelers in the changing economic and social conditions and present the results of such analyzes.
C3. Familiarization with issues of traffic management within the railway stations and bus stops.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Following the course, the student should be able to identify needs and identify functional requirements in relation to the train or bus passenger transport.
PEK_W02 - As a result, the lectures the student gains knowledge of management principles stations and stops in passenger transport.

II. Relating to skills:
PEK_U01 - Following the course, the student should be able to analyze the degree of meeting the needs of travelers by the solution (planned or existing) train or bus passenger transport.
PEK_U02 - As a result of the course the student is able to design a functioning bus stop or railway passenger transport - including developing the specification of essential conditions of movement and trade, which must meet the construction project.

III. Relating to social competences:
PEK_K01 - As a result of the course, the student will be aware of the social consequences of making certain design decisions in the organization of passenger traffic - with analysis of points of view of different groups of travelers.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	The transport network and access to transport services. The density of stops and the rules of their location. Placement of stops and offered travel time.	2
Lec2	Location stops in a street. Stops on interstitial segments. Stops at intersections - pros and cons of each location.	2
Lec3	Terminals urban transport. Conditions of Trade (interchange cascade and the meetings of the line). Conditions for movement (the number and arrangement of bus stations, and system capacity stands haulage). Rules allocation of line positions.	2
Lec4	Terminal transport interchange at Grunwald Square in Wroclaw (genesis solutions, discuss alternative projects, tour of the facility).	2
Lec5	Regional transport stations. Bus terminals - terminals analogies with urban transport. Train stations (front, transit and mixed, the system tracks and platforms; functional zones train). Linking the regional stations to urban transport.	2
Lec6	Wrocław Main Railway Station (history, founding remodeling, tour of the facility).	2
Lec7	Railway stations long-distance transport. Railway high-speed rail - similarities and differences compared to traditional train stations. Airports (rules for the exchange of passengers needs low-cost airlines, airports system - runways, taxiways, aprons, bagażownie).	2
Lec8	Airport Wroclaw (history, founding remodeling, tour of the facility).	2
Lec9	Movement of passenger flows depending on the type of stop (plain end, interchange). The role of information in the control streams travelers. Shaping space platforms (functional zones, adapting to the requirements of sections passengers, the needs of the disabled).	2

Lec10	The needs of passengers while waiting for the connection (time and comfort expectations). Shaping the building platform (the principles of building individual functional areas, benches and racks for luggage, light design and construction).	2
Lec11	Engineering pedestrian traffic in the vicinity of bus stops and within nodes. Traffic conditions on footpaths (useful width of passage, the effect of flow and structure of the directional movement). The influence of type of luggage on the behavior of pedestrians. The advantages and disadvantages of traffic lights.	2
Lec12	Linking individual railway transport - car parks (Park & Ride), cycling (Bike & Ride), zones of rapid exchange of passengers (Kiss & Ride). Tariffs parking interchanges.	2
Lec13	Railway stations and shopping centers. The commercial potential of space railway stations. Trade organization and the basic functions of stations. Actual and induced the needs of passengers in commercial	2
Lec14	Availability of public transport in historic city centers. Solutions multilevel - the underground and overground stations. Reconstruction of railway hubs in Berlin and Warsaw. Overview of the proposed introduction of a rapid transport to the center of Wroclaw.	2
Lec15	Summary discussion lecture, based on the most interesting cases raised by students during the seminar.	2
		Total hours: 30
Form of classes – Seminar		Number of hours
Sem1	Discussion topics seminars and presentation rules of individual issues. The division of subjects (students choose their familiar objects from everyday experiences, present their design and discuss the advantages and disadvantages from the point of view of the passenger).	2
Sem2	Interstitial stops public transport (on the sidewalk on the high street, on the sidewalk to the cycle path tram from entering the roadway, Viennese tram - the elevated roadway, located on the island).	2
Sem3	Nodal stops public transport (the square off from other traffic, at the crossroads - with a move horizontally, at the crossroads - the underpass, on the island center, at the sports complex).	2
Sem4	Regional bus terminals (small town, big city - one-storey, city - a two-level, connected to a shopping center connected to the train station).	2
Sem5	Regional bus stops and train stations (rural bus stop, train station in a small town in a big city railway station junction, station depth).	2
Sem6	Train long-distance (international communication bus station, railway high-speed rail, marine railway, airport, aviation hub).	2
Sem7	Projects interchanges on examples of selected railway (linking regional communications and transport, regional transport link and far, a Park and Ride parking Bike & Ride zone rapid exchange of passengers' Kiss & Ride).	3
		Total hours: 15

TEACHING TOOLS USED

N1. problem lecture
N2. case study
N3. problem discussion
N4. multimedia presentation
N5. report preparation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)		
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_K01	included in the assessment summarizing the seminar
P = 100%*Psem		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_K01	preparation of oral presenting the selected station or stop with the assessment of its operation
F2	PEK_U02,	a study written, includes a description of the conditions which shall meet the analyzed object bus stop or train station
P = 50%*F1+50%*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Neufert E.: Podręcznik projektowania architektoniczno-budowlanego. Arkady Warszawa 2007.[2] Cieślakowski S. J.: Stacje kolejowe. WKŁ Warszawa 1992.[3] Romanowicz A.: Dworce i przystanki kolejowe. Arkady Warszawa 1970.[4] Gajna-Korycka A., Korycki T.: Inwentaryzacja infrastruktury transportu regionalnego na Dolnym Śląsku. Politechnika Wrocławska, Wrocław 2010.[5] miesięcznik Transport Miejski i Regionalny.

SECONDARY LITERATURE

[6] Załuski D.: Śródmiejskie przestrzenie podróży. Dworce kolejowe. Wydział Architektury Politechniki Gdańskiej, Gdańsk 2010.[7] Zwierz M. (red.): Wrocławskie dworce kolejowe. Muzeum Architektury. Wrocław 2006.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Stations and stops for passengers
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_TP_W03, K1TR_W06	C1, C3	Wy1-Wy15	N1, N2, N3
PEK_W02	K1TR_TP_W02	C3	Wy1-Wy15	N1, N2, N3
PEK_U01	K1TR_TP_U03, K1TR_U07, K1TR_U10	C1, C2	Se1-Se7	N3, N4, N5
PEK_U02	K1TR_TP_U02, K1TR_TP_U03, K1TR_U12	C1, C2, C3	Se1-Se7	N3, N4, N5
PEK_K01	K1TR_K07, K1TR_K08	C2	Wy1-Wy15, Se1-Se7	N1-N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Organizacja transportu pasażerskiego**
Name in English: **Organization of passenger transport**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031103**
Group of courses: **yes**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	15			
Number of hours of total student workload (CNPS)	30	60			
Form of crediting	Crediting with grade	Crediting with grade			
Group of courses		X			
Number of ECTS points	1	2			
including number of ECTS points for practical (P) classes		2			
including number of ECTS points for direct teacher-student contact (BK) classes	0.6	1.4			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of the issues presented in the context of courses "History of transport", "transport infrastructure", "Transportation in the cities".
2. Having the skills presented in the course "Engineering Statistics" and "Operations Research".
3. lack of prerequisites for other competencies

SUBJECT OBJECTIVES

C1. Familiarization with the principles of organization of passenger transport.
C2. Obtaining the ability to assess the state of the existing system of passenger transport.
C3. Obtaining design skills passenger transport systems.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Following the course, the student will have knowledge of the organization of passenger transport systems and existing developments in this area.

II. Relating to skills:

PEK_U01 - As a result of the course the student will be able analyze it isnt passenger transportation systems, for compliance of Their parameters with the Requirements of passengers.

PEK_U02 - As a result of the course the student will be able to design systems for passenger transport and plan their operations.

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	The principles of organization of public transport in Switzerland (network layout, design principles offer transport, process agreed timetable, the responsibility of local governments and funding, uniform tariff, infrastructure management, reliability of public transport).	2
Lec2	Transport needs - to assess and predict (the need for the existence of public transport, traffic source and target systems, roof movement, measurement and forecasting needs).	2
Lec3	Transport plans - the role of local government in shaping public transport (transport policy, plans, objectives, methodology and determinants of creating plans, the planning period, data sources, links with other strategic documents, the role of the public consultation).	2
Lec4	Desired travel time a passenger as a primary factor in the choice of means of transport (travel time components and methods of their calculation, the commercial speed and relational comparison of the competitiveness of individual public transport and individual).	2
Lec5	The holiday travel time - shaping the transport offer (placement of stops, frequency of traffic, driving time, synchronized motion, the organization transfers, analyzes izochronowe).	2
Lec6	Offered network of connections - design assumptions timetable (types and numbering connections, network lines, stops and network nodes, elements of the construction timetables, the division of tasks between means of transport, the role of traffic engineering).	2
Lec7	Other considerations timetable (restrictions infrastructure and rolling stock, conditions and working hours of drivers, tram drivers, drivers and conductors).	2
Lec8	Public transport infrastructure (railways and trams: line one, two or more rail solutions knots and parking stations, trolleybus infrastructure, dedicated bus lanes and roads).	2
Lec9	Desired standard of transport services - the quality of public transport (elements of the quality assessment and quality control, the concept of qualitative shortcomings, specifications, quality requirements for carriers).	2

Lec10	Information on public transport (naming and labeling stops, bus stops information; information traditional - direct, telephone, automated information - Internet, SMS, marking vehicles, information on vehicles, advertising on public transport).	2
Lec11	Tariffs and tickets (types of tariffs, types of incentives, legal, forms of ticket vending machines, conductors, ticket control, communications free of charge).	2
Lec12	Traffic control (traffic visibility in succession and maintain the road; the role of the signaling, the role of information in the process control and traffic prioritization; power of the vehicles and traffic automation).	2
Lec13	Execution of transport (dispatching: the real picture of traffic, train reserve, substitute means of transport and communications, vehicles and passengers, organization of repair work; variability needs and offer transport).	2
Lec14	Complementary forms of transport (communication table, tourist transport, transport of bicycles and skis, Transportation during major events dedicated to transport disabled).	2
Lec15	Forms organizational and legal conditions (calls government and commercial transport companies and managements of communication, problems of integration of public transport, legal conditions)	2
		Total hours: 30
Form of classes – Classes		Number of hours
Cl1	Factors influencing the choice of public transport a passenger - a discussion among participants (depending on the plan schedule - mutual order of lectures and exercises - a topic that can be implemented on 1 or 7 classes).	2
Cl2	Evaluation and forecasting of transport needs (planning studies, discussion on sample results, calculate forecasts).	2
Cl3	Elements of transport plans (identifying determinants of network development, analysis of socio-economic characteristics of the transport network, modal split).	2
Cl4	Shaping the offer and timetable (deployment stops, determining the frequency of movement, choice of vehicles, synchronized motion, stabilization journey times).	2
Cl5	Elements of Design Infrastructure (adapting infrastructure to the needs of the timetable, the analysis of occupancy infrastructure in the conduct traffic at a distance away).	2
Cl6	Analysis of the quality of public transport (analysis of the results of qualitative research, planning, quality control, method mystery shopper).	2
Cl7	Designing tariffs (outlining quotas, determining the grant rate relief analysis, competitive analysis).	2
Cl8	Final test.	1
		Total hours: 15

TEACHING TOOLS USED

N1. problem lecture
N2. problem exercises
N3. calculation exercises
N4. problem discussion

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01	test
P = 100%*Pcw		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Classes)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U02	Array participation in exercises and discussions in the classroom
F2	PEK_U01, PEK_U02	solution of tasks of problem during final test
P = 50%*F1+50%*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Molecki B. (red.): Rola samorządu w kształtowaniu transportu regionalnego w Polsce i w Europie. Politechnika Wrocławska, Wrocław 2010.
[2] Podoski J.: Transport w miastach. WKŁ, Warszawa 1977.
[3] Grzelec K., Wyszomirski O.: Plan zrównoważonego rozwoju publicznego transportu zbiorowego dla gmin i związków międzygminnych. Izba Gospodarcza Komunikacji Miejskiej, Warszawa 2011.
[4] Tarski I.: Czynnik czasu w procesie transportowym. WKŁ, Warszawa 1976.
[5] pr. zb.: Organizacja i technika ruchu miejskiej komunikacji zbiorowej. Biuro Wydawnictw MHWiU, Warszawa 1972.
[6] Rudnicki A.: Jakość komunikacji miejskiej. SITK, Kraków 1999.
[7] Wyszomirski O. (red.): Transport miejski. Ekonomika i organizacja. Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2008.
[8] Żurowska J.: Prognozowanie przewozów - modele, metody, przykłady. Politechnika Krakowska, Kraków 2005.
[9] Łaszkiewicz R.: Organizacja kolejowych przewozów pasażerskich. Politechnika Radomska, Radom 1998.
[10] Chwieduk A., Dyr T.: Projektowanie ruchu pociągów. Politechnika Radomska, Radom 1997.

SECONDARY LITERATURE

[11] Mikiel P., Rozkosz M.: Publiczny transport zbiorowy - wybrane zagadnienia w pytaniach i odpowiedziach. Izba Gospodarcza Komunikacji Miejskiej, Warszawa 2012.
[12] Zalewski R.: Planowanie obsługi trakcyjnej na PKP. WKŁ, Warszawa 1980.
[13] Wesołowski J.: Miasto w ruchu. Dobre praktyki w organizowaniu transportu miejskiego. Instytut Spraw Obywatelskich, Łódź 2008.
[14] miesięcznik Transport Miejski i Regionalny.
[15] miesięcznik Autobusy - Technika, Eksploatacja, Systemy Transportowe.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Organization of passenger transport
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_TP_W02, K1TR_TP_W03	C1	Wy1-Wy15	N1, N4
PEK_U01	K1TR_U10	C2	Ćw1-Ćw7	N2, N3, N4
PEK_U02	K1TR_U11, K1TR_U13	C3	Ćw1-Ćw7	N2, N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Transport pionowy pasażerski**
Name in English: **Vertical passenger transport**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031104**
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
Group of courses					
Number of ECTS points	1				2
including number of ECTS points for practical (P) classes					2
including number of ECTS points for direct teacher-student contact (BK) classes	0.6				1.4

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of physics, in terms of kinematics, statics and dynamics at high school level
2. Ability to read drawings and produce sketches of devices for vertical transport of passengers, together with structural diagrams of simple systems containing these devices
3. Ability to use tools for creating multimedia presentations

SUBJECT OBJECTIVES

C1. C1 Knowledge of the types of structures, parameters and fundamental elements for the vertical system of passenger transport (VSPT), knowledge of the principles of their operation and control, knowledge of the selection of the elements of these systems, ie., special, short-distance transport equipment (SDT) such as lifts, escalators, cable, and ski lifts
C2. Acquisition of basic skills to identify structural types, carry out analytical description and calculation of basic technical and operating characteristics of VSPT systems and their SDT components to meet specified passenger flow
C3. Awareness of the interrelationship between size and type of structures of VSPT systems together with technical parameters of its SDT components and operating characteristics (capabilities) as well technical characteristics (due to energy efficiency considerations) of the VSPT systems

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Knows the basic structures, parameters, principles of operation and control of VSPT systems and their basic STD elements

PEK_W02 - Has knowledge of the principles of selection of STD elements with cyclic movement (lifts) and those of continuous operation (escalators, cable cars and ski lifts) that operate in specified passenger flow systems, as implemented by VSPT

II. Relating to skills:

PEK_U01 - Able to identify the structure and basic parameters of VSPT systems, and create general schemes for these structures

PEK_U02 - Can determine computationally the basic technical parameters of VSPT systems and their STD components ensuring the implementation of a given passenger flow

III. Relating to social competences:

PEK_K01 - Is aware of the relationship between size and and types of structural systems of VSPT, together with technical characteristics of its STD components and operating (capabilities) and technical (due to energy efficiency considerations) parameters of these systems.

PEK_K02 - Recognizes the relationship between adequate knowledge of mathematics and selected branches of mechanics used in the identification and analysis of VSPT systems

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Basic concepts, review and classification of VSPT systems; types of structures. Factors influencing the efficiency of VSPT systems working cyclically and continuously	2
Lec2	The basic elements of VSPT systems for cyclic operation (passenger lifts), classification according to the design features, application, intensity of use; general selection criteria	2
Lec3	Basic technical and operating parameters and factors determining productivity of cyclic work STD systems (lifts	2
Lec4	General principles of control, selected topics and standardized requirements for lift safety; typical safety devices for passenger lifts	2
Lec5	The basic elements of VSPT systems for continuous operation (escalators, cable cars and ski lifts), classification according to design features and intended use; general criteria of selection	2
Lec6	Basic technical and operational parameters and factors determining the performance of continuous work STD systems (escalators, lifts and cable cars)	2
Lec7	General principles of control, selected topics and standardized safety requirements for continuous work SDT systems; typical safety equipment for these systems	2
Lec8	Selected aspects of automation of VSPT systems	1
		Total hours: 15
Form of classes – Seminar		Number of hours

Sem1	Examples of solutions for VSPT systems differing in: size, location, logistical structure, degree of automation, type of operation (cyclic or continuous), productivity, and installed capacity	2
Sem2	Examples of solutions for cyclic work VSTP systems of a given structure, degree of automation, productivity, types of STD equipment (cranes, lifts, rail cars, etc.)	2
Sem3	Examples of STD elements (cranes, lifts, rail cars, etc.), cyclic work VSPT systems; basic design, technical and operational characteristics, degree of automation of STD	2
Sem4	Examples of solutions for safety and control devices in cyclic work VSPT systems of a given structure, degree of automation, productivity, type of STD equipment (cranes, lifts, rail cars, etc.).	2
Sem5	Examples of solutions for continuous work VSPT systems of a given structure, degree of automation, capacity, type of STD equipment (escalators, lifts and cable cars).	2
Sem6	Examples of STD elements (escalators, cable cars and ski lifts) for continuous work VSTP systems, basic design, technical and operational characteristics degree of automation of STD equipment	2
Sem7	Examples of solutions for safety and control devices in continuous work VSPT systems of a specified structure, degree of automation, productivity, and types of STD equipment (escalators, lifts and cable cars).	2
Sem8	Examples of algorithms and procedures for the control of selected VSTP systems	1
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. tutorials
N3. self study - self studies and preparation for examination
N4. multimedia presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_W02	Test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U02	Mark of paper and its presentation
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Kwaśniewski J. -Passenger lifts and elevators, structure and eksploitation. Publ. AGH Cracow 2004
[2] Goździecki M., Świątkiewicz H. – Conveyors. WNT Warsow 1978
[3] Mindur l. - Contemporary technologies of transport. Publ. T.U. Radom 2002

SECONDARY LITERATURE

[1] Piątkiewicz A., Urbanowicz H. - Electrical lifts. WNT Warsow 1972
[2] Kudzielka H. - Cable cars and ski lifts. Publ. KaBe Krosno 2010
[3] Catalogues of lifts and conveyors offered by firms: FAMAK, KONE, SCHINDLER, OTIS, AUIMUND

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Vertical passenger transport
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W10	C1	Lec1	N1, N2, N3
PEK_W02	K1TR_W10	C1	Lec2 to Lec8	N1, N2, N3
PEK_U01	K1TR_U18	C2	Sem1, Sem2, Sem4, Sem6	N2, N3, N4
PEK_U02	K1TR_U18	C2	Sem3, Sem5, Sem7	N2, N3, N4
PEK_K01, PEK_K02	K1TR_K04	C3	Lec1 to Lec8, Sem1 to Sem8	N1, N2, N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Wnętrza pojazdów pasażerskich**
Name in English: **Interior of passenger vehicles**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031105**
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	
Group of courses				X	
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	0.6			0.7	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of the issues presented in the context of things "Basics of designing means of transport", "Electrical engineering and electronics".
2. Ability to use computer software costs associated with the design.
3. lack prerequisites in terms of competence

SUBJECT OBJECTIVES

C1. Acquainted with the conditions and requirements of designing and ordering of passenger vehicle interiors.
C2. Familiarization with the issues of ergonomics.
C3. Gaining the ability to create the Terms of Orders (ToR).

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Following the course, the student should be able to select and characterize elements of interior passenger vehicles.
PEK_W02 - As a result of the course the student should be able to explain the requirements relating to the design of passenger vehicles in the field of ergonomics.

II. Relating to skills:
PEK_U01 - As a result of the course the student should be able to draw up Terms of Reference (ToR) in the field of interior passenger vehicles.

III. Relating to social competences:
PEK_K01 - Following the course, the student should possess the ability to work in a project group, the division of tasks among members of the group, as well as gain a sense of responsibility for their work within the whole group and liability for the entire project with social consequences.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Terms of replacement passenger (doors, stairs, walkways internal issues of low floor).	2
Lec2	Architecture interior of the vehicle (the share of seats, the distribution of seats, places separated: for prams, wheelchairs, bicycles, luggage, toilets, color and interior design, interior modifiable).	2
Lec3	Issues of ergonomics (requirements for people sitting, standing and lying: armchairs, the distance between the seats, handles, gauge people standing, couches, vibration, acceleration and peacefulness of course, the requirements for the positions of drivers and drivers).	2
Lec4	Carriage of persons with disabilities (requirements of the physically disabled, blind, pregnant women, people with small children).	2
Lec5	Lighting, sound system and other electrical systems (lighting - to work, consumption, night, access to electricity and the Internet, public address systems, television and information, alarm systems, intervals of silence).	2
Lec6	Ventilation, heating and air conditioning (concept of coziness; construction windows; an overview of ventilation systems, heating and air conditioning).	3
Lec7	Issues Ticket (automatic tickets at the door; manual control - drivers, controllers, conductors, positions and intervals Konduktorska, and ticket vending machines in vehicles).	2
		Total hours: 15
Form of classes – Project		Number of hours
Proj1	The introduction to the subject classes. Discussion of the significance of the terms of reference (TOR). Analysis Example real specification.	2
Proj2	Development of assumptions exchange passengers (doors, stairs, the share of low floor).	2

Proj3	Planning the interior of the vehicle (the passenger division, the distribution of seats etc.).	2
Proj4	The development of ergonomic requirements of the vehicle (the seat railing system, control panel design and layout of the desktop).	2
Proj5	Develop requirements for the transport of persons with disabilities (access to inputs, whereabouts, availability of toilets).	2
Proj6	Development of assumptions installations: lighting, electrical, loudspeaker, IT and information.	2
Proj7	Clarifying the requirements for climatic comfort in the vehicle.	2
Proj8	Test. The discussion on the draft for the SIWZ.	1
		Total hours: 15

TEACHING TOOLS USED

N1. problem lecture
N2. case study
N3. problem discussion
N4. self study - preparation for project class
N5. report preparation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_W02	included in the assessment summarizing the project
P = 100%*Ppr		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

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_U01	evaluation prepared terms of reference of the vehicle
F2	PEK_U01, PEK_K01	to evaluate the activity during discussions in class design
P = 80%*F1+20%*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Grajnert J. (red.): Nowoczesne pojazdy komunikacji miejskiej. Politechnika Wrocławska, Wrocław 1995.
[2] Janiak M., Kalinkowski A.: Normalnotorowe wagony PKP. Opisy i charakterystyki techniczno-eksploatacyjne. WKŁ, Warszawa 1974.
[3] Kwaśniowski S. (red.): Ogrzewanie, wentylacja i klimatyzacja w pojazdach mechanicznych. Politechnika Wrocławska, Wrocław 1995.
[4] Ogrodzki A.: Technika cieplna w pojazdach. WKŁ, Warszawa 1982.

SECONDARY LITERATURE

[5] Deinert W.: Eisenbahnwagen. Transpress, Berlin 1985.
[6] Wagner P., Wagner S.: Reisezugwagen Archiv. Transpress, Berlin 1973.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Interior of passenger vehicles
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_TP_W01, K1TR_W07	C1	Wy1-Wy7	N1, N2
PEK_W02	K1TR_TP_W01, K1TR_W15, K1TR_W19	C2	Wy3-Wy6	N1, N2
PEK_U01	K1TR_TP_U01, K1TR_U03, K1TR_U12, K1TR_U16	C3	Pr1-Pr8	N2-N5
PEK_K01	K1TR_K03, K1TR_K07, K1TR_K09	C1, C2, C3	Wy1-Wy7, Pr1-Pr8	N1-N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Ekonomika transportu pasażerskiego**
Name in English: **Economics of public transport**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031106**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			15	
Number of hours of total student workload (CNPS)	60			30	
Form of crediting	Examination			Crediting with grade	
Group of courses					
Number of ECTS points	2			1	
including number of ECTS points for practical (P) classes				1	
including number of ECTS points for direct teacher-student contact (BK) classes	1.2			0.7	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Transport systems
2. Modes of transport

SUBJECT OBJECTIVES

C1. Acquisition of knowledge in the area of economic importance and function of public transport. He knows the social interest of passenger transport. Classification, transportation and the location of production and settlements, labor productivity.
C2. Acquisition of knowledge about the costs and structure of economic calculation in public transport. The nature and functions of the public transport market. Streams of passengers, operators household, competition, pricing services, construction tariffs.
C3. Knowledge of the transport policy, the impact of transport on the balance of payments. Economics and organization of passenger transport

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - It has an fundamental knowledge of the analysis and measure of the passenger transport
PEK_W02 - Able to analyse and calculate of the costs of passenger transport
PEK_W03 - Able to prepare the project of work for the passenger transport company

II. Relating to skills:
PEK_U01 - Able to planning the process of the passenger transport
PEK_U02 - Able to calculate the costs in company
PEK_U03 - Able to analyse of the passengers flows

III. Relating to social competences:
PEK_K01 - Able to interact and work in a group, taking there different roles of organization corresponding to the functions in production and service companies.
PEK_K02 - Able to thinking creative and enterprising

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Public transport, divisions and classification	2
Lec2	Fundamentals of conducting services in passenger transport	2
Lec3	Breakdown of area activities in passenger transportation, marketing, sources of financing public transport	2
Lec4	City passenger transport, tasks and the economy	2
Lec5	Interregional road transport	2
Lec6	Interregional rail and air transport	2
Lec7	Tourist transport	2
Lec8	Intake and demand. Factors affecting intake. Competition	2
Lec9	The costs of transport activities their own costs and external; fixed costs, half -variables and variables.	2
Lec10	Evaluation indicators of passenger transport system	2
Lec11	Registry of costs and economic balance. Systems tariff and prices of transport services, Determining of transport services price	2
Lec12	Investment in infrastructure -quality by. present value, internal rate of return like.	2
Lec13	Investments in means of transport - vehicle life cycle cost LCC	2
Lec14	Szacowanie kosztów zewnętrznych w transporcie miejskim. Koszty kongestii i kształtowanie ich optymalnego poziomu 1	2
Lec15	The costs of congestion and shaping their optimal level 2	2
		Total hours: 30
Form of classes – Project		Number of hours
Proj1	Transport groups of people, Carry yourself or outsource? analysis of the costs and tasks	2

Proj2	Analysis of the creek of passengera, selectionof the vehicle	2
Proj3	The costs of transport company, working hours and wages of drivers on the example	2
Proj4	Calculating the cost of a simple transport tasks	2
Proj5	Calculating the cost of passenger transport network	2
Proj6	Process design for traveling abroad	2
Proj7	Preparing and supervising the process of traveling abroad	2
Proj8	Concluding	1
		Total hours: 15

TEACHING TOOLS USED

N1. case study
N2. traditional lecture with the use of transparencies and slides
N3. problem lecture

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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	Exam
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

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_U03, PEK_K01, PEK_K02	credit with a grade
P = F-1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Górski W. Mendyk E.: Prawo transportu lądowego. WKiŁ, 2005;
2. Izabela Dembińska-Cyran, Marek Gubała: Podstawy zarządzania transportem w przykładach. Wydawnictwo: Instytut Logistyki i Magazynowania, 2005
3. Podoski J.: Transport w miastach. WKiŁ Warszawa 1985.
4. red. O.Wyszomirski, Gospodarowanie w komunikacji miejskiej,Wyd. UG, Gdańsk 2002
5. Starowicz, Wiesław. Kształtowanie jakości usług przewozowych w miejskim transporcie zbiorowym, 2001.
6. Krzysztof Lewandowski (red.): Miasto Wrocław. Przestrzeń komunikacji i transportu, Oficyna Wydawnicza Politechniki Wrocławskiej, 2004

SECONDARY LITERATURE

Magazins: transport, logistyka

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Economics of public transport
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01-PEK_W03	K1TR_TP_W01, K1TR_TP_W03	C1	lect1-Lect3	N.1.-N.3.
PEK_U01, PEK_U02, PEK_U03,	K1TR_TP_U01, K1TR_TP_U02, K1TR_U04, K1TR_U05, K1TR_U07, K1TR_U09, K1TR_U10, K1TR_U11, K1TR_U12, K1TR_U15, K1TR_U16, K1TR_U21, K1TR_U22	C2, C3	Lect12-lect13, Proj3-Proj7	N.1.-N.3.
PEK_K01, PEK_K02	K1TR_K03, K1TR_K04, K1TR_K05, K1TR_K10	C2, C3	Lect14-Lect15	N.1.-N.3.

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Internetowe systemy informacji**
Name in English: **Web information systems**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031107**
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	
Group of courses					
Number of ECTS points				2	
including number of ECTS points for practical (P) classes				2	
including number of ECTS points for direct teacher-student contact (BK) classes				1.4	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of the issues raised in the context of subjects "Information Technology", "Organization of passenger transport."
2. Ability to use basic programs, office suites (word processor, spreadsheet).
3. Ability to work in a group and the division of tasks among members of the group.

SUBJECT OBJECTIVES

C1. Introduction to basic principles of presenting passenger information and skills in the preparation of such information.
C2. Acquiring the ability to create terms of reference in relation to online passenger information systems.
C3. Acquisition of basic skills to design and database management systems, passenger information.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

PEK_U01 - As a result of the course, the student should be able to carry out the traditional forms of passenger information (landing and network timetables, network diagrams and connections, etc.).

PEK_U02 - As a result of the course the student should be able to design a passenger information system (define detailed requirements, tailored to the needs of passengers - to be implemented by the contractor system).

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Project		Number of hours
Proj1	Introduction to passenger information. Discussion of the tasks and principles of assessment.	2
Proj2	Naming lines and odds.	2
Proj3	Naming stops and nodes.	2
Proj4	Form, appearance and functionality of network diagrams transport connections.	2
Proj5	Form, appearance and functionality of bus schedules.	2
Proj6	Form, appearance and functionality of dynamic passenger information systems.	2
Proj7	The basic passenger information systems on the Internet.	2
Proj8	The functionality of websites.	2
Proj9	Search Engines calls.	2
Proj10	Problems pedestrian movements.	2
Proj11	Database Basics.	2
Proj12	Specifications assumptions for the database schedules.	2
Proj13	Specification guidelines for Internet service.	2
Proj14	Designing news site.	2
Proj15	Pick site by the client.	2
		Total hours: 30

TEACHING TOOLS USED

N1. case study
N2. self study - preparation for project class
N3. project presentation
N4. report preparation
N5. problem discussion

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U02	assessment of your presentation together with a written report - summary of the requirements of the Terms of Reference
F2	PEK_U01, PEK_U02	Evaluation of activity during the course of project - to prepare and participate in the discussion
P = 80%*F1+20%*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Nielsen J., Loranger H.: Optymalizacja funkcjonalności serwisów internetowych. Helion, Gliwice 2007.
[2] Krug S.: Nie każ mi myśleć! O życiowym podejściu do funkcjonalności stron internetowych. Helion, Gliwice 2006.

SECONDARY LITERATURE

[3] miesięcznik "Transport Miejski i Regionalny"

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Web information systems
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U01	K1TR_TP_U03, K1TR_U03	C1	Pr2-Pr6	N1-N5
PEK_U02	K1TR_TP_U03, K1TR_U01, K1TR_U14	C2, C3	Pr7-Pr15	N1-N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Prawo transportowe - transport pasażerski**
Name in English: **Transportation law - passenger transport**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031108**
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)	30				
Form of crediting	Crediting with grade				
Group of courses					
Number of ECTS points	1				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	0.6				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture	Number of hours

Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		2
Lec9		2
Lec10		2
Lec11		2
Lec12		2
Lec13		2
Lec14		2
Lec15		2
		Total hours: 30

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. problem discussion

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01, PEK_K02	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Transportation law - passenger transport
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W08	C1, C2, C3		N1, N2
PEK_K01	K1TR_K02	C1, C2, C3		N1, N2
PEK_K02	K1TR_K09	C1, C2, C3		N1, N2
PEK_W02	K1TR_W08	C1, C2, C3		N1, N2

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Technologie transportowe**
Name in English: **Transportation technologies**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031109**
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)	90				60
Form of crediting	Examination				Crediting with grade
Group of courses					
Number of ECTS points	3				2
including number of ECTS points for practical (P) classes					2
including number of ECTS points for direct teacher-student contact (BK) classes	1.8				1.4

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		2
Lec9		2
Lec10		2
Lec11		2
Lec12		2
Lec13		2
Lec14		2
Lec15		2
		Total hours: 30
Form of classes – Seminar		Number of hours
Sem1		2
Sem2		2
Sem3		2
Sem4		2
Sem5		2
Sem6		2
Sem7		2
Sem8		1
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. problem discussion
N3. multimedia presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK-W01, PEK-W02,	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)		
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	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Transportation technologies
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W07	C1, C2, C3		N1
PEK_W02	K1TR_W14	C1, C2, C3		N1
PEK_U01	K1TR_U10	C1, C2, C3		N2, N3
PEK_U02	K1TR_U11	C1, C2, C3		N2, N3
PEK_K01	K1TR_K09	C1, C2, C3		N2

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Proseminarium dyplomowe**
Name in English: **Diploma Thesis Seminar**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031110**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					15
Number of hours of total student workload (CNPS)					30
Form of crediting					Crediting with grade
Group of courses					
Number of ECTS points					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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of problems dealing with subject of final project.

SUBJECT OBJECTIVES

C1. Attain of ability of problem recognition and formulation of the task to solve.
C2. Attain of ability of sources and bibliography collecting to prepare compact text of problem solving using methods learned during study.
C3. Attain of ability of public presentation of achievements.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

PEK_U01 - Student should know how to edit writing work with steps of solving given problem.

III. Relating to social competences:

PEK_K01 - Easiness of interpersonal communication.

PROGRAMME CONTENT

Form of classes – Seminar		Number of hours
Sem1	Description of the way of final project preparation. Origin of the subject, contents: state of art, problem, solution, summery, literature.	1
Sem2	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 1-4.	2
Sem3	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 5-10.	2
Sem4	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 11-15.	2
Sem5	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 16-20.	2
Sem6	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 21-25.	2
Sem7	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 26-30.	2
Sem8	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 16-30.	2
		Total hours: 15

TEACHING TOOLS USED

N1. self study - preparation for project class

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement

F1	PEK_U01, PEK_U01	assessment of final project progress
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE
Poradnik inżyniera mechanika.

SECONDARY LITERATURE
http://www.wm.pwr.wroc.pl/88428.dhtml

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Diploma Thesis Seminar
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U01, PEK_K01	K1TR_K03, K1TR_U01, K1TR_U04, K1TR_U07	C1, C2,C3	Se2-Se8	N1

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Certyfikat kompetencji zawodowych - przewóz osób**
Name in English: **The certificate of professional driver competences passenger transport**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031111**
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				
Group of courses					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture	Number of hours

Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		2
Lec9		2
Lec10		2
Lec11		2
Lec12		2
Lec13		2
Lec14		2
Lec15		2
		Total hours: 30

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. case study

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01, PEK_K02, PEK_K03	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
The certificate of professional driver competences passenger transport
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W08	C1, C2, C3		N1, N2
PEK_W02, PEK_W03	K1TR_W21	C1, C2, C3		N1, N2
PEK_K01, PEK_K02, PEK_K03	K1TR_K01, K1TR_K05, K1TR_K08	C1, C2, C3		N1, N2

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Niekonwencjonalne systemy transportu pasażerskiego**
Name in English: **Unconvencial passenger transport systems**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031113**
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
Group of courses					
Number of ECTS points					2
including number of ECTS points for practical (P) classes					2
including number of ECTS points for direct teacher-student contact (BK) classes					1.4

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of issues in context of presented topics in courses "History of Transportation", "Transport Systems" and "Transportation in cities".
2. Ability to prepare presentations and editing of written studies on transport systems.
3. lack prerequisites in terms of competence

SUBJECT OBJECTIVES

C1. Getting Acquainted with unconventional passenger transport systems - advantages, disadvantages and scope of each solution.
C2. Familiarization with the problem of social responsibility for implementing specific transport solutions. Acquiring the ability to present proposed solutions in a manner understandable to the public.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

PEK_U01 - As a result of the course the student is able to analyze the impact of transport systems functioning social behavior and assess the suitability of a particular system to be implemented in concrete terms.

III. Relating to social competences:

PEK_K01 - As part of the course, the student gains competence in the public presentation of the pros and cons and effects of implementing specific solutions in the field of transport.

PROGRAMME CONTENT

Form of classes – Seminar		Number of hours
Sem1	Introductory classes, discuss the issues, distribution of Topics	2
Sem2	Passenger cableways (ropeways, rope-rail, cable cars)	2
Sem3	Railways suspended and gear (railways, suspended asymmetrically and symmetrically, railways gear)	2
Sem4	monorails (railways Units, gyro)	2
Sem5	conducted buses (spurbusy, optically guided buses, trams pneumatic guide)	2
Sem6	pneumatic railways (rail, atmospheric tubular rail, trams pneumatic)	2
Sem7	railways on pillow (Aerotrain, magnetic railway)	2
Sem8	Unconventional means of city transport (trams without overhead line, trams dual-mode, duobusy)	2
Sem9	Transport systems on demand (minibuses, rufbusy, taxis, personal rapid transit)	2
Sem10	Devices with a continuous motion - apron conveyors (moving walkways, escalators, system Transurban)	2
Sem11	Devices with a continuous motion - conveyors cage (paternostry integrator Bouladona)	2
Sem12	Purposefulness and conditions for use of non-conventional systems - network (transport in small towns, large and urban areas)	2
Sem13	Purposefulness and conditions for use of non-conventional systems - a point (transport in tourist resorts, mountain resorts, in the exhibition)	2
Sem14	Purposefulness and conditions for use of non-conventional systems - linear (long-distance calls and airport)	2
Sem15	Future development of non-conventional systems - summary discussion	2
		Total hours: 30

TEACHING TOOLS USED

N1. multimedia presentation
N2. report preparation
N3. problem discussion

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_K01	preparation of oral and multimedia presentation on a selected topic
F2	PEK_U01, PEK_K01	prepare to discuss the problem in the form of a written report
F3	PEK_U01, PEK_K01	assessment of active participation in discussions on the analyzed topics
P = 33%*F1+33%*F2+34%*F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Schneigert Z.: Koleje niekonwencjonalne. WKŁ Warszawa 1971
[2] Bahke E.: Systemy transportowe dziś i jutro. WKŁ Warszawa 1977
[3] Podoski J.: Transport w miastach. WKŁ Warszawa 1977

SECONDARY LITERATURE

[4] miesięcznik Świat Kolei
[5] miesięcznik Technika Transportu Szynowego
[6] miesięcznik Autobusy - Technika, Eksploatacja, Systemy Transportowe

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Unconvencial passenger transport systems
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_K01	K1TR_K06, K1TR_K08	C2	Se1-Se15	N1,N2,N3
PEK_U01	K1TR_U01, K1TR_U16, K1TR_U20	C2	Se1-Se15	N1,N2,N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Procesy transportu pasażerskiego**
Name in English: **Passenger transport processes**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031114**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			15	
Number of hours of total student workload (CNPS)	60			30	
Form of crediting	Crediting with grade			Crediting with grade	
Group of courses					
Number of ECTS points	2			1	
including number of ECTS points for practical (P) classes				1	
including number of ECTS points for direct teacher-student contact (BK) classes	1.2			0.7	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge presented in courses "Transportation means", "Interiors of passenger vehicles", "Organization of passenger transport", "Theory of traffic", "Fundamentals of traffic engineering".
2. The ability to use optimization methods presented in courses like "Applied mathematics".
3. no requirements for competence

SUBJECT OBJECTIVES

C1. Skills in process design passenger using appropriate methods and algorithms.
C2. Knowledge of methods of assessment and analysis of transport processes.
C3. Familiarization with the principles of minimizing interference for the implementation of transport processes.
C4. Achieving the ability to select the vehicle to the transport task.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Following the course, the student should be able to characterize issues related to the design and implementation of transport processes in respect of the carriage of passengers.
PEK_W02 - As a result of the course the student knows the methods of measurement to define the fundamental values characterizing the processes of passenger transport.

II. Relating to skills:
PEK_U01 - As a result of the course the student should be able to choose the characteristics of the vehicle to the needs of the constructed transport offer. He should be able to develop terms of reference used to purchase new vehicles.
PEK_U02 - As a result of the course the student will be able to design the transportation process.

III. Relating to social competences:
PEK_K01 - During the course the student gains knowledge of the legal implications of the creation of engineering studies at the specifications of public procurement.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Determining the travel time (traction parameter selection to transport task; methods of determining the driving time: measurements, calculations, projections, commercial and technical stoppages in various transport systems; Technical intervals).	3
Lec2	The construction of timetables (tabular timetable and chart of traffic, construction graph of traffic; ancillary infrastructure occupancy charts; graphic services, restrictions on working time; chart circuits RS).	3
Lec3	The organization of transfers (direct and indirect connection;-awaited certainty interchange; types of transfers, the effectiveness of interchanges).	3
Lec4	Cyclic integrated timetable (synchronization of timetables; adaptation of the infrastructure to the needs of timetable, design and distribution infrastructure in Switzerland).	3
Lec5	Disruptions in traffic (traffic congestion, disruption of rail and air transport; analysis of propagation interference method to prevent interference, dispatching, compensation for passengers).	3
Lec6	Parametric analysis of the processes of passenger transport (passenger qualitative characteristics, measurement and quality analysis, analysis of activity dyspozytury, short- and long-term forecasting of demand).	3
Lec7	Reminding of graph knowledge (graph and its components; directed and undirected graphs, the costs and bandwidth nodes and branches, basic graph algorithms: shortest path, minimum spanning tree, maximum throughput).	3
Lec8	Graph algorithms in practical applications (search connections in public transport, tourist travel and Traveling Salesman Problem; the use of classical algorithms and their adaptation to the actual limitations).	3
Lec9	The transport process model (model grafowy elements of the process, passenger travel and the critical path; modeling of critical paths).	3

Lec10	Model the transport process - completion (Petri nets, simulation models). Final test	3
		Total hours: 30
Form of classes – Project		Number of hours
Proj1	Introduction to classes. Inventory organizer's requirements and the needs of passenger transport.	3
Proj2	Design of traffic charts (technical assumptions, assumptions trading, conflict of access to infrastructure).	3
Proj3	Chart analysis of traffic due to the additional conditions (restrictions during working hours, circuits fleet, the organization transfers).	3
Proj4	Measurements of movement taken into account in the design of traffic graphs.	3
Proj5	Classes settlement (performance measurement results, discussion of results).	3
		Total hours: 15

TEACHING TOOLS USED

N1. problem lecture
N2. self study - preparation for project class
N3. case study
N4. problem discussion
N5. report preparation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_W02	final test
P = 100%*F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

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	average ratings of the various stages of the project
F2	PEK_U01, PEK_U02, PEK_K01	activity in the discussion during the project
P = 80%*F1+20%*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Marcinkowski J.: Systemy transportowe. Środki transportu. Politechnika Wrocławska, Wrocław 1988.
[2] Tarski I.: Czynnik czasu w procesie transportowym. WKŁ, Warszawa 1976.
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SECONDARY LITERATURE

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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Passenger transport processes
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W10	C1, C3	Wy1-Wy9	N1
PEK_W02	K1TR_W12	C2	Wy4, Wy5, Wy8, Wy9	N1
PEK_U01	K1TR_TP_U01, K1TR_U12	C1, C4	Pr1-Pr5	N2-N5
PEK_K01	K1TR_K02, K1TR_K09	C4	Pr1-Pr5	N3, N4
PEK_U02	K1TR_TP_U02, K1TR_TP_U03, K1TR_U08	C1, C2, C3	Pr1-Pr5	N2-N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Bezpieczeństwo transportu pasażerskiego**
Name in English: **Safety of passenger transport**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031115**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	60		30		
Form of crediting	Crediting with grade		Crediting with grade		
Group of courses					
Number of ECTS points	2		1		
including number of ECTS points for practical (P) classes			1		
including number of ECTS points for direct teacher-student contact (BK) classes	1.2		0.7		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of the construction of means of transport.
2. Knowledge of transport infrastructure.
3. Skills of individual and group laboratory working.

SUBJECT OBJECTIVES

C1. To acquaint the participants with factors affecting passenger safety.
C2. To gain basic knowledge of the methods of accident reconstruction.
C3. To acquire the skills to evaluate and interpret test results.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - It has knowledge of the factors affecting the safety of passengers.
PEK_W02 - It has knowledge about the safety of passenger transport in the various transport sectors.
PEK_W03 - It has a basic knowledge of safety engineering of transport systems;especially road safety.

II. Relating to skills:

PEK_U01 - Is able to obtain and use information from literature, databases and other sources to the activities of vehicle construction engineering.
PEK_U02 - It has the ability to self-learning in order to improve the professional competence.
PEK_U03 - Able to estimate the safety of passenger transport.

III. Relating to social competences:

PEK_K01 - Is aware of the importance, responsibility and impact of activities of the transport engineer.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Basic terms, legal regulations safety issues. The criteria for evaluation.	2
Lec2	Integrated brake assist system.	2
Lec3	Active safety elements of chassis systems.	2
Lec4	Traction control systems.	2
Lec5	Numerical computer aided systems for road accidents reconstruction.	2
Lec6	Road transport safety.	2
Lec7	Safety of water transport.	2
Lec8	Safety of rail transport.	2
Lec9	Photographic documentation, measurement and description of the accident.	2
Lec10	Mechanics of car movement in emergency situations.	2
Lec11	Mechanics of vehicle collisions.	3
Lec12	The collision with a pedestrian.	2
Lec13	Reconstruction of road traffic accidents.	3
Lec14	An integrated system of transport safety.	2
		Total hours: 30

Form of classes – Laboratory		Number of hours
Lab1	Research on the influence of chassis parameters on drivability.	2
Lab2	The test of the ABS model.	2
Lab3	The test of steering system.	2
Lab4	Tests of the brake system. Traction control systems.	2
Lab5	The test of energy consumption of structure on the drop-hammer.	2
Lab6	The test of loads affecting the dummy in simple crash tests.	2
Lab7	The test of materials and stitches used for the construction of airbags.	2

Lab8	Testing and assessment of the safety belts	1
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. self study - preparation for laboratory class
N3. multimedia presentation
N4. laboratory experiment

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	Wy1-Wy5	final test
F2	Wy6-Wy14	final test
P = (F1 +F2) / 2		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	La1-La4	test, report
F2	La5-La8	test, report
P = (F1 +F2) / 2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Prochowski L. et al.: Podstawy rekonstrukcji wypadków drogowych. WKŁ Warszawa 2008
Krystek R. red pracy zbiorowej Zintegrowany system bezpieczeństwa transportu Tom I Diagnoza bezpieczeństwa transportu w PolsceWKŁ Warszawa 2009.
Unarski J., Zębala J.: Zbiór podstawowych wzorów i równań stosowanych w analizie wypadków drogowych. Wydanie 2, Wydawnictwo – Instytut Ekspertyz Sądowych, Kraków 2012
Wicher J.:Bezpieczeństwo samochodów i ruchu drogowego, Wydawnictwo Komunikacji i Łączności, Warszawa 2001
Zieliński A.: Konstrukcja nadwozi samochodów osobowych i pochodnych, WKŁ Warszawa 1998
Informator techniczny BOSCH: Układy bezpieczeństwa i komfortu jazdy. WKŁ, Warszawa 2000
Informator techniczny BOSCH: Układ stabilizacji toru jazdy ESP. WKŁ, Warszawa 2000
Tomasz Szczuraszek, Bezpieczeństwo ruchu miejskiego, WKŁ.

SECONDARY LITERATURE

Wierciński J., Reza A.: Wypadki drogowe. Vademecum biegłego sądowego Wydanie 2 uaktualnione, Wydawnictwo – Instytut Ekspertyz Sądowych Krakw 2008
Wach W.: Symulacja wypadków drogowych w programie PC-Crash. Instytut Ekspertyz Sądowych Kraków 2010
Uwe Rokosch, Poduszki gazowe i napinacze pasów, WKŁ.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Safety of passenger transport
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01, PEK_W02, PEK_W03	K1TR_W13	C1, C2, C3	Lec1-Lec14	N1, N3
PEK_U01, PEK_U02, PEK_U03	K1TR_U06, K1TR_U18	C1, C2, C3	Lab1-Lab18	N2, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Ubezpieczenia komunikacyjne**
Name in English: **Car Insurance**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031116**
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
Group of courses					
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	0.6				0.7

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		1
		Total hours: 15
Form of classes – Seminar		Number of hours
Sem1		2
Sem2		2
Sem3		2
Sem4		2
Sem5		2
Sem6		2
Sem7		2
Sem8		1
		Total hours: 15

TEACHING TOOLS USED

N1. problem lecture
N2. problem discussion
N3. case study

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U02	
F2	PEK_U03	
F3	PEK_K02	
F4	PEK_K03	
P = P=F1/4+F2/4 +F3/4+F4/4		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Car Insurance
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01-PEK_W03	K1TR_TP_W01, K1TR_TP_W02, K1TR_TP_W03	C1-C4		N1 N2 N3
PEK_U01-PEK_U03	K1TR_U03, K1TR_U06, K1TR_U18, K1TR_U20, K1TR_U21, K1TR_U22	C1-C4		N2 N3
PEK_K01-PEK_K03	K1TR_K02, K1TR_K04, K1TR_K06, K1TR_K07, K1TR_K08, K1TR_K09	C1-C4		N1 N2 N3

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Seminarium dyplomowe**
Name in English: **Diploma Seminar**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031117**
Group of courses: **no**

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Seminar		Number of hours
Sem1		1
Sem2		2
Sem3		2
Sem4		2
Sem5		2
Sem6		2
Sem7		2
Sem8		2
		Total hours: 15

TEACHING TOOLS USED

N1. multimedia presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_K01	
F2	PEK_U01, PEK_K01	
P = 60%*F1+40%*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Diploma Seminar
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_K01	K1TR_K08	C1		N1
PEK_U01	K1TR_U01, K1TR_U04	C2		N1

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Ekologia transportu pasażerskiego**
Name in English: **Ecology of passenger transport**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031118**
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		
Group of courses					
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	0.6		0.7		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		2
Lec9		2
Lec10		2
Lec11		2
Lec12		2
Lec13		2
Lec14		2
Lec15		2
		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1		2
Lab2		2
Lab3		2
Lab4		2
Lab5		2
Lab6		2
Lab7		2
Lab8		1
		Total hours: 15

TEACHING TOOLS USED

N1. multimedia presentation
N2. tutorials
N3. self study - preparation for laboratory class
N4. report preparation
N5. laboratory experiment

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01-PEK_K03	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)		
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_U03	
F2	PEK_U01 PEK_U02 PEK_U03	
F3	PEK_U01 PEK_U02 PEK_U03	
F4	PEK_U01 PEK_U02 PEK_U03	
F5	PEK_U01 PEK_U02 PEK_U03	
F6	PEK_U01 PEK_U02 PEK_U03	
F7	PEK_U01 PEK_U02 PEK_U03	
P = (F1+F2+F3+F4+F5+F6+F7)/7		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Ecology of passenger transport
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_TP_W01, K1TR_TP_W03	C1	Lec1 Lec2 Lec3	N1. N2.

PEK_W02	K1TR_TP_W01, K1TR_TP_W03	C2	Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11	N1. N2.
PEK_W03	K1TR_TP_W01, K1TR_TP_W03	C3	Lec12 Lec13 Lec14 Lec15	N1. N2.
PEK_U01	K1TR_U10, K1TR_U16	C1 C2	La1 La2 La3 La4 La5	N3. N4. N5
PEK_U02	K1TR_U10, K1TR_U16	C1 C2	La6 La7 La8	N3. N4. N5
PEK_U03	K1TR_U10, K1TR_U16	C1 C2 C3	La2 La3 La4 La5	N3. N4. N5
PEK_K01	K1TR_K01	C1 C2 C3	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N1. N3. N5.
PEK_K02	K1TR_K02	C1 C2 C3	Lec1 Lec2 Lec3 Lec4 Lec5 Lec6 Lec7 Lec8 Lec9 Lec10 Lec11 Lec12 Lec13 Lec14 Lec15	N1. N3. N5.
PEK_K03	K1TR_K03, K1TR_K11	C1 C2 C3	Lec1 Lec12 Lec15 La8	N1. N3. N5.

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **PRACA DYPLOMOWA**
Name in English: **MASTER THESIS**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031150**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					
Number of hours of total student workload (CNPS)					
Form of crediting					
Group of courses					
Number of ECTS points					
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes					

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

TEACHING TOOLS USED

N1. case study
N2. tutorials
N3. self study - self studies and preparation for examination

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
MASTER THESIS
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U1, PEK_U2, PEK_U3	K1TR_U27	C1, C2, C3		N1, N2, N3
PEK_K1, PEK_K2, PEK_K3	K1TR_K06	C1, C2, C3		N1, N2, N3

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Bezpieczeństwo bierne pojazdów towarowych**
Name in English: **Passive safety of commercial vehicles**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031200**
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			30	
Form of crediting	Crediting with grade			Crediting with grade	
Group of courses					
Number of ECTS points	2			1	
including number of ECTS points for practical (P) classes				1	
including number of ECTS points for direct teacher-student contact (BK) classes	1.2			0.7	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge in the field of strength of materials.
2. Knowledge of transport infrastructure.
3. Design basics of transport means.

SUBJECT OBJECTIVES

C1. The acquisition of knowledge in the filed of freight vehicles.
C2. Acquisition of knowledge of the design elements providing the passive safety in freight vehicles.
C3. The acquisition of knowledge in the design of freight vehicles.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - The correct definition of test procedures for goods vehicles.
PEK_W02 - Design principles of freight vehicles with regard to passive safety.
PEK_W03 - Ability to propose design changes to improve passive safety.

II. Relating to skills:

PEK_U01 - Ability to carry out simulation studies in the field of passive safety.
PEK_U02 - Ability to interpret the results of studies in the field of passive safety of freight vehicles
PEK_U03 - The ability to analyze the results obtained during the tests.

III. Relating to social competences:

PEK_K01 - Acquires teamwork skills.
PEK_K02 - Thinks and works in a creative way.
PEK_K03 - Student deliberately takes some actions and knows their consequences

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction to vehicle safety in freight.	2
Lec2	Studies of passive safety in trucks.	2
Lec3	Studies of passive safety in construction and mining machines.	2
Lec4	Structural elements ensure the safety of machine operators and rules for their design.	2
Lec5	Numerical methods in the evaluation of passive safety.	2
Lec6	Methodology for conducting simulation studies in the field of passive safety of freight vehicles.	2
Lec7	Methods for solving nonlinear problems physically and geometrically in the assessment of passive safety of freight vehicles	2
Lec8	The directions of development.	1
		Total hours: 15

Form of classes – Project		Number of hours
Proj1	Discussion of design project. Introduction to the FE software	2
Proj2	Principles of construction of computational models of elements that protect the operators.	2
Proj3	Evaluation of the impact of the adopted model on the accuracy of the results.	2
Proj4	Principles of construction of shell models.	2
Proj5	Methods of dynamic analysis taking into account the physical and geometric nonlinearity.	2
Proj6	Analysis of the structure protecting opertator while being hit by falling objects. The example.	2
Proj7	Development of the analysis results. Determination of basic necessary to assess the protective structure.	2

Proj8	Methodology static analysis taking into account the physical and geometric nonlinearity.	2
Proj9	Analysis of the structure in terms of protecting the loaded static lateral force resulting from the rollover. The example.	2
Proj10	Development of the analysis results. Determination of basic necessary to assess the protective structure during the rollover.	2
Proj11	Develop own geometric model construction to protect against falling objects and protects the operator during rollover.	2
Proj12	design a model for FEM calculations.	2
Proj13	Definition of load and carrying out computer simulation	2
Proj14	Analysis of the results obtained and to determine the basic size for the assessment of protective structures.	2
Proj15	Working out the final report.	2
		Total hours: 30

TEACHING TOOLS USED

N1. multimedia presentation
N2. problem exercises
N3. project presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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	writing or oral test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

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_U03	evaluation of the computational part of the project, oral test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Dyrektywa Maszynowa 2006/42/WE
Prochowski L., Żuchowski A., Samochody ciężarowe i autobusy, WKiŁ, Warszawa 2006
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Passive safety of commercial vehicles
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_TT_W01, K1TR_W07	C1, C2	Wy1, Wy2, Wy3, Wy5, Wy6, Wy 7	N1
PEK_W02	K1TR_W07	C2, C3	Wy2, Wy3	N1
PEK_W03	K1TR_TT_W01, K1TR_TT_W03	C2, C3	Wy4, Wy6, Wy8	N1
PEK_U01	K1TR_U01	C1, C2	Pr1, Pr2, Pr3, Pr4, Pr5, Pr8, Pr11, Pr12, Pr13	N2
PEK_U02	K1TR_U09, K1TR_U10	C1, C2	Pr3, Pr6, Pr 9	N2
PEK_U03	K1TR_U04, K1TR_U09	C2	Pr7, Pr10, Pr 14, Pr15	N3
PEK_K01	K1TR_K03	C1, C2	Pr1, Pr2, Pr3, Pr4, Pr5, Pr6,	N2
PEK_K02	K1TR_K05, K1TR_K09	C1, C2	Pr6, Pr7, Pr9, Pr10,	N2

PEK_K03	K1TR_K09	C1, C2	Pr7, Pr8, Pr13, Pr14, Pr15	N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Centra logistyczne**
Name in English: **Logistics Center**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031202**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30				15
Number of hours of total student workload (CNPS)	30				60
Form of crediting	Crediting with grade				Crediting with grade
Group of courses					
Number of ECTS points	1				2
including number of ECTS points for practical (P) classes					2
including number of ECTS points for direct teacher-student contact (BK) classes	0.6				1.4

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of logistics.
2. Basic knowledge of mechanical engineering
3. The ability of logical thinking, reasoning.

SUBJECT OBJECTIVES

C1. Understanding the concept of "logistics center", along with the whole issue of modern technology on securing the flow of industrial transport and storage of materials supply systems, production and distribution.
C2. Skills in controlling flows of goods and electronic exchange of information about them.
C3. Life skills in logistics centers.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Able to define the term "logistics center", replace part of the structural and operational, naming and describing its various components.

PEK_W02 - Able to identify logistics center appropriate for specific tasks handling and transport equipment (technology), and they are implemented (suitable magazines and front hubs).

PEK_W03 - Able to calculate the possibilities for picking processes and choose the right one

II. Relating to skills:

PEK_U01 - Able to characterize the process of attempting to operate the technical resources of the logistics center in the right: technically and economically feasible way.

PEK_U02 - Collaborates with other magazines (logistics centers) in the supply chain coordinating action if necessary.

PEK_U03 - Selects the appropriate packaging for goods and means of long-distance transport using their permissible parameters (eg., A load or weight limit).

III. Relating to social competences:

PEK_K01 - Works independently and interact as a team.

PEK_K02 - Respects the findings doing the job.

PEK_K03 - Discussed, maintaining openness to other sentence.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Providing basic and supplementary literature. Overview of the course based on object tab. Term examination of the course. Introduction to the subject by recalling already learned knowledge base. Logistic centers in the earlier courses and to discuss the concept of a logistics center.	1
Lec2	Definition of storage. Division and discussion of the basic ways of storage. Providing storage systems evaluation indicators.	1
Lec3	Discussion of the high-bay warehouse construction to build indoor and "self-supporting". Illustrating the film showing high storage operating units pallet and boxes Stacking KLT single-column, two-column - these content.	1
Lec4	Discussion of the examples of the use of high technology, automated storage example: - Logistics center in Dresden and Hamburg car magazine, - Library of Silesia in Katowice (KLT box) - easyPack	1
Lec5	Discussion of the storage technology of dynamic and static storage (definitions). A definition: Piecing homogeneous unit load. Discussion rack storage drive-in: - Cruising version, not cruising, - Provide the advantages and disadvantages of storage drive-in, the determination of queuing methods, utilization rates of storage space, - The problem of manual rack using forklift trucks, - Characteristics of the truck to handle drive-in rack.	1

Lec6	Discussion rack storage pater-noster and carousel and ..... - The technical requirements, - Operational problems, - The area of applications, advantages, disadvantages, utilization rates of storage space, queuing. Case Study,, discussion.	1
Lec7	Discussion rack storage pater-noster and carousel and ..... - The technical requirements, - Operational problems, - The area of applications, advantages, disadvantages, utilization rates of storage space, queuing. Case Study,, discussion.	1
Lec8	Discussion storage racks on wheels: - The technical requirements, - Operational problems, - The area of applications, advantages, disadvantages, utilization rates of storage space, queuing. Case Study,, discussion.	1
Lec9	Providing effective methods: - Use space on EURO pallet, - The use of typical cargo space vehicle bodies. Example calculations.	1
Lec10	The issue of media economy logistics centers: - Discussion of the pallet pooling of activities including an analysis of optional example: EPAL or CHEP. - Waste containers - Alternative media logistics applications. Example optional palette Styrofoam or cardboard.	1
Lec11	Providing methods of selecting a forklift truck for storage tasks. Discussion on the example of the calculation takes into account the characteristics of the method for selecting the drive truck, vehicle service time windows loading docks.	1
Lec12	Discussion of the division of forklifts. Characterization of basic movements working forklift. Ratings and operating the forklift (determination of the center of gravity, energy intensity).	1
Lec13	Construction of a forklift truck with electric drive. - Areas of application, - Advantages and disadvantages. Discussion of exemplary embodiments.	1
Lec14	Construction forklift gas-powered. - Areas of application, - Advantages and disadvantages. Discussion of exemplary embodiments.	1
Lec15	Overview of the stacker crane warehouse construction, including: - Operational height, - Construction (single-column, two-column) - Operating mechanisms - Ways of positioning.	1
Lec16	Discussion of basic cycles stacker crane warehouse. Presentation on the example of the essence of scheduling computational cycles stacker crane warehouse.	1
Lec17	Final test 1Z2, binding material from lecture 1 to lecture 14.	1

Lec18	Discussion of techniques in handling logistics centers using conveyors: - Variety of conveyors, - Basic structural elements, - Building components.	1
Lec19	Scheduling conveyors and calculate their performance with regard to cooperation with other devices. Example of calculation associated with the queuing strings of load units on the transport conveyer.	1
Lec20	AGV technologies used in devices handling logistics centers: - Principles of operation of AGV technology, - Principles of operation of vehicles equipped with AGV technology.	1
Lec21	AGV technologies used in devices handling logistics centers: - Principles of operation of AGV technology, - Principles of operation of vehicles equipped with AGV technology.	1
Lec22	The use of cranes to operate intermodal terminals in logistics centers: - Types of cranes are used, - Scheduling. Analysis example of the use of a crane at the logistics center.	1
Lec23	Discussion of the organization spread scenery. Principles for the preparation card charge flow in logistics centers.	1
Lec24	Subsystem flow of information at the logistics center: - A traditional paper-based, - EDI (using automatic identification) electronic workflow.	1
Lec25	The flow of information at the logistics center using bar codes: - Discussion of the code GS1-8; 13, with the modulo 39 - Analysis of examples marking codes piece goods.	1
Lec26	The flow of information at the logistics center using bar codes: - Discussion of the GS1-128 bar codes and modulo 103, - Discussion of labeling rules SSCC piece units, - Standard identifiers applications. - Analysis of examples marking codes piece goods. - The marking of containers GS1-128 bar codes.	1
Lec27	Barcodes for logistics applications: - Discussion of logistic label according to the standard GS-1 through the use of the codes GS1-13 and 128, SSCC, MA, - Analysis of the examples of the determination of logistic label loading units.	1
Lec28	Posts reloading piece of transport logistics center: - Types of loading docks, - Foliarki, - Weight.	1
Lec29	Analysis of logistics centers, in terms of: - Infrastructure, - Organizational structure, - Logistics functions. Optional: Logistics Center Dresden, Italy, something else.	1
Lec30	Final test 2Z2, which is under the lecture material from 15 to 29.	1
		Total hours: 30
Form of classes – Seminar		Number of hours

Sem1	Topic 1 .: "warehouse logistics centers with a maximum storage height above 12 m equipped with stacker cranes" Topic 2 .: "warehouse logistics centers with a maximum storage height of less than 12 m" Theme 3. "warehouse logistics specialist centers - Optional: cold or silos".	2
Sem2	Topic 5 .: "Place components in logistic centers, their infrastructure and logistics processes implemented" Theme 6 .: "Manoeuvring in logistics centers - implemented logistics processes, and the problem of managing" Topic 7 .: "Is gantry can work efficiently handling terminals for logistics?". Topic 8 .: "Crane in logistics centers and give their construction and performance parameters.	2
Sem3	About 9 .: "truck container logistics centers (new or used) - or cranes ?, About 10 .: "Whither internal transport technology using forklifts and computer-assisted lifting?". About 11 .: "Forklift universal (optional specialized) in the logistic center - Map applications" About 12 .: "Applications conveyors (optional: Band / roller / chain) in logistic centers"	2
Sem4	About 13 .: "conveyor suspended - at the logistics center or production hall?". About 14 .: "Manipulators and robots - their functions in logistic centers" About 15 .: "Touring handling logistics centers (optional temperature regime)" About 16 .: "Using containers in logistics centers.") In logistic centers "	2
Sem5	About 17 .: "Operation pallet logistics centers" About 18 .: "Using transport and storage containers for logistics" About 19 .: "laminating machines pallets (optional: weight) in logistic centers. About 20 .: "Food and drink, hotels, petrol stations, workshops for logistics"	2
Sem6	About 21 .: "Computer systems used in logistics centers" About 22 .: "Automatic identification of goods in logistics centers" About 23 .: "Radio systems used for the exchange of information logistics center." Topic 24. Electronic Data Interchange (ang. EDI), e-signature, e-documents in logistic centers.	2
Sem7	About 25 .: "Bonded warehouses in logistic centers" About 26 .: "Highways (formal requirements, eg. Speed, width and number of lanes) in the area of access to logistics centers" Subject 27: "railway sidings (formal requirements, eg. Speed, the amount / length of track, traction) in the area of access to logistics centers" About 28 .: "airport serving the logistics center, the principle of the organization of work, etc.".	2
Sem8	About 29 .: "Inland ports / marine logistics centers" About 30 .: "International logistics center in Hamburg - how does it work?" ..	1
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. tutorials
N3. case study
N4. problem discussion
N5. multimedia presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)		
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	test
F2	PEK_U01, PEK_U02, PEK_U03PEK_K01, PEK_K02, PEK_K03	participate in discussions problem, written tests
P = (F1+F2)/2		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)		
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_W03PEK_U01, PEK_U02, PEK_U03	verbal response test, the evaluation of the preparation and presentation of the paper,
F2	PEK_K01, PEK_K02, PEK_K03PEK_W01, PEK_W02, PEK_W03PEK_U01, PEK_U02, PEK_U03	test
P = (F1+F2)/2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Korzeń Z.: „Logistyczne systemy transportu bliskiego i magazynowania” T. I; Instutut Logistyki i Magazynowania; Poznań 1998;
[2] Korzeń Z.: „Logistyczne systemy transportu bliskiego i magazynowania” T. II; Instutut Logistyki i Magazynowania; Poznań 1999;
[3] Fijałkowski J.: „Transport wewnętrzny w systemach logistycznych”; Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2001.
[4] Krawczyk S. (red.): "Logistyka. Teoria i praktyka"; Wydawnictwo DIFIN; Warszawa; 2011;
[5]dla potrzeb seminarium materiały z czasopism specjalistycznych polsko- i angielskojęzycznych (np. w wersji elektronicznej).

SECONDARY LITERATURE

[1]. Gudehus T.: „Logistik” T. I; Grundlagen, Verfahren und Strategien; Springer, Hamburg; 1999;
[2]. Gudehus T.: „Logistik” T. I; Netzwerke, Systeme und Lieferketteen; Springer, Hamburg; 1999;

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Logistics Center
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01, PEK_W02, PEK_W03	K1TR_W06, K1TR_W09, K1TR_W10	C1, C2, C3	Wy1, Wy2, Wy3, Wy4, Wy5, Wy6, Wy7, Wy8, Wy9, Wy10, Wy11, Wy12, Wy13, Wy14, Wy15	N1, N2, N3, N4, N5
PEK_U01, PEK_U02, PEK_U02,PEK_K01, PEK_K02, PEK_K03	K1TR_K01, K1TR_U07, K1TR_U11, K1TR_U19, K1TR_U20, K1TR_U21	C1, C2, C3	Se1, Se2, Se3, Se4, Se5, Se6, Se7	N2, N3, N4, N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Opakowania transportowe**
Name in English: **Transport packaging**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031203**
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		
Group of courses					
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	0.6		0.7		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		1
		Total hours: 15
Form of classes – Laboratory		Number of hours
Lab1		2
Lab2		2
Lab3		2
Lab4		2
Lab5		2
Lab6		2
Lab7		2
Lab8		1
		Total hours: 15

TEACHING TOOLS USED
N1. traditional lecture with the use of transparencies and slides N2. self study - preparation for laboratory class N3. laboratory experiment

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)		
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_K01	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_U02	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Transport packaging
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W11	C2		N1
PEK_W02	K1TR_W11	C1		N1, N2, N3
PEK_W03	K1TR_W07, K1TR_W11	C1, C3		N1, N2, N3
PEK_U01	K1TR_U10	C2		N1, N2, N3
PEK_U02	K1TR_U10	C3		N1, N2, N3
PEK_K01	K1TR_K02	C1, C2, C3		N1

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Spedycja**
Name in English: **Freight forwarding**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031204**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	15			
Number of hours of total student workload (CNPS)	30	60			
Form of crediting	Crediting with grade	Crediting with grade			
Group of courses					
Number of ECTS points	1	2			
including number of ECTS points for practical (P) classes		2			
including number of ECTS points for direct teacher-student contact (BK) classes	0.6	1.4			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. It has a basic knowledge of management, design and testing processes / systems.
transport and logistics
2. It has a basic knowledge in the field of transport infrastructure.

SUBJECT OBJECTIVES

C1. Presentation of the rules governing access to the market for transport of goods.
C2. Skills in the process forwarding.
C3. Gaining awareness of responsibility for decisions and the implementation of tasks in the area of transport of goods.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Have knowledge about transportation law, the rules governing access to the transport direction of goods and trade rules for international transport. It also has a basic knowledge of customs clearance of goods.
PEK_W02 - He has knowledge of freight forwarding activities in the field of road transport, rail, air, intermodal and transportation of cargo.

II. Relating to skills:
PEK_U01 - Able to plan and organize the process of shipping in the area of road, rail, air and intermodal transport cargo in those circumstances technical, commercial, legal and social issues.

III. Relating to social competences:
PEK_K01 - It is aware of the importance and understanding of the impacts of the shipping company associated with that responsibility for decisions. It is prepared to work in a team.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Grounds for the freight forwarder in Poland and other countries Issue 1. The basic range of services freight forwarder, forwarding agreement, the rules governing the contract forwarding. Issue 2. The rights and duties of the forwarder and the principal under the contract forwarding. Issue 3. Polish General Forwarding, Model FIATA Forwarding Conditions. Issue 4. Legal and organizational forms of business of shipping companies. Issue 5. Organisations of freight forwarders in Poland and other countries (eg. Polish Chamber of Forwarding and Logistics). Issue 6. Documents Towing developed by FIAT.	2
Lec2	Transactions in foreign trade Issue 1. The concept of foreign trade, types and forms of conducting transactions. Issue 2. Commercial documents. Issue 3. Permission to carry out foreign trade in selected groups of goods and services. Issue 4. The import or export of certain goods.	2
Lec3	Terms of delivery of goods in foreign trade Issue 1. Formula trade. Issue 2. The layout and structure and interpretation of the Incoterms, 2010. Issue 3. The costs of the use of Incoterms, 2010. Issue 4. Structure Combiterms. Issue 5. Rules for selection of an appropriate commercial formula. Issue 6. responsible for transport.	2
Lec4	Terms of payment in foreign trade Issue 1. The forms of payment, payment run. Issue 2. Documentary Collection. Issue 3. documentary letter of credit. Issue 4. Promissory note and check sales.	2

Lec5	Management of shipping company Issue 1. Marketing shipping company. Issue 2. The mission and vision of the company forwarding. Issue 3. The structure of the shipping company. Issue 4. The functions and duties of employees.	2
Lec6	Maritime transport Issue 1. Forms of contracts of carriage in maritime transport. Issue 2. Basic arrangements charter contracts, the differences between the charter and the charter in time for the trip. Issue 3. Responsibilities of the owner and the captain of the ship. Issue 4. Receipt helmsman marine bill of lading, cargo manifest. Issue 5. Legal regulations in maritime transport. Issue 6. Calculation of freight, freight tariff.	2
Lec7	Rail transport 1/2 Issue 1. Organization of railway transport in Poland. Issue 2. Regulations governing the reciprocal use of wagons in international transport, the conditions for admission private wagons to freight. Issue 3. The agreements governing the international transport by rail. Issue 4. Tariffs COTIF / CIM, SMGS agreement.	2
Lec8	Rail transport 2/2 Issue 1. Responsibilities turn for cargo, damages, obligations of the sender and recipient load. Issue 2. Tasks forwarder in the implementation of cargo by rail cargo service. Issue 3. transport documents in international rail traffic. Issue 4. Calculation and the principle of paying debts in rail transport.	2
Lec9	Freight 1/2 Issue 1. Legislation related to international road transport. Issue 2. CMR Convention, the use, the content of CMR, the liability of the carrier. Issue 3. The TIR Carnet, definition, rules for the carriage of goods under cover of the carnet. Issue 4. The contract ERTA, ATP.	2
Lec10	Freight 2/2 Issue 1. The rules provide international transportation by transport companies established in Poland. Issue 2. Types of items appearing in road transport. Issue 3. The process forwarding road transport. Issue 4. The relationship forwarder - carrier, rights and obligations of the parties. Issue 5. Calculation of freight rates. The impact of external factors on transportation costs.	2
Lec11	Aviation 1/2 Issue 1. The organization of air transport in Poland. Issue 2. The role of ICAO and IATA air transport. Issue 3. The rules of admission of aircraft to fly, the types and categories of airports. Issue 4. Classification of shipments in air transport.	2

Lec12	Aviation 2/2 Issue 1. Legal regulations on air. Issue 2. The rights and obligations of the parties in the contract of carriage in air transport. Issue 3. The tasks of air freight forwarder. Issue 4. Documentation in air transportation, types of bills of lading, contract of carriage, rules on filling. Issue 5. Tariffs for air transport, the rules for calculating air freight.	2
Lec13	Intermodal transport Issue 1. The course of forwarding process in the transport of intermodal land-sea exports and imports. Issue 2. The process forwarding in international carriage by rail-road. Issue 3. Integration of organizational, legal, documentary and pricing.	2
Lec14	Transportation of dangerous goods and other cargo Issue 1. Laws governing the transport of dangerous goods and special (oversized loads, loads unusual). Issue 2. Obligations safety adviser for the transport of dangerous goods. Issue 3. Obligations of the shipper, the knowledge required in organizing the transport of dangerous goods and special. Issue 4. Required documentation in the carriage of dangerous goods and special.	2
Lec15	Customs clearance and insurance of goods in cargo traffic Issue 1. Customs Agency, functions, the role of customs agent. Issue 2. The Customs Code, the customs procedure. Issue 3. Documentation rules SAD customs declarations. Issue 4. Additionally, permissions and responsibilities of the customs authorities during customs control. Issue 5. Liability Insurance shipper.	2
		Total hours: 30
Form of classes – Classes		Number of hours
Cl1	introduction Presentation of the scope of the exercise, the conditions for receiving credit, rules for the tasks detailed discussion of the subject individual meetings.	2
Cl2	Example of the order shipping in maritime transport. Issue 1. Solving the scope of the order forwarding in maritime transport. Simulation of real events. Individual preparation and service orders shipping in maritime transport.	2
Cl3	Example forwarding execution in rail transport. Issue 1. Solving the scope of the order freight rail transport. Simulation of real events. Individual preparation and service orders shipping in rail transport.	2
Cl4	Example forwarding execution in road transport. Issue 1. Solving the scope of the order freight road transport. Simulation of real events. Individual preparation and service orders shipping in road transport.	2
Cl5	Example of the order forwarding air transport. Issue 1. Solving the scope of the order forwarding air transport. Simulation of real events. Individual preparation and service orders shipping in air transport.	2
Cl6	Example of the order shipping in intermodal transport. Issue 1. Solving the scope of the order shipping in intermodal transport. Simulation of real events. Individual preparation and service orders shipping in intermodal transport.	2

Cl7	Example forwarding execution in the transport of dangerous goods and special. Issue 1. A solution for shipping in the transport of dangerous goods and special. Individual preparation and service orders shipping in the transport of dangerous goods and special.	2
Cl8	A course Final test	1
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. case study
N3. problem exercises
N4. tutorials

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_W02	Final test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Classes)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01	Evaluation of the work in the classroom and final test
F2	PEK_K01	Evaluation of commitment / workload in the tasks of team
P = 0,8*F1+0,2*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Januła, Eugeniusz. Spedycja, 2011
2. Marciniak-Neider, Danuta, Neider Janusz, Podręcznik Spedytora z podtytułem TRANSPORT SPEDYCJA LOGISTYKA, PISiL, 2012

SECONDARY LITERATURE

1. Ficoń, Krzysztof Logistyka morska : statki, porty, spedycja, 2010
2. Kacperczyk, Radosław. Transport i spedycja : podręcznik dla uczniów technikum i szkoły policealnej. Cz. 2, Spedycja, 2010
3. Kacperczyk, Radosław. Transport i spedycja : podręcznik dla uczniów technikum i szkoły policealnej. Cz. 1, Transport, 2010
4. Współczesne wyzwania transportu w logistyce, 2008
5. Sikorski, Piotr M. Spedycja w praktyce - wiek XXI, 2008
6. Transport i spedycja : podręcznik do kształcenia w zawodzie technik logistyk , 2008
7. Transport i spedycja : podręcznik do kształcenia w zawodzie technik logistyk , 2007
8. Sikorski, Piotr M. Spedycja w praktyce, 2006

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Freight forwarding
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01, PEK_W02	K1TR_TT_W03, K1TR_W06, K1TR_W08, K1TR_W13	C1, C2	Wy1 - W15	N1, N4
PEK_U01	K1TR_TT_U02, K1TR_TT_U03, K1TR_U11, K1TR_U12, K1TR_U19	C1, C2	Ćw1 - Ćw7	N2, N3, N4
PEK_K01	K1TR_K02, K1TR_K03	C3	Ćw1 - Ćw7	N2, N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Systemy przeładunku**
Name in English: **Transshipment systems**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031205**
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
Group of courses					
Number of ECTS points	1				2
including number of ECTS points for practical (P) classes					2
including number of ECTS points for direct teacher-student contact (BK) classes	0.6				1.4

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of physics, in terms of kinematics, statics and dynamics at high school level
2. Ability to read drawings and diagrams used in the representation of short-distance (handling) transport systems devices, and schematics of simple structures systems containing these devices
3. Ability to use tools for creating multimedia presentations

SUBJECT OBJECTIVES

C1. Knowledge of the types of structures, parameters and fundamental elements of bulk material handling and compact cargo systems; knowledge of the principles of their operation and control, knowledge of the selection of elements (handling devices) for these systems
C2. Acquisition of basic skills of identification of structures, analytical description plus calculation of basic technical and operational characteristics of transshipment systems and their components (material handling devices - MHD) to ensure implementation of specified flow of materials and loads
C3. Awareness of the interrelationship between sizes and types of transshipment structures together with the technical characteristics of their components (MHD) plus operating (capabilities) and technical (energy efficiency considerations) characteristics of these systems

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Know the basic structure, parameters, principles of operation and control, as well as the basic elements of bulk materials and compact cargo transshipment systems

PEK_W02 - Has knowledge of the selection principles for the elements of cyclic work (cranes), continuous operation (conveyors), and mixed mode (mobile working machines), operating in specified material flows and cargo handling systems

II. Relating to skills:

PEK_U01 - Able to identify the structure and basic parameters of bulk materials and compact cargo shipment systems; can create schematics of these structures.

PEK_U02 - Can computationally determine the basic technical parameters of transshipment systems and their components (cranes and conveyors) to ensure realisation of specified flow of materials and loads

III. Relating to social competences:

PEK_K01 - Is aware of the relationship between sizes and types of the transshipment systems structures, and technical characteristics of their components (MHD), and operating (capabilities) and technical (energy efficiency considerations) characteristics of these systems

PEK_K02 - Recognizes the relationships between adequate knowledge of mathematics and mechanics used in the relevant areas, to identify and analyze the transshipment systems

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Basic concepts, review and classification of transshipment systems; types of structures. Factors influencing efficiency of continuous, cyclic, and mixed mode operation transshipment systems	2
Lec2	The basic elements of the transshipment system for cyclic operation (cranes); classification according to the design features, intended use, and intensity of operation; general selection criteria	2
Lec3	Basic technical parameters and factors determining the transshipment efficiency of cranes. General rules for the control of cranes, and selected topics on their automation	2
Lec4	Basic elements of continuous work handling systems (conveyors), classification according to design features and intended use, general selection criteria	2
Lec5	Basic technical parameters and factors determining the transhipment efficiency of conveyors. General principles of control and selected topics on conveyor automation	2
Lec6	Basic elements of the handling systems for mixed operation (mobile working machines); classification according to design features and intended use	2
Lec7	Basic technical parameters and factors determining the transshipment efficiency of mobile working machines. General rules for the control, and selected topics concerning automation of these machines	2
Lec8	Selected topics in automation handling systems	1
		Total hours: 15
Form of classes – Seminar		Number of hours

Sem1	Examples of solutions for handling systems differing in: size, location, logistical structure, degree of automation, type of loads and materials, capacity, and installed power	2
Sem2	Examples of solutions for cyclic work handling structures, degree of automation, capacities, types of handling equipment appropriate to types of loads and materials	2
Sem3	Examples of parts of handling systems operating in a cyclic mode (cranes); basic design features, technical and operational parameters; degree of automation	2
Sem4	Examples of solutions for a continuous work handling system of a given structure, degree of automation, capacities, types of handling equipment appropriate to the type of loads and materials	2
Sem5	Examples of parts of handling systems operating continuously (conveyors); basic design features, technical and operational parameters; degree of automation	2
Sem6	Examples of solutions to the mixed handling systems of a given structure, degree of automation, capacities, and types of handling equipment appropriate to the type of loads and materials	2
Sem7	Examples of parts of handling systems operating in a mixed mode (mobile working machines); basic design features, technical and operational characteristics; degree of automation	2
Sem8	Examples of fully automated handling systems	1
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. tutorials
N3. self study - self studies and preparation for examination
N4. multimedia presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01, PEK_K02	Test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)

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	Mark of paper and its presentation
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Korzeń Z. - Logistic systems of handling and storage. Vol.1. ILM Poznań 1998
[2] Mindur L.Contemporary technologies of transport. Publ. Radom TU 2002

SECONDARY LITERATURE

[1] Piątkiewicz A., Sobolski R. – Cranes. WNT Warsow 1977
[2] Goździecki M., Świątkiewicz H. – Conveyors. WNT Warsow 1978
[5] Catalogues of unified components of cranes and conveyors offered by firms: FAMAK, DEMAG, ABUS, KONE CRANES, AUMUND

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Transshipment systems
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W10	C1	Lec1	N1, N2, N3
PEK_W02	K1TR_W10	C1	Lec2 to Lec8	N1, N2, N3
PEK_U01	K1TR_U18	C2	Sem1, Sem2, Sem4, Sem6	N2, N3, N4
PEK_U02	K1TR_U18	C2	Sem3, Sem5, Sem7	N2, N3, N4
PEK_K01, PEK_K02	K1TR_K04	C3	Lec1 to Lec8, Sem1 to Sem8	N1, N2, N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **CAL**
Name in English: **Computer aided logistics**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031206**
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	
Group of courses					
Number of ECTS points				2	
including number of ECTS points for practical (P) classes				2	
including number of ECTS points for direct teacher-student contact (BK) classes				1.4	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of management, design and analysis of transport and logistics processes/systems.
2. Basic knowledge of spreadsheet (eg. Excel).

SUBJECT OBJECTIVES

C1. The course aims to introduce students to the subject of integrated systems supporting enterprise management, in case of logistics and transport support. Presentation of basic terms related to computer systems, their classification and rules for the selection, implementation and operation.
C2. Presentation of the principles of electronic data interchange (EDI) in the logistics chain, its use in the cargo transport.
C3. Presentation and provide knowledge on the use of computer simulation to solve problems in the area of logistics interests.
C4. The introduction to the subject of information systems and other tools used to managing a warehouse, a shipping and transport company
C5. Teaching work in a group in the implementation of selected projects

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

PEK_U01 - The student is able to use computer tools for analysis, rating and improvement existing technologies in the area of the enterprises in the TSL.

PEK_U02 - The student is able to perform the model of logistics process using the tools to develop a computer simulation (Flexsim Software).

III. Relating to social competences:

PEK_K01 - The student is able to work in a group, organize and plan the way to perform work, can take different roles and functions.

PROGRAMME CONTENT

Form of classes – Project		Number of hours
Proj1	Introduction and presentation of methods for solving common logistics and transportation tasks using spreadsheet and other computer tools 1/3 Issue 1: ABC/XYZ Analysis	2
Proj2	Introduction and presentation of methods for solving common logistics and transportation tasks using spreadsheet and other computer tools 2/3 Issue 1: Demand forecasting methods Issue 2: Solving problems in the area of maintaining inventories and planning the distribution process.	2
Proj3	Introduction and presentation of methods for solving common logistics and transportation tasks using spreadsheet and other computer tools. Presentation of the principles of electronic data interchange (EDI) in the logistics chain and its use in the transport of cargo. 3/3 Issue 1: Mapping of selected logistics and transport processes using BPMN, practical exercises Issue 2: Electronic Data Interchange (EDI) in the logistics chain, its use in the transport of cargo.	2
Proj4	Logistics and transportation problems solving, using tools for computer simulations (Flexsim Software) 1/11 Issue 1: An introduction to the Flexsim Software, object-oriented modeling.	2
Proj5	Logistics and transportation problems solving, using tools for computer simulations (Flexsim Software) 2/11 Issue 1: Programming the basic logic functions, global tables and labels.	2
Proj6	Logistics and transportation problems solving, using tools for computer simulations (Flexsim Software) 3/11 Issue 1: Programming the kinematics of objects.	2
Proj7	Logistics and transportation problems solving, using tools for computer simulations (Flexsim Software) 4/11 Issue 1: Development of the simulation model of the logistics process (eg. warehouse inventory management process, container terminal).	2

Proj8	Logistics and transportation problems solving, using tools for computer simulations (Flexsim Software) 5/11 Issue 1: Development of the simulation model of the logistics process (eg. warehouse inventory management process, container terminal).	2
Proj9	Logistics and transportation problems solving, using tools for computer simulations (Flexsim Software) 6/11 Issue 1: Development of the simulation model of the logistics process (eg. warehouse inventory management process, container terminal).	2
Proj10	Logistics and transportation problems solving, using tools for computer simulations (Flexsim Software) 7/11 Issue 1: Development of the simulation model of the logistics process (eg. warehouse inventory management process, container terminal).	2
Proj11	Logistics and transportation problems solving, using tools for computer simulations (Flexsim Software) 8/11 Issue 1: Sensitivity analysis of the model.	2
Proj12	Logistics and transportation problems solving, using tools for computer simulations (Flexsim Software) 9/11 Issue 1: Sensitivity analysis of the model.	2
Proj13	Logistics and transportation problems solving, using tools for computer simulations (Flexsim Software) 10/11 Issue 1: Interpretation of the results, decision, solution to the problem.	2
Proj14	Logistics and transportation problems solving, using tools for computer simulations (Flexsim Software) 11/11 Issue 1: Interpretation of the results, decision, solution to the problem.	2
Proj15	Examination of the subject	2
		Total hours: 30

TEACHING TOOLS USED

N1. case study
N2. problem exercises
N3. self study - preparation for project class
N4. project presentation
N5. tutorials

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01-PEK_U03	Examination of the subject
F2	PEK_U01	Rating of exercises carried out during the course
F3	PEK_U02	Rating of the project
F4	PEK_K01	Rating of involvement in the implementation of group tasks

P = 0,3*F1+0,2*F2+0,4*F3+0,1*F4

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Klonowski Z.J.: Systemy informatyczne zarządzania przedsiębiorstwem. Modele rozwoju i właściwości funkcjonalne. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2004.
2. Piotr Adamczewski; Zintegrowane systemy informatyczne w praktyce. Wyd. Mikom, Warszawa 2004

SECONDARY LITERATURE

1. Wojtochnik R., Elektroniczna wymiana dokumentów. Handel, usługi, logistyka, finanse, wyd. MIKOM, W-wa, 2004
2. Majewski J.: Informatyka dla logistyki. Wyd. ILiM, Poznań 2002

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Computer aided logistics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U01-PEK_U02	K1TR_U07	C1, C2, C4		N1 - N5
PEK_K01	K1TR_K03	C5		N1 - N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Ekonomika transportu towarowego**
Name in English: **Economics of freight transport**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031207**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			15	
Number of hours of total student workload (CNPS)	60			30	
Form of crediting	Examination			Crediting with grade	
Group of courses					
Number of ECTS points	2			1	
including number of ECTS points for practical (P) classes				1	
including number of ECTS points for direct teacher-student contact (BK) classes	1.2			0.7	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Transport systems
2. Modes of transport

SUBJECT OBJECTIVES

C1. Acquisition of knowledge in the area of economic importance and functions of transport. Classification, transportation and the location of production and settlements, labor productivity.
C2. Acquisition of knowledge about the costs and structure of economic calculation in transport. Streams of cargo, actors household, competition, pricing services, construction tariffs.
C3. Knowledge of the transport policy, the impact of transport on the balance of payments. Economics and organization of the intermodal transport

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - It has a basic knowledge of analysis and assessment of the cost of freight transport
PEK_W02 - Is able to analyze and calculate the cost of freight transport
PEK_W03 - Able to prepare an action plan freight transport company

II. Relating to skills:
PEK_U01 - He can comprehensively plan the flow of goods in urban areas
PEK_U02 - Able to analyze the costs of the company
PEK_U03 - Able to analyze the market for freight transport

III. Relating to social competences:
PEK_K01 - Able to interact and work in a group, taking in the various organizational roles for functions in manufacturing companies and service companies.
PEK_K02 - Able to thinking and act in a creative and enterprising

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Transport services-types, definitions, classifications.	2
Lec2	Distribution of goods into groups and analyze their transportability.	2
Lec3	Zasady dobory wykonawcy usługi transportowej. Równowaga na rynku usług transportowych	2
Lec4	Intake and demand. Factors affecting intake.	2
Lec5	The costs of transport activities their own costs and external; fixed costs, half-variables and variables.	2
Lec6	Indicators of the transport system.	2
Lec7	Controlling the transport company by margin analysis covering the costs.	2
Lec8	Registry costs and economic balance. Systems tariff and prices of transport services	2
Lec9	Investment in infrastructure -Assessing by. present value, internal rate of return like.	2
Lec10	Investments in means of transport - vehicle life cycle cost LCC.	2
Lec11	Estimating the external costs of transport. The costs of congestion and shaping their optimal level	2
Lec12	Determining prices of transport services	2
Lec13	The choice of means of transport	2
Lec14	The history and basis of the organization of intermodal transport	2
Lec15	Concluding	2
		Total hours: 30
Form of classes – Project		Number of hours
Proj1	Investment in road infrastructure, the designation payback time and money for the ride	2

Proj2	Investment in rail infrastructure, setting payback time and money for the ride	2
Proj3	The costs of transport company, working hours and wages of drivers on the example	2
Proj4	Calculating the cost of a simple transport tasks	2
Proj5	The calculation of the cost of the transport network, Task of Salesman	2
Proj6	The project orders foreign trip	2
Proj7	Preparing and supervising the process of traveling abroad	2
Proj8	Concluding	1
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. case study
N3. informative lecture

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01-PEK_W03	exam
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

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_U03, PEK_K01, PEK_K02	credit with a grade
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1.Rydzkowski Włodzimierz, Wojewódzka- Król Krystyna (red). Transport, Wydawnictwo Naukowe PWN,
2.Dembińska- Cyran Izabela, Gubała Marek: Podstawy zarządzania transportem w przykładach, Instytut Logistyki i Magazynowania , Poznań , 2005
3.Romanow Paweł: Zarządzanie transportem przedsiębiorstw przemysłowych, WSL, Poznań 2003,
4.Jakowski Stefan: Opakowania transportowe Poradnik. WNT, 2007;
5.Górski W. Mendyk E.: Prawo transportu lądowego. WKiŁ, 2005;
7. Izabela Dembińska-Cyran, Marek Gubała: Podstawy zarządzania transportem w przykładach. Wydawnictwo: Instytut Logistyki i Magazynowania, 2005

SECONDARY LITERATURE

Magazins: Logistyka, Samochody specjalne, Trailer

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Economics of freight transport
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01 - PEK_W03	K1TR_TT_W01, K1TR_TT_W02, K1TR_TT_W03, K1TR_W14	C1.	lect1-Lect15	N1 -N3
PEK_U01 - PEK_U03	K1TR_TT_U01, K1TR_TT_U02, K1TR_TT_U03, K1TR_U09, K1TR_U10	C1, C3	proj1-proj8	N1-N3
PEK_K01 - PEK_K02	K1TR_K05, K1TR_K09	C1, C2, C3	Lect12-lect17, proj6, lect14-Lect15, proj7-proj8	N1-N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Prawo transportowe - transport towarowy**
Name in English: **transportation law - freight transport**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031208**
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)	30				
Form of crediting	Crediting with grade				
Group of courses					
Number of ECTS points	1				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	0.6				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture	Number of hours

Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		2
Lec9		2
Lec10		2
Lec11		2
Lec12		2
Lec13		2
Lec14		2
Lec15		2
		Total hours: 30

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. problem discussion

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01, PEK_K02	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
transportation law - freight transport
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W08	C1, C2, C3		N1, N2
PEK_K01	K1TR_K02	C1, C2, C3		N1, N2
PEK_K02	K1TR_K09	C1, C2, C3		N1, N2
PEK_W02	K1TR_W08	C1, C2, C3		N1, N2

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Ładunkoznawstwo**
Name in English: **Study on freights**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031209**
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)	90				60
Form of crediting	Examination				Crediting with grade
Group of courses					
Number of ECTS points	3				2
including number of ECTS points for practical (P) classes					2
including number of ECTS points for direct teacher-student contact (BK) classes	1.8				1.4

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		2
Lec9		2
Lec10		2
Lec11		2
Lec12		2
Lec13		2
Lec14		2
Lec15		2
		Total hours: 30
Form of classes – Seminar		Number of hours
Sem1		2
Sem2		2
Sem3		2
Sem4		2
Sem5		2
Sem6		2
Sem7		2
Sem8		1
		Total hours: 15

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. problem discussion
N3. multimedia presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_W02	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)

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	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Study on freights
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W07	C1, C2, C3		N1
PEK_W02	K1TR_W14	C1, C2, C3		N1
PEK_U01	K1TR_U10	C1, C2, C3		N2, N3
PEK_U02	K1TR_U11	C3		N2, N3
PEK_K01	K1TR_K09	C1, C2, C3		N2

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Proseminarium dyplomowe**
Name in English: **Diploma Thesis Seminar**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031210**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					15
Number of hours of total student workload (CNPS)					30
Form of crediting					Crediting with grade
Group of courses					
Number of ECTS points					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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of problems dealing with subject of final project.

SUBJECT OBJECTIVES

C1. Attain of ability of problem recognition and formulation of the task to solve.
C2. Attain of ability of sources and bibliography collecting to prepare compact text of problem solving using methods learned during study.
C3. Attain of ability of public presentation of achievements.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

PEK_U01 - Student should know how to edit writing work with steps of solving given problem.

III. Relating to social competences:

PEK_K01 - Easiness of interpersonal communication.

PROGRAMME CONTENT

Form of classes – Seminar		Number of hours
Sem1	Description of the way of final project preparation. Origin of the subject, contents: state of art, problem, solution, summery, literature.	1
Sem2	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 1-4.	2
Sem3	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 5-10.	2
Sem4	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 11-15.	2
Sem5	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 16-20.	2
Sem6	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 21-25.	2
Sem7	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 26-30.	2
Sem8	Final project presentation: assumptions, aim and scope with justifying and sources of knowledge and data. Subjects of students according to list 16-30.	2
		Total hours: 15

TEACHING TOOLS USED

N1. self study - preparation for project class

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement

F1	PEK_U01, PEK_K01	assessment of final project progress
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE
Poradnik inżyniera mechanika.

SECONDARY LITERATURE
http://www.wm.pwr.wroc.pl/88428.dhtml

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Diploma Thesis Seminar
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U01, PEK_K01	K1TR_K04, K1TR_U01, K1TR_U04, K1TR_U07	C1, C2, C3	Se2-Se8	N1

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Certyfikat kompetencji zawodowych - przewóz rzeczy**
Name in English: **The certificate of professional driver competences freight transport**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031211**
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				
Group of courses					
Number of ECTS points	2				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture	Number of hours

Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		2
Lec9		2
Lec10		2
Lec11		2
Lec12		2
Lec13		2
Lec14		2
Lec15		2
		Total hours: 30

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. case study

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01, PEK_K02, PEK_K03	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
The certificate of professional driver competences freight transport
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01, PEK_W02, PEK_W03	K1TR_W08, K1TR_W21	C1, C2, C3		N1, N2
PEK_K01, PEK_K02, PEK_K03	K1TR_K01, K1TR_K05, K1TR_K08	C1, C2, C3		N1, N2

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Niekonwencjonalne systemy transportu towarów**
Name in English: **Unconvencial goods transport systems**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031213**
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
Group of courses					
Number of ECTS points					2
including number of ECTS points for practical (P) classes					2
including number of ECTS points for direct teacher-student contact (BK) classes					1.4

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of the issues presented in the course "History of Transportation", "transport systems" and "Transportation in the cities."
2. Ability to prepare presentation and editing in writing papers on transport systems.
3. no prerequisites for competence

SUBJECT OBJECTIVES

C1. Get to know the unconventional freight systems - advantages, disadvantages and scope of each solution.
C2. Familiar with the problem of social responsibility for the implementation of specific transportation solutions. Acquiring the ability to present the proposed solutions in a manner understandable to the public.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

PEK_U01 - As a result of the course the student is able to analyze the impact of the operation of transport systems on social behavior and evaluate the usefulness of a particular system to be implemented in concrete terms.

III. Relating to social competences:

PEK_K01 - As part of the course the student acquires skills in presenting to the public the advantages and disadvantages and the effects of the implementation of specific solutions in the field of transport.

PROGRAMME CONTENT

Form of classes – Seminar		Number of hours
Sem1	Introductory classes, discussion of the issues, the division of topics	2
Sem2	Freight ropeway (cable cars, funicular rail)	2
Sem3	Rail mounted and rack (rail mounted symmetrically and asymmetrically, railways gear)	2
Sem4	Monorails (railways unit, gyro)	2
Sem5	Railways air (atmospheric railway, railway tubular pneumatic post)	2
Sem6	Railways cushion	2
Sem7	Unconventional systems on inland waterways - ramps and other	2
Sem8	Unconventional ways of transporting goods by air - (balloons, airships)	2
Sem9	Unconventional systems freight airport - (highloader, container and pallet transporters air)	2
Sem10	Airport transport systems - (double drum belt conveyors, circular - Rotary, etc.)	2
Sem11	Storage systems change in the direction of the airport shuttle - (Vertisorter, Vertibelt, Diverter, Reverse sorter)	2
Sem12	Purpose and conditions of use of non-conventional systems - network	2
Sem13	Purpose and conditions of use of non-conventional systems - point	2
Sem14	Purpose and conditions of use of non-conventional systems - linear	2
Sem15	The directions of the future development of non-conventional systems - final discussion	2
		Total hours: 30

TEACHING TOOLS USED

N1. multimedia presentation
N2. report preparation
N3. problem discussion

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_K01	preparation of oral and multimedia presentation on a selected topic
F2	PEK_U01, PEK_K01	prepare to discuss the problem in the form of a written report
F3	PEK_U01, PEK_K01	assessment of active participation in discussions on the analyzed topics
P = 0,33*F1+0,33*F2+0,34*F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Schneigert Z.: Koleje niekonwencjonalne. WKŁ Warszawa 1971[2] Bahke E.: Systemy transportowe dziś i jutro. WKŁ Warszawa 1977

SECONDARY LITERATURE

[3] miesięcznik Świat Kolei[4] miesięcznik Technika Transportu Szynowego[5] miesięcznik Autobusy - Technika, Eksploatacja, Systemy Transportowe

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Unconvencial goods transport systems
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_K01	K1TR_K06, K1TR_K08	C2	Se1-Se15	N1,N2,N3
PEK_U01	K1TR_U01, K1TR_U16, K1TR_U20	C2	Se1-Se15	N1,N2,N3

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Procesy transportu towarowego**
Name in English: **Freight transport processes**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031214**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30			15	
Number of hours of total student workload (CNPS)	60			30	
Form of crediting	Crediting with grade			Crediting with grade	
Group of courses					
Number of ECTS points	2			1	
including number of ECTS points for practical (P) classes				1	
including number of ECTS points for direct teacher-student contact (BK) classes	1.2			0.7	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Znajomość zagadnień przedstawianych w ramach kursów "Środki transportu", "Infrastruktura transportu", "Teoria ruchu pojazdów", "Podstawy inżynierii ruchu", "Ekonomika transportu towarowego"
2. The ability to use optimization methods presented in the course "Operations Research".
3. no requirements for the competence

SUBJECT OBJECTIVES

C1. Purchase of goods for process design skills using appropriate methods and algorithms.
C2. Knowledge of methods of assessment and analysis of freight transport processes.
C3. Familiar with the principles of minimizing the impact of noise on the implementation of the freight transport processes.
C4. Achieving an ability to select the vehicle to transport task.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Following the course, the student should be able to describe the issues related to the design and implementation of transport processes in relation to the carriage of goods.
PEK_W02 - As a result of the course the student has knowledge and is able to propose suitable metrics to define the basic quantities characterizing the transport processes in the transport of goods.

II. Relating to skills:
PEK_U01 - Following the course, the student should be able to choose the characteristics of the vehicle to the needs of the constructed transport offer (goods).
PEK_U02 - As a result of the course the student will be able to design the transportation process.

III. Relating to social competences:
PEK_K01 - As part of the course the student acquires knowledge of legal implications of the creation of engineering studies at the tender specification.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Determining the travel time (choice of traction to the transport task, the method for determining the driving time: measurements, calculations, projections, sales and technical stops in different transport systems, technical intervals).	3
Lec2	Construction schedules (tabular timetable and traffic chart; construction traffic graph; auxiliary graphs busy infrastructure services schedule, reducing working time circuit diagram RS). Order an ad-hoc basis.	3
Lec3	Organization of cargo handling (call direct - and indirect p2p - Hub & Spoke, expected confidence interchange; types of transfers; efficiency hubs).	3
Lec4	The implementation of the transport of goods. Cyclic schedules (lots) of vehicles (airplanes) stores. The cyclic schedule and ad hoc connection. Adapting to the needs of the transport infrastructure.	3
Lec5	Disruption to traffic (traffic congestion, disruption to rail and air, noise propagation analysis, methods to prevent interference, dispatching; compensation for principal).	3
Lec6	Parametric analysis of the processes of freight (cargo characteristics, measurement and quality analysis, analysis of business dyspozytury, short-and long-term forecasting of demand).	3
Lec7	Reminder messages graphs (graph and its elements, directed and undirected graphs, cost and bandwidth nodes and branches, basic graph algorithms: shortest path, minimum spanning tree, maximum throughput).	3
Lec8	Graph algorithms for practical applications (search for connections in freight transport, traveling salesman problem, the use of classical algorithms and their adaptation to the actual limit).	3
Lec9	Transport process model (model grafowy elements of the process, modeling critical paths, Petri nets, simulation models).	3
Lec10	Final test	3
		Total hours: 30

Form of classes – Project		Number of hours
Proj1	Introduction to classes. Inventory Organizer transport requirements and the needs of shipping companies.	3
Proj2	Designing routes for using graph-algorithms.	3
Proj3	Designing traffic chart (technical assumptions, assumptions commercial, conflict of access to infrastructure).	3
Proj4	Chart analysis of traffic due to the additional conditions (constraints at work, transport circuits, the organization handling).	3
Proj5	Class Settlement (show measurement results, discussion of results).	3
		Total hours: 15

TEACHING TOOLS USED

N1. self study - preparation for project class
N2. case study
N3. problem discussion
N4. report preparation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_W01, PEK_W02	test
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Project)

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	Average ratings of the various stages of the project
F2	PEK_U01, PEK_U02, PEK_K01	activity in the discussion during the project
P = 0,8*F1+0,2*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Marcinkowski J.: Systemy transportowe. Środki transportu. Politechnika Wrocławska, Wrocław 1988.
[2] Tarski I.: Czynnik czasu w procesie transportowym. WKŁ, Warszawa 1976.
[3] Neider J.: Transport międzynarodowy. PWE Polskie Wydawnictwo Ekonomiczne, 2011.
[4] Kacperczyk R.: Transport i spedycja. Transport. Część 1. Difin Centrum Doradztwa i Informacji, 2009.

SECONDARY LITERATURE

[5] Korzan B.: Elementy teorii grafów i sieci. Metody i zastosowania. WNT, Warszawa 1978.
[6] Malarski M.: Inżynieria ruchu lotniczego. Oficyna Wydawnicza Politechniki Warszawskiej, 2006.
[7] Komar Z., Wolek Cz.: Inżynieria ruchu drogowego. Wybrane zagadnienia. Politechnika Wrocławska, Wrocław 1994.
[8] Cormen T. H., Leiserson Ch. E., Rivest R. L.: Wprowadzenie do algorytmów. WNT, Warszawa 1997 i in.
[9] Sysło M. M., Deo N., Kowalik J. S.: Algorytmy optymalizacji dyskretnej. PWN, Warszawa 1995.
[10] Wyrzykowski W.: Ruch kolejowy (tom I - ruch pociągów). WKŁ, Warszawa 1966.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Freight transport processes
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W10	C1, C3	Wy1-Wy9	N1
PEK_W02	K1TR_W12	C2	Wy4, Wy5, Wy8, Wy9	N1
PEK_U01	K1TR_TT_U01, K1TR_U12	C1, C4	Pr1-Pr5	N2-N5
PEK_K01	K1TR_K02, K1TR_K09	C4	Pr1-Pr5	N3, N4
PEK_U02	K1TR_TT_U02, K1TR_TT_U03, K1TR_U08	C1, C2, C3	Pr1-Pr5	N2-N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Bezpieczeństwo transportu towarowego**
Name in English: **Freight Transport Security**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031215**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		15		
Number of hours of total student workload (CNPS)	60		30		
Form of crediting	Crediting with grade		Crediting with grade		
Group of courses					
Number of ECTS points	2		1		
including number of ECTS points for practical (P) classes			1		
including number of ECTS points for direct teacher-student contact (BK) classes	1.2		0.7		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Basic knowledge of the traffic engineering of automotive vehicles
2. Knowledge of transport infrastructure
3. Basics of designing of means of transport

SUBJECT OBJECTIVES

C1. To acquaint the participants with factors affecting safety goods transport and materials handling safety
C2. Understanding the basic knowledge of the transport of goods and materials handling
C3. To acquaint the participants with the basic concepts of rescue system in land transport

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - He has knowledge about the factors affecting on safety freight transport
PEK_W02 - Has knowledge of traffic engineering, control and management of transport systems
PEK_W03 - He has knowledge of developments in freight transport systems

II. Relating to skills:

PEK_U01 - Can obtain information from literature, databases, engineering standards and other sources, can integrate the information, make their interpretation, and draw conclusions
PEK_U02 - Can make a critical analysis of means and transportation systems due to the criteria

III. Relating to social competences:

PEK_K01 - Student is aware of the legal action taken as an engineer
PEK_K02 - Is aware of the importance, responsibility and impact of activities in the transport engineerin

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Classification of freight by different institutions. Hazard analysis on the transported freight. The forces acting on freight in different situations. Protection of freight and the methods of protection used in the road and rail transport	2
Lec2	The forces acting on the vessel under the influence of waves, the principle of loading because of the stability, the rules ballast of ships, protection of containers and other cargo and vehicles on vessels	2
Lec3	The dangerous cargo, hazard, designation, rules for transporting of hazardous materials by road (ADR) and rail (RID, SMGS Appendix No. 2)	2
Lec4	Rules of safe transport of inland waterway transport (ADN), The conventions and international regulations (IMDG, etc.). Rules for safe transport of by air (ICAO)	2
Lec5	Engineering solutions and equipment of road vehicles influencing an increase of safety during the transport of goods and people, the statistics of road accidents and their causes. Actions to increase the safety of transport on the road.	2
Lec6	Passive safety of materials handling. The basic requirements of European standards (EN) and international (ISO) and Office of Technical Inspection (UDT) in the design, manufacture and operation materials handling (UTB) Examples of safe design solutions UTB	2
Lec7	The organization and system evaluation of emergency in road transport in Poland	2
Lec8	Active safety handling. The basic requirements of standards and regulations UDT in the operation and construction safety equipment UTB. Basic safety equipment UTB - general construction diagrams. Examples of design solutions UTB	2
Lec9	The calculation of the forces acting on the vehicle and the freights in different situations: acceleration, braking, ride the curve of the road, wheel slip.	2

Lec10	The forces acting on rail vehicle and the freights in different situations: braking, collision. Protection, road safety on the curved track, critical velocity of traffic	2
Lec11	Rules of rational selection of protective measures in road transport freight. Friction as a factor that contributes to the safety of cargo protection	2
Lec12	Cargo carrying capacity, stability (center of gravity, the curve of righting lever, stability criterion by the PRS or IMO)	2
Lec13	Rules for selection of isothermally and refrigerating means of transport. The safety of perishable freight	2
Lec14	Analysis of transport possibilities containers for the specified part of the inland waterway (the number of containers, weight, number of layers)	2
Lec15	Description of the procedure in the event of a dangerous situation in land transport and analysis of hazards during transportation of hazardous materials	2
		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1	The test of the brake system. Effect of weight distribution on the braking process	2
Lab2	The test of chassis frame and the geometry of the vehicles. Criteria for assessment the geometry of the chassis vehicles	2
Lab3	Test and identification of road wheels vehicle. Determination of vehicle traction performance	2
Lab4	Evaluation of electromechanical and strain gauge type capacity limiter of the overhead traveling crane	2
Lab5	Evaluation of laser protection system lever against railway collision	2
Lab6	Evaluation of electronic protection system of handling machine against loss of stability	2
Lab7	Analysis of vehicle load and method of loading the goods	2
Lab8	Stability test of vehicle for the transport of goods during the curvilinear motion	2
		Total hours: 16

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. laboratory experiment
N3. self study - preparation for laboratory class

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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	final test

P = F1

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01,PEK_U02	short test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Przepisy instytucji klasyfikacyjnych PRS, IMO, Przepisy Reńskie.
[2] Jóźwiak Z., Kierzkowski A., Kulczyk J., Kwaśniowski S.: Transport ładunków nie-bezpiecznych. Seria Navigator nr 23. Ofic. Wyd. Pol. Wroc. Wrocław 2012 (w przy-gotowaniu).
[3]Jerzy Wicher, „Bezpieczeństwo samochodów i ruchu drogowego", Wydawnictw Ko-munikacji i Łączności, Warszawa 2001
[4] Grabowski E. – Artykuły nt. metod i technik ograniczania zukosowania dźwignic to-rowych w kwartalniku „Transport Przemysłowy" w latach 2001-2002
[5] Norma EN 13001-1:2007 – Bezpieczeństwo dźwignic. Ogólne zasady projektowania. Część 1 – Postanowienia ogólne i wymagania
[6] P.A. Wrzecioniarz, W. Ambroszko, A. Górniak - Energy Efficient design of powertrain and body, PWr, 2011

SECONDARY LITERATURE

[1] Grzegorczyk K, Buchcar R.; Towary niebezpieczne Transport w praktyce. Wyd.ADeR Błonie 2009
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Freight Transport Security
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01,PEK_W02, PEK_W03	K1TR_TT_W01, K1TR_TT_W02, K1TR_TT_W03	C1, C2, C3	Lec1-Lec15	N1
PEK_U01,PEK_U02	K1TR_U01, K1TR_U10	C1, C2, C3	Lab1-Lab8	N2, N3
PEK_K01,PEK_K02	K1TR_K02, K1TR_K09	C1, C2, C3	Lec1-Lec15, Lab1-Lab8	N1, N2, N3

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Ubezpieczenia transportowe**
Name in English: **Transport insurance**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031216**
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
Group of courses					
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	0.6				0.1

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		1
		Total hours: 15
Form of classes – Seminar		Number of hours
Sem1		2
Sem2		2
Sem3		2
Sem4		2
Sem5		2
Sem6		2
Sem7		2
Sem8		1
		Total hours: 15

TEACHING TOOLS USED

N1. problem lecture
N2. case study
N3. problem discussion

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01 PEK_K02	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)		
Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01	
F2	PEK_U02	
F3	PEK_U03	
F4	PEK_K03	
P = F1/4+F2/4+F3/4+F4/4		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Transport insurance
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01-PEK_W03	K1TR_TT_W01, K1TR_TT_W03, K1TR_W17	C1		N1
PEK_U01-PEK_W03	K1TR_U01, K1TR_U06, K1TR_U07, K1TR_U16, K1TR_U17, K1TR_U20, K1TR_U21, K1TR_U22	C3		N2 N3
PEK_K01-PEK_K03	K1TR_K02, K1TR_K03, K1TR_K04, K1TR_K05, K1TR_K09, K1TR_K10	C1		N2 N3

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Seminarium dyplomowe**
Name in English: **Diploma Seminar**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031217**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					15
Number of hours of total student workload (CNPS)					30
Form of crediting					Crediting with grade
Group of courses					
Number of ECTS points					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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Seminar		Number of hours
Sem1		1
Sem2		2
Sem3		2
Sem4		2
Sem5		2
Sem6		2
Sem7		2
Sem8		2
		Total hours: 15

TEACHING TOOLS USED

N1. multimedia presentation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Seminar)

Evaluation (F – forming (during semester), P – concluding (at semester end)	Educational effect number	Way of evaluating educational effect achievement
F1	PEK_U01, PEK_K01	
F2	PEK_U01, PEK_K01	
P = 60%*F1+40%*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Diploma Seminar
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_K01	K1TR_K08	C1		N1
PEK_U01	K1TR_U01, K1TR_U04	C2		N1

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Ekologia transportu towarowego**
Name in English: **Ecology freight**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **TRM031218**
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		
Group of courses					
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	0.6		0.7		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1		2
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		2
Lec7		2
Lec8		2
Lec9		2
Lec10		2
Lec11		2
Lec12		2
Lec13		2
Lec14		2
Lec15		2
		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1		2
Lab2		2
Lab3		2
Lab4		2
Lab5		2
Lab6		2
Lab7		2
Lab8		1
		Total hours: 15

TEACHING TOOLS USED

N1. multimedia presentation
N2. tutorials
N3. laboratory experiment
N4. self study - preparation for laboratory class
N5. report preparation

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)

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_K01-PEK_K03	
P = F1		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)		
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_U03	
F2	PEK_U01 PEK_U02 PEK_U03	
F3	PEK_U01 PEK_U02 PEK_U03	
F4	PEK_U01 PEK_U02 PEK_U03	
F5	PEK_U01 PEK_U02 PEK_U03	
F6	PEK_U01 PEK_U02 PEK_U03	
F7	PEK_U01 PEK_U02 PEK_U03	
P = (F1+F2+F3+F4+F5+F6+F7)/7		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Ecology freight
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_TT_W01, K1TR_TT_W03	C1		N1. N2.

PEK_W02	K1TR_TT_W01, K1TR_TT_W03	C2		N1. N2.
PEK_W03	K1TR_TT_W01, K1TR_TT_W03	C3		N1. N2.
PEK_U01	K1TR_U10, K1TR_U16	C1 C2		N3. N4. N5
PEK_U02	K1TR_U10, K1TR_U15	C1 C2		N3. N4. N5
PEK_U03	K1TR_U10, K1TR_U16	C1 C2 C3		N3. N4. N5
PEK_K01	K1TR_K01	C1 C2 C3		N1. N3. N5.
PEK_K02	K1TR_K02	C1 C2 C3		N1. N3. N5.
PEK_K03	K1TR_K03, K1TR_K11	C1 C2 C3		N1. N3. N5.

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **PRACA DYPLOMOWA**
Name in English: **MASTER THESIS**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRM031250**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					
Number of hours of total student workload (CNPS)					
Form of crediting					
Group of courses					
Number of ECTS points					
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes					

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

TEACHING TOOLS USED

N1. case study
N2. tutorials
N3. self study - self studies and preparation for examination

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
MASTER THESIS
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_U1, PEK_U2, PEK_U3	K1TR_U27	C1, C2, C3		N1, N2, N3
PEK_K1, PEK_K2, PEK_K3	K1TR_K01, K1TR_K06	C1, C2, C3		N1, N2, N3

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Elektrotechnika i elektronika**
Name in English: **Electechnics and electronics**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **obligatory**
Subject code: **TRR031001**
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		90		
Form of crediting	Crediting with grade		Crediting with grade		
Group of courses					
Number of ECTS points	2		3		
including number of ECTS points for practical (P) classes			3		
including number of ECTS points for direct teacher-student contact (BK) classes	1.2				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. 1.He has knowledge of mathematics and physics at the high school level
2. 2.He is aware of the work in groups
3. 3.It is aware of the need for education

SUBJECT OBJECTIVES

C1. The acquisition of basic knowledge of DC and AC current, electromagnetism, components and electronics
C2. The acquisition of research skills of the components and electrical and electronic circuits
C3. Acquiring the ability to understand, interpreted and quantitative analysis of measurement results

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - It has a basic knowledge of circuit's current and electromagnetic phenomena
PEK_W02 - He has basic knowledge in the field of components and circuits electronics
PEK_W03 - He knows the test methods of selected electrical and electronic circuits

II. Relating to skills:

PEK_U01 - He had combine selected circuits electric and electronics of the based on the instructions
PEK_U02 - Can you do your research using measuring instruments
PEK_U03 - Able to analyze the results of measurements

III. Relating to social competences:

PEK_K01 - Carry out the duties
PEK_K02 - She learns that the group work

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	The basic laws of electrical engineering. Electrical circuits DC	2
Lec2	Electromagnetic phenomena – magnetic circuits, electromagnetic induction	2
Lec3	Electrical and mechanical energy conversion, AC current, R, L, C circuits	2
Lec4	Resonant circuits, reactive power, three-phase AC	2
Lec5	Power transformers. Asynchronous and synchronous motors	2
Lec6	DC machines. Electricity distribution	2
Lec7	Electric shock protection. Partial test	2
Lec8	Passive Components, RC circuits, semiconductor diodes	2
Lec9	Bipolar and unipolar transistor, amplifier	2
Lec10	Feedback, Operational Amplifier, perfect OPAMP	2
Lec11	OPAMP - selected circuits	2
Lec12	The real OPAMP	2
Lec13	Generators – examples. Partial test	2
Lec14	Digital technology	2
Lec15	Test	2
		Total hours: 30
Form of classes – Laboratory		Number of hours
Lab1	Introduction. Health and safety	2
Lab2	Power measurement in three-phase circuits	2
Lab3	Testing of control	2
Lab4	The test three-phase transformer	2
Lab5	Reactive power compensation	2
Lab6	Research DC motor	2

Lab7	Drive system - induction motor, voltage inverter	2
Lab8	Measuring equipment, laboratory posts, health and safety	2
Lab9	The study of circuits RC	2
Lab10	Semiconductor diodes	2
Lab11	Bipolar transistor, amplifier OE	2
Lab12	Operational Amplifier	2
Lab13	Operational Amplifier - advanced circuitry	2
Lab14	Digital technology	2
Lab15	Summary course	2
		Total hours: 30

TEACHING TOOLS USED
N1. traditional lecture with the use of transparencies and slides N2. laboratory experiment N3. tutorials

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Lecture)		
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	Test
P = P		

EVALUATION OF SUBJECT EDUCATIONAL EFFECTS ACHIEVEMENT (Laboratory)		
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	The activity of the substantive
F2	PEK_U03 PEK_K01	Evaluation reports

P = 0,3F1 + 0,7F1

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Electechnics and electronics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_W01	K1TR_W04	C1	Lec1 - Lec7	N1, N3
PEK_W02	K1TR_W04	C1	Lec8 - Lec15	N1, N3
PEK_W03	K1TR_W04	C1	Lab1 - Lab15	N2
PEK_U01	K1TR_U03	C2, C3	Lab1 - Lab15	N2, N3
PEK_U02	K1TR_U03	C2, C3	Lab1 - Lab15	N2, N3
PEK_U03	K1TR_U03	C3	Lab1 - Lab15	N2
PEK_K01	K1TR_K01	C1, C2, C3	Lec1 - Lec15, Lab1 - Lab15	N1, N2, N3
PEK_K02	K1TR_K03	C1, C2, C3	Lec1 - Lec15, Lab1 - Lab15	N2, N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **BLOK ZAJĘCIA SPORTOWE**
Name in English: **Block of Sports Activities**
Main field of study (if applicable): **Transport**
Level and form of studies: **I level, full-time**
Kind of subject: **optional**
Subject code: **WFW000000BK**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					
Number of hours of total student workload (CNPS)					
Form of crediting					
Group of courses					
Number of ECTS points					
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes					

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

TEACHING TOOLS USED

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Block of Sports Activities
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Transport

Subject educational effect	Correlation between subject educational effect and educational effects defined for main field of study and specialization (if applicable)	Subject objectives	Programme content	Teaching tool number
PEK_K01	K1TR_K11	wg kart opracowanych przez SWFiS		wg kart opracowanych przez SWFiS

SUBJECT SUPERVISOR