Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Ekonomia**
Name in English: **Economics**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **EKZ000346**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
Number of hours of total student workload (CNPS)	60				
Form of crediting	Crediting with grade				
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

C1. Providing knowledge and understanding economic theory on the microeconomic and macroeconomic scale, including different economic schools.
C2. Providing knowledge of categories and economic laws as well as institutions of market economy and their functions in economic system
C3. Providing knowledge of the rules of taking optimal decisions by market subjects on different markets, including factor production markets.
C4. Providing knowledge of government functions in economy in relation to development and economic growth
C5. Providing knowledge of factors belonging to macroeconomic environment of company and engineering activity in factual knowledge and regulation contexts (dimensions) linked to conducted economic policy. Explain the impact of these factors on the economic subjects' behaviours and their choices.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - PEK_W01 know and understand fundamental economic terms, laws and economic phenomena.
PEK_W02 know conditions and economic laws to make optimal decisions by market subjects (producers and consumers).
PEK_W03 know causal relationships in economic policy and economic phenomena as well as their influence on companies' operating conditions and other economic subjects.
PEK_W04 know the factors production markets

II. Relating to skills:

III. Relating to social competences:

PEK_K01 - be able to understand the economic causations of taken management and engineering decisions.
PEK_K02 - be able to think and act in entrepreneurial way

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Economics as science. Micro- and macroeconomics. Positive and normative economics. Fundamental terms connected with economics and economy. Range, aims and research tools. Seeking economic data. Economic inference.	1
Lec2	Decision in economics: terms, types and the assumptions of rationality of action. Short and long term in economics, production possibility frontier (type of choice: "trade off") and opportunity cost, law of increasing opportunity cost, total and marginal product, the law of diminishing product. Production possibility frontier and short-run and long-run decisions. Rules of decision optimization.	1
Lec3	Types of economies	2
Lec4	The theory of customers choice.	2
Lec5	The supply theory – production theory. The choice of optimal input combination in short-run and long-run. Marginal rate of technical substitution. Average product and marginal product.	2
Lec6	Koszty w przedsiębiorstwie (całkowite, przeciętne, marginalne). Koszty w krótkim i długim okresie. Efekty skali. Koszty ekonomiczne.	1
Lec7	Revenue and financial results (profit/loss before tax). Marker structures and their general characteristics.	2
Lec8	Measuring the Value of Economic Activity. Fluctuation of GDP, production and income. The consumption demand and the investment demand.	2
Lec9	Development and economic growth. The models of economic growth. Cycle fluctuations of market economy. Passive and active countercyclical policy	1
Lec10	Monetary and credit system. Capital market. Inflation.	2
Lec11	Labour market and unemployment.	1
Lec12	State budget. The budget debt and the public debt. Economic mean of public debt.	1
Lec13	Test	2

	Total hours: 20

TEACHING TOOLS USED

N1. informative lecture
N2. multimedia presentation
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, PEK_W04 PEK_K01, PEK_K02	test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1]Makro- i mikroekonomia. Podstawowe problemy współczesności, praca zb. pod red nauk. Marciniaka St. , Wydawnictwo Naukowe PWN, Warszawa 2013.
[2]Mankiw, N. Gregory; Taylor, John B., Mikroekonomia, Państwowe Wydawnictwo Ekonomiczne, , Warszawa 2006.
[3]Mankiw, N. Gregory; Taylor Mark P., Makroekonomia, Państwowe Wydawnictwo Ekonomiczne, Warszawa, 2009.
[4]Samuelson F. W., Marks S.(1998), Ekonomia menedżerska, Warszawa, PWE.
[5]Samuelson P.A., Nordhaus W.D.(2012), Ekonomia, Warszawa, PWN.

SECONDARY LITERATURE

[1]Czarny, B., Czarny, E., Bartkowiak, R., Rapacki R., Podstawy ekonomii, PWE, Warszawa 2000 i kolejne wydania.
[2]Kwaśnicki W., Zasady ekonomii rynkowej, Wrocław 2001.
[3]Podstawy ekonomii, pod red. Milewskiego R. Wydawnictwo Naukowe PWN, Warszawa 2004.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Economics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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_W	K1ZIP_W13	C1-C5	Lec	N1-N3
PEK_K	K1ZIP_K03, K1ZIP_K05	C1-C5	Lec	N1-N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Rachunkowość i finanse**
Name in English: **Accounting and finance companies**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **FBZ001190.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20	10			
Number of hours of total student workload (CNPS)	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
		Total hours: 20

Form of classes – Classes		Number of hours
Cl1		2
Cl2		2
Cl3		4
Cl4		2
		Total hours: 10

TEACHING TOOLS USED

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

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	
P = F		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Accounting and finance companies
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W19	C1, C2, C3		N1; N2
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U19	C1, C2, C3		N2; N3
PEK_K01, PEK_K02, PEK_K03	K1ZIP_K01, K1ZIP_K07, K1ZIP_K11	C1, C2, C3		N2; N3

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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **university-wide**
Subject code: **FZP001068**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20	10	10		
Number of hours of total student workload (CNPS)	90	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					

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. Special 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 1Organizational matters. Laws od dynamics. Equations of motion.(2h) Lec 2Work and mechanical energy. The laws of conservation of mechanical energy and momentum.(2h) Lec 3Kinematics and dynamics of rotational motion of the rigid body. The principle of conservation of the angular momentum. (2h) Lec 4Oscillations around stable equilibrium state. (2h) Lec 5 Basic properties of mechanical waves. Elements of acoustics. Wave energy.(2h) Lec 6First and second principles of thermodynamics. Ideal gas conversions. Entropy. Real gases (2h) Lec 7Gravitational and electrostatic interactions.(3h) Lec 8Magnetostatic field. Interaction of magnetic field with current currying conductor. Electromagnetic induction. Maxwell equations. Electromagnetic waves.(1h) Lec 9Elements of relativistic kinematics and dynamics. (2h) Lec 14Physics of the atom, atomic nucleus, elementary particles. Elements of astrophysics (2h)	20
		Total hours: 20
Form of classes – Classes		Number of hours
Cl1	Cl. 1Solving 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. 2Test - evaluation of educational effects relating to skills: PEK_U01, PEK_U06, PEK_K01, PEK_K03 (1h) Cl. 3Analyzing and solving problems of kinematics and dynamics of oscillations and wave movement. (1h) Cl. 4Solving problems of thermodynamics.(1h) Cl. 5Analyzing and solving problems of electrodynamics and special theory of relativity. Analyzing and solving problems of quantum physics. (1h) Cl. 6Test – evaluation of educational effects relating to skills: PEK_U07, PEK_U12, PEK_K01, PEK_K03 (2h)	10
		Total hours: 10
Form of classes – Laboratory		Number of hours
Lab1	Lab 1Introduction to LPF: issues of the organization of the classes, introduction of the students to: a) the safety rules for measurements (short health and safety training), b) how to prepare the writing reports, c) the basics of the measurement uncertainty analysis. The performance of simple measurements. (1h) Lab 2Making 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 3Making measurements of selected mechanical quantities +++, developing reports(2h) Lab 4Making measurements of selected thermodynamical quantities +++, developing reports(2h) Lab 5Making measurements of selected electromagnetic quantities +++, developing reports (2h) Lab 7Supplementary classes, crediting test concerning principles of calculation of measurements uncertainties (1h)	10
		Total hours: 10

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_W01PEK_W14, PEK_U01PEK_U16, PEK_K01PEK_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.
[6] Witryna dydaktyczna Instytutu Fizyki PWr w zakładce Jednolite kursy fizyki znajdują się zalecane e-materiał dydaktyczne.

Supplementary literature in English

[1] H.D. Young, R.A. Freedman, SEAR'S AND ZEMANSKY'S UNIVERSITY PHYSICS WITH MODERN PHYSICS, Addison-Wesley Publishing Company, wyd. 12. z 2008 r.
[2] D.C. Giancoli, Physics Principles with Applications, 6th Ed., Addison-Wesley, 2005; Physics: Principles with Applications with MasteringPhysics, 6th Ed., Addison-Wesley 2009.
[3] R.A. Serway, Physics for Scientists and Engineers with Modern Physics, 8th Ed., Brooks/Cole, Belmont 2009;
[4] [4] P.A. Tipler, G. Mosca, Physics for Scientists and Engineers, Extended Version, W. H. Freeman 2007.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Physics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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_W	K1ZIP_W02, K1ZIP_W03	C1, C2, C4		1, 6
PEK_U	K1ZIP_U02, K1ZIP_U06	C3		3, 5, 6, 7, 8
PEK_K	K1ZIP_K01, K1ZIP_K02, K1ZIP_K03, K1ZIP_K04, K1ZIP_K05	C1-C4		1÷8
PEK_U	K1ZIP_U01, K1ZIP_U02	C2		2,4,7,8

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **BLOK HUMANISTYCZNY (Ochrona własności intelektualnej)**
Name in English: **Block of humanistic courses**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **HMH100035BK.**
Group of courses: **no**

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

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		10
		Total hours: 10

TEACHING TOOLS USED

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	wg kart opracowanych przez SNH	
P =		

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE
SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Block of humanistic courses
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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_W	K1ZIP_W26	wg kart opracowanych przez SNH		wg kart opracowanych przez SNH

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **BLOK JĘZYKI OBCE**
Name in English: **Block of Foreign languages**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **JZM042050BK, 2051BK.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)		80			
Number of hours of total student workload (CNPS)		150			
Form of crediting		Crediting with grade			
Group of courses					
Number of ECTS points		5			
including number of ECTS points for practical (P) classes		5			
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 – Classes	Number of hours

Cl1		80
		Total hours: 80

TEACHING TOOLS USED

N1.

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	wg kart przygotowanych przez SJO	
P =		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Block of Foreign languages
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_U13, K1ZIP_U28, K1ZIP_U29, K1ZIP_U31	wg kart przygotowanych przez SJO		wg kart przygotowanych przez SJO
PEK_K01	K1ZIP_K01	wg kart przygotowanych przez SJO		wg kart przygotowanych przez SJO

SUBJECT SUPERVISOR

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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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **university-wide**
Subject code: **MAP001467**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20	10			
Number of hours of total student workload (CNPS)	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					

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. It is recommended that the knowledge of mathematics is equivalent to high school certificate at the basic level.

SUBJECT OBJECTIVES

C1. Exposition of basic theorems and algorithms concerning the theory of linear equations.
C2. Exposition of basic notions concerning matrix calculus, eigenvalues and eigenvectors of matrices.
C3. Exposition of rudiments of the theory of complex numbers, polynomial and rational functions.
C4. Exposition of rudiments of analytic geometry in R3.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - PEK_W01 knows basic methods of solving systems of linear equations,
PEK_W02 knows basic properties of complex numbers,
PEK_W03 knows basic algebraic properties of polynomials,
PEK_W04 knows characterizations of lines, planes and conic sections,
PEK_W05 knows definitions of eigenvalues and eigenvectors of matrices

II. Relating to skills:

PEK_U01 - PEK_U01 can add and multiply matrices and calculate determinants,
PEK_U02 can solve systems of linear equations,
PEK_U03 can carry out calculations with use of complex numbers,
PEK_U04 can find line and plane equations in the space R3.

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Mathematical induction. Newton’s binomial formula.	1
Lec2	The notion of a matrix. Operations on matrices. Transposition. Examples of matrices (triangular, symmetric, diagonal etc.).	1
Lec3	The determinant of a matrix. The Laplace expansion. Cofactor of an element of a matrix. Minors. Properties of determinants. Calculation of determinants by elementary row and column operations. Cauchy’s theorem. Nonsingular matrix.	2
Lec4	Inverse matrix. Computation of inverse matrix by cofactors or by elementary row operations. Properties of inverse matrices. Matrix equations. Rank of a matrix. Applications of determinants, their connections with rank and invertibility.	2
Lec5	Systems of linear equations. Rouché–Capelli theorem. Cramer’s formulas. Gaussian elimination. Solving arbitrary systems of linear equations.	2
Lec6	Complex numbers. Operations on complex numbers in algebraic form. Complex conjugate. Modulus. Argument.	1
Lec7	Geometric interpretation of a complex number. Polar form of a complex number. De Moivre’s formula. Roots of complex numbers.	2
Lec8	Polynomials. Polynomial remainder theorem. Fundamental theorem of algebra. Roots of polynomials with real coefficients.	1
Lec9	Linear and quadratic factors of a real polynomial. Decomposition of a polynomial into factors. Rational functions. Real partial fractions with irreducible denominators. Partial fraction decomposition of a real rational function.	2
Lec10	Analytic geometry in the space R3. Operations on vectors. Length of a vector. Scalar product, cross product and triple product of vectors - computing area and volume.	1
Lec11	Planes. Normal to a plane. Equations of a plane. Relative location of planes.	1

Lec12	Line in the space. Equations of a line (parametric, directional). Line as an intersection of planes. Relative location of two lines. Relative location of a line and a plane. Orthogonal projection of a point onto a line or a plane.	2
Lec13	Conic sections. Circle. Ellipse. Hyperbola. Parabola.	1
Lec14	Applications of linear algebra. Eigenvalues and eigenvectors of a matrix.	1
		Total hours: 20
Form of classes – Classes		Number of hours
Cl1	Transformation of algebraic expressions. Newton’s binomial formula. Operations on matrices.	1
Cl2	Calculation of matrix determinants with use of their properties. Laplace expansion. Computation of an inverse matrix. Solving matrix equations. Cramer’s formulas. Gaussian elimination. Solving of arbitrary systems of linear equations. Rozwiązywanie równań macierzowych.	2
Cl3	Operations on complex numbers in algebraic form. Polar form. Geometric interpretation. Powers and roots of complex numbers. Solving simple equations and inequalities.	3
Cl4	Finding roots of polynomials. Decomposition of a polynomial into irreducible components. Partial fraction decomposition of a real rational function.	1
Cl5	Vector operations. Scalar, cross or triple product of vectors and their applications to calculating area and volume. Solving problems in analytic geometry in R3 – finding equations of lines and planes, finding projections of vectors etc.	2
Cl6	Test.	1
		Total hours: 10

TEACHING TOOLS USED

N1. Lecture - traditional method.
N2. Classes - traditional method (problems sessions and discussion).
N3. Student’s self-study with the assistance of mathematical packages.
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_W05	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_U04	oral presentations, quizzes, tests
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2015.
[2] T. Jurlewicz, Z. Skoczylas, Algebra i geometria analityczna. Definicje, twierdzenia, wzory. Oficyna Wydawnicza GiS, Wrocław 2014.
[3] P. Kajetanowicz, J. Wierzejewski, Algebra z geometrią analityczną, PWN 2008.
[4] M. Zakrzewski, Markowe wykłady z matematyki, Algebra z geometrią, Oficyna Wyd. GiS, Wrocław 2015.

SECONDARY LITERATURE

[1] B. Gleichgewicht, Algebra, Oficyna Wydawnicza GiS, Wrocław 2004.
[2] A. Mostowski, M. Stark, Elementy algebry wyższej, PWN, Warszawa 1963.
[3] W. Stankiewicz, Zadania z matematyki dla wyższych uczelni technicznych, Cz. A, PWN, Warszawa 2003.
[4] F. Leja, Geometria analityczna, PWN, Warszawa 1972.
[5] E. Kącki, D. Sadowska, L. Siewierski, Geometria analityczna w zadaniach, PWN, Warszawa 1993.

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

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_W05	K1ZIP_W01	N1-N4	Lec1-Lec14	N1,N4
PEK_U01- PEK_U04	K1ZIP_U01	N1-N4	Cl1-Cl5	N2-N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Analiza matematyczna I**
Name in English: **Mathematical Analysis I**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **university-wide**
Subject code: **MAT001646**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20	20			
Number of hours of total student workload (CNPS)	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					

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. It is recommended that the knowledge of mathematics is equivalent to high school certificate at the advanced level.

SUBJECT OBJECTIVES

C1. Exposition of basic elementary functions and their properties.
C2. Exposition of basic notions and theorems of differential calculus of functions of a single variable.
C3. Introduction of the concept of the definite integral, its basic properties and methods of calculation.
C4. Presentation of practical applications of methods of differential and integral calculus of functions of a single variable.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - knows the graphs and properties of basic elementary functions,
PEK_W02 - knows basic notions and theorems of differential calculus of functions of a single variable,
PEK_W03 - knows the concept of the definite integral, its properties and the basic applications.

II. Relating to skills:

PEK_U01 - can solve typical equations and inequalities with elementary functions,
PEK_U02 - can examine a function and draw its graph,
PEK_U03 - PEK_U3 can evaluate typical indefinite integrals and calculate definite integrals,
PEK_U4 can apply differential and integral calculus to solve practical problems.

III. Relating to social competences:

PEK_K01 - understands the need for systematic and independent work on mastery of course material.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Definition of a function. Basic examples: linear, quadratic and polynomial functions. Rational functions. Composition of functions. Transformations of graphs of functions.	2
Lec2	Injective functions. The inverse function and its graph. Power and exponential functions and their inverses. Properties of logarithms.	1
Lec3	Trigonometric functions. Unit (trigonometric) circle. Inverse trigonometric functions.	1
Lec4	Sequences of real numbers. Finite and infinite limit of a sequence. Basic theorems on limits of sequences. Indeterminate expressions. The number e.	2
Lec5	The limit of a function at a point and the limit at infinity. Examples of the limits of certain indeterminate expressions. Asymptotes.	1
Lec6	Continuity of a function at a point and on an interval. Basic properties of continuous functions. Approximate solutions of equations.	1
Lec7	The derivative of a function. Geometrical and physical interpretations of the derivative. Tangent line. Differential of a function. Derivatives of basic elementary functions. Differentiation rules.	1
Lec8	Lagrange’s theorem. Intervals of monotonicity of a function. De l’Hospital’s rule.	1
Lec9	Local and global extrema. Examples of optimization problems.	1
Lec10	Definition and basic properties of indefinite integral. Basic rules. The substitution rule and integration by parts.	1
Lec11	Definition and basic properties of definite integral. Fundamental theorem of calculus (Newton-Leibniz theorem).	2
Lec12	Applications of integral calculus (e.g. average value of a function, area of a flat region, volumes of solids of revolution, arc length etc.)	2
Lec13	Integration of rational and trigonometric functions.	2

Lec14	Examples of applications of methods of mathematical analysis of a single variable (e.g. Taylor's theorem , convexity and inflection points of a function or other applications typical for the field of study).	2
		Total hours: 20
Form of classes – Classes		Number of hours
Cl1	Elements of mathematical logic (logical connectives, quantifiers). Determination of the domain of a function. Even and odd functions.	1
Cl2	Composition of functions. Transformations of graphs of functions. Polynomial and rational equations and inequalities.	1
Cl3	The inverse function. Typical equations and inequalities with exponential and logarithmic functions.	1
Cl4	Trigonometric and inverse trigonometric functions. Unit (trigonometric) circle. Typical trigonometric equations and inequalities.	1
Cl5	Monotonicity and boundedness of sequences. Computing proper and improper limits of sequences.	1
Cl6	Limits of functions. Asymptotes.	1
Cl7	Continuity of a function. Approximate solutions of equations	1
Cl8	Derivative of a function. Rules of differentiation. Tangent line. Differentials and their applications.	1
Cl9	De l'Hospital's rule. Intervals of monotonicity of a function	1
Cl10	Determining local and global extrema of a function.	1
Cl11	Evaluation of indefinite integrals of elementary functions. Integration by parts and by substitution.	2
Cl12	Calculating definite integrals. Area of a flat region as an application of definite integral.	2
Cl13	Applications of definite integral.	1
Cl14	Integration of rational and trigonometric functions.	1
Cl15	Test.	2
		Total hours: 18

TEACHING TOOLS USED

N1. Lecture - traditional method.
N2. Classes - traditional method (problems sessions and discussion).
N3. Student's self-study with the assistance of mathematical packages.
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_W03	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_U04, PEK_K01	tests, oral presentations, quizzes
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1]G. Decewicz, W. Żakowski, Matematyka, Cz.1, WNT, Warszawa 2007.
[2]M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2015.
[3]M. Gewert, Z. Skoczylas, Analiza matematyczna 1. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2015.
[4]W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, Cz. I, PWN, Warszawa 2006.

SECONDARY LITERATURE

[1]F. Leja, Rachunek różniczkowy i całkowy, PWN, 2012.
[2]R. Leitner, Zarys matematyki wyższej dla studiów technicznych, cz.1-2, WNT, Warszawa 2006.
[3]M. Zakrzewski, Markowe wykłady z matematyki. Analiza, Oficyna Wydawnicza GiS, Wrocław 2013.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mathematical Analysis I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W01	C1-C4	Lec	N1-N4

PEK_U01- PEK_U04	K1ZIP_U01	C1-C4	Cl	N1-N4
PEK_K01	K1ZIP_K04	C1-C4	Lec, Cl	N1-N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Analiza matematyczna II**
Name in English: **Mathematical analysis II**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **university-wide**
Subject code: **MAT001647**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10	10			
Number of hours of total student workload (CNPS)	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	1.2	1.4			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of differential calculus and integration for functions of one variable.

SUBJECT OBJECTIVES

C1. Exposition of basic notions and laws of multivariable differential calculus and its applications.
C2. Exposition of basic notions and laws for double integrals and their applications in geometry.
C3. Exposition of basic notions and laws concerning improper integrals. Exposition of the basic criteria for convergence of numerical series and properties of power series.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - knows rudiments of multivariable differential calculus,
PEK_W02 - has basic knowledge of double integrals and knows their applications,
PEK_W03 - has basic knowledge of improper integrals of type I and numerical and function series.

II. Relating to skills:
PEK_U01 - can compute partial derivatives, the gradient and directional derivatives of multivariate functions and use them to find local extrema of multivariate functions,
PEK_U02 - can calculate integrals of functions of two variables and apply integral calculus geometry and physics,
PEK_U03 - can verify convergence of improper integrals of type I and numerical and function series and can construct power series approximating given functions of one variable.

III. Relating to social competences:
PEK_K01 - understands the need of systematic and independent work on mastery of the course material

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Functions of several variables. The domain of a function of two variables. Graphs of typical functions of two variables. The partial derivative. The plane tangent to the graph of a function of two variables. The differential of multivariate function and its applications.	2
Lec2	Directional derivatives. Gradient of a function. Higher order partial derivatives.	1
Lec3	Local and global extrema. Sufficient conditions for the existence of the extreme.	1
Lec4	The definite integral of a function of two variables. Geometric interpretation. Double integrals over normal and regular regions.	2
Lec5	Change of variables in double integrals. Double integrals in polar coordinates. Applications of double integrals in geometry.1	1
Lec6	Improper integrals of type I. Comparison and limit comparison test.	1
Lec7	Infinite numerical series. The basic criteria for convergence of series. Absolute convergence.	1
Lec8	Power series. Taylor and Maclaurin series.	1
		Total hours: 10
Form of classes – Classes		Number of hours
Cl1	Partial derivatives. The plane tangent to the graph of a function of two variables. Applications of the differential of multivariate function.	1
Cl2	Directional derivatives. Gradient. Higher order partial derivatives.	1
Cl3	Local and global extrema.	1
Cl4	Calculation of double integrals over normal regions.	2
Cl5	Double integrals in polar coordinates. Applications of double integrals in geometry.	1
Cl6	Improper integrals of type I.	1

Cl7	Infinite numerical series.	1
Cl8	Power series.	1
Cl9	Test.1	1
		Total hours: 10

TEACHING TOOLS USED

N1. Lecture - traditional method.
N2. Classes - traditional method (problem sessions and discussion).
N3. Student’s self-study with the assistance of mathematical packages
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_W03	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_U3, PEK_K01	tests, oral presentations, quizzes
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1]M. Gewert, Z. Skoczylas, Analiza matematyczna 2. Definicje, twierdzenia, wzory, Oficyna Wydawnicza GiS, Wrocław 2016.
[2]F. Leja, Rachunek różniczkowy i całkowy, PWN, Warszawa 2012.
[3]W.Żakowski, W.Kołodziej, Matematyka, cz. II, WNT, Warszawa 2014.

SECONDARY LITERATURE

[1]M. Gewert, Z. Skoczylas, Analiza matematyczna 2. Przykłady i zadania, Oficyna Wydawnicza GiS, Wrocław 2016.
[2]W. Krysicki, L. Włodarski, Analiza matematyczna w zadaniach, Cz. II, PWN, Warszawa 2006.
[3]R. Leitner, Zarys matematyki wyższej dla studiów technicznych, Cz. 1-2, WNT, Warszawa 2006.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Mathematical analysis II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W01	C1-C3	Lec	N1-N4
PEK_U01-PEK_U03	K1ZIP_U01	C1-C3	Cl	N1-N4
PEK_K01	K1ZIP_K04	C1-C3	Lec, Cl	N1-N4

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Prawo gospodarcze**
Name in English: **Business Law**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **PRZ000336**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
Number of hours of total student workload (CNPS)	90				
Form of crediting	Crediting with grade				
Group of courses					
Number of ECTS points	3				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.8				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The student has a basic knowledge of the country and the making of law

SUBJECT OBJECTIVES

C1. Informing students about basic organizational and legal forms of enterprises
C2. Informing students about the requirements to start a business
C3. Informing students about basic consumer rights

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - He recognizes and understands basic terms, economic rules and phenomena as well as their effects in market economy, he knows conditions and principles of making optimal decisions by market entities (producers and consumers), he has knowledge about markets and production factors.

PEK_W02 - He has basic knowledge about economy law and running business, he knows legal regulations concerning establishing enterprises in Poland and their functioning, he knows issues of trade relations, he knows and understands basic terms of industrial property protection and author's law.

II. Relating to skills:

PEK_U01 - Analyzing and properly interpreting legal regulations in the organization's activities

III. Relating to social competences:

PEK_K01 - Ability to work in a team

PEK_K02 - Ability to optimize management decisions

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction to the course. Conditions of the course. The concept of law and the rule of law. Construction of a legal norm. The system of law. Business Law with other branches of the law. Solving practical examples. Sources of law.	2
Lec2	Starting a business in Poland by individuals. Starting a business in the form of companies (place of business start). Starting a business in selected countries of the European Union. Doing business on the Internet.	4
Lec3	Product liability - complaints of goods and services.Product liability - Internet sales. New law on consumer rights.	8
Lec4	Product liability - safety and health of consumer	4
Lec5	Legal aspects of mergers and divisions of companies. Final test.	2
		Total hours: 20
Form of classes – Seminar		Number of hours
Sem1	Basic organizational and legal forms of business (partnerships and equity)	4
Sem2	The most common contracts related to the business activity (sales, leasing, insurance)	2
Sem3	The most common contracts related to the business activity (leasing, transportation, errand)	2
Sem4	The most common contracts related to the business activity (agency, commission, franchising, factoring)	2
		Total hours: 10

TEACHING TOOLS USED

N1. multimedia presentation
N2. traditional lecture with the use of transparencies and slides
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	Final test
P = F1+F2+F3		

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_K01, PEK_U02, PEK_U03, PEK_K01, PEK_K02	The participation in discussions of problem, the defense of the project
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Zymonik K., Product liability in the management of the innovative enterprise, Wydawnictwo Difin, Warszawa.
2. Nowińska E., Cybula P. (red), European consumer law and the polish law, Wydawnictwo Zakamycze.
3. Bogaczyk I., Krupski B., Lubińska H., Starting a business. Setting up and running a business, Wydawnictwo Forum.
4. Jeleńska A., Corporations, Wszechnica podatkowa, Kraków.
5. Jacyszyn J. (red), Commercial companies in questions and answers, LexisNexis.

SECONDARY LITERATURE

1.Koch A., Napierała J.,Agreement in trade, Wolters Kluwer Polska – LEX, 2011.
2.Gospodarek J., Agreement in trade, Szkoła Główna Handlowa, Warszawa 2010.
3.Zymonik K., Guarantee of producer, Problemy jakości nr 2/2008, s.30-34

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Business Law
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W13, K1ZIP_W26	C3	Lec 1, Lec3, Lec4	N1, N2, N3
PEK_W02	K1ZIP_W22, K1ZIP_W26	C1, C2	Lec1 - Lec5	N1, N2, N3

SUBJECT SUPERVISOR

dr Krzysztof Zymonik tel.: 713202864 email: krzysztof.zymonik@pwr.edu.pl

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Ekologia w produkcji przemysłowej**
Name in English: **Ecology in industrial manufacturing**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **XXX**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
Number of hours of total student workload (CNPS)	60				
Form of crediting	Crediting with grade				
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. The student has systematized secondary school knowledge of biology, chemistry and physics; knows the principles of engineering drawing.
2. Can interpret the basic relationship between human activity and the behaviour of living organisms and the whole environment.
3. Implementing novel solution in the construction, operation and modernization of machines in accordance with the principles of sustainable development and the protection of natural resources and the environment.

SUBJECT OBJECTIVES

C1. The student is to learn about the structure and functioning of living nature, the effect of ecotoxins, and the greenhouse effect; to acquaint herself/himself with the hazards arising from the escalation of human industrial activity and with the legal regulations concerning environmental protection; to understand the environmental management systems, the ISO 14000 standard.
C2. The student is to acquaint herself/himself with the hazards involved in and the ways of acquiring energy from conventional and renewable sources and the principles of waste management – waste minimization and recycling, the LCA method.
C3. The student is to acquaint herself/himself with the principles of constructing, operating and modernizing machines, conducive to the protection of natural resources and the environment.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - The student knows and understands the hazards arising from the greenhouse effect, the development of technology, energy acquisition and waste production and recycling.

PEK_W02 - The student understands the necessity of introducing environmental regulations; knows the environmental management systems; has knowledge relating to the implementation of ISO 14000.

PEK_W03 - The student knows and understands the hazards arising from the escalation of human activity; knows the principles and advantages of implementing the environment-friendly rules of constructing and operating machines.

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction, literature, what everyone can do to protect the environment; the hazards arising from industrial activity, ecotoxins, the greenhouse effect.	2
Lec2	The international conventions and the Polish Laws relating to environmental protection; environmental management.	2
Lec3	Environmental management systems, the current standards: BS, EMAS, ISO 14000 and other.	2
Lec4	Environmental consequences of acquiring energy from conventional sources, hazards.	2
Lec5	Environment-friendly methods of acquiring energy from renewable sources.	2
Lec6	Waste minimization, recycling, rational and eco-friendly way of managing wastes; examples of recycling in selected branches of industr	2
Lec7	Recycling in the automotive industry; waste management, waste processing, energy recovery, safe storage	2
Lec8	Environment-friendly materials in machine operation – oils, lubricants, greases; biodegradability, toxicity, carcinogenicity and mutagenicity of consumable materials; PCB.	2
Lec9	New environment-friendly techniques in machine operation; seals; the energy aspects of machine operation; the environmental aspects of the construction, use and modernization of machines.	2
Lec10	Final test.	2
		Total hours: 20

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	Written final test, oral test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Konspekty przekazane przez prowadzącego,
2. Lewandowski W: Proekologiczne odnawialne źródła energii, WNT W-wa 2010,
3. Mackenzie A., i inni: Ekologia, PWN W-wa 2009,
3. Nierzwicki W: Zarządzanie środowiskowe, Polskie Wyd. Ekonomiczne, W-wa 2006,
4. Rosik-Dulewska Cz: Podstawy gospodarki odpadami, PWN 2007

SECONDARY LITERATURE

Czasopisma: "Czysta Energia", „Utrzymanie ruchu", „Recykling", „Nasze Środowisko" , "Ekotechnika"

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Ecology in industrial manufacturing
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W20	C1, C2, C3	Wy1 - Wy10	N1, N2, N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy elektrotechniki i elektroniki**
Name in English: **Fundamentals of Electrical Engineering and Electronics**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **XXX**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10		10		
Number of hours of total student workload (CNPS)	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. The student has the knowledge, skills and competence based on the Physics courses.

SUBJECT OBJECTIVES

C1. Comprehension of the issues related to the mathematical description and physical interpretation of the phenomena accompanying the production and usage of electric fields, magnetic and electromagnetic fields.
C2. Understanding the physical phenomena occurring in materials (including in semiconductors).
C3. Introduction to the analysis of DC and AC linear and nonlinear circuits, using basic electrical engineering concepts and laws (Ohm's law, I and II Kirchhoff law).
C4. Understanding the construction's principles and applications of selected electronic components, semiconductor devices and integrated circuits (analog and digital).
C5. Acquiring the ability to choose and measure the active and passive components used in electronic applications and ability to characterize their properties/parameters.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - The student has expertise in the field of physics, including mechanics, thermodynamics, optics, electricity and magnetism, nuclear physics and solid state physics, including the knowledge necessary to understand the basic physical phenomena occurring in electronic components and circuits and in their environment/surrounding.

PEK_W02 - The student understands the physical basis of the operation of semiconductor devices and the importance of their parameters.

II. Relating to skills:

PEK_U01 - The student has the ability to choice the materials, components and equipment's construction according to the technical requirements and operating conditions.

PEK_U02 - The student can operate the measuring equipment and can assemble measurement systems.

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	The basic phenomena and laws of electrical engineering: electrification, electric charge, electric field, electric potential, voltage, source voltage: constant, variable, electric current, electric power, electrical circuits, linear, nonlinear, classical method of solving electrical circuits, magnetic fields, electric current: DC, AC, production and properties of alternating current.	2
Lec2	Signals applied in electronics: analog and digital (description of the fundamentals of the signals).	2
Lec3	Physical principles of semiconductor electronic components. P-N junction: the mechanism of the formation of the junction, the direct current I-V characteristics of the diode.	2
Lec4	Bipolar transistors, Unipolar transistor: Field Effect Transistor, Junction Transistor - PNFET: the principle of operation, I-V characteristics, parameters.	2
Lec5	Digital Circuits: Basic logic functions, parameters. Logic gates of TTL and CMOS family: construction and parameters. Final test.	2
		Total hours: 10
Form of classes – Laboratory		Number of hours
Lab1	Introduction. Basic methods and measuring instruments. Description of the electronic components properties. Passive Components. I-V characteristics of the p-n junction (diode: universal, stabilization).	3
Lab2	Static characteristics of the bipolar transistor.	3
Lab3	The measurements of unipolar transistors: JFET and MOSFET transistors.	3
Lab4	Additional term.	1
		Total hours: 10

TEACHING TOOLS USED

N1. Traditional lecture (Power Point presentation)
N2. Self-study
N3. Consultations
N4. Repetition of the presented material as a preparation for the laboratory classes
N5. Assessment of the laboratory classes: test regarding the knowledge about the topic of the exercise, report from the realized work during the 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_W02	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	Marks from tests and reports from realized exercise
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

A. Świt, J. Pułtorak, Przyrządy półprzewodnikowe, WNT, 1984
S. Bolkowski, Teoria obwodów elektrycznych, WNT, 2003
P. Hempowicz, R. Kiełsznia, A. Piłatowicz, J. Szymczyk i inni, Elektrotechnika i elektronika dla nieelektryków, WNT, 2004

SECONDARY LITERATURE

G. Rizzoni, Fundamentals of Electrical Engineering, McGraw-Hill, 2010
W. Marciniak, Przyrządy półprzewodnikowe i układy scalone, WNT, 1984
M. Rusek, J. Pasierbiński, Elementy i układy elektroniczne w pytaniach i odpowiedziach, WNT, 1991

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Fundamentals of Electrical Engineering and Electronics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W09	C1 - C3	Lec1 - Lec5	N1 - N3
PEK_U01, PEK_U02	K1ZIP_U09	C4, C5	Lab1 - Lab4	N3 - N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy marketingu**
Name in English: **Basic of Marketing**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **XXX**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
Number of hours of total student workload (CNPS)	90				
Form of crediting	Examination				
Group of courses					
Number of ECTS points	3				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.8				

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		1
Lec3		1
Lec4		1
Lec5		1
Lec6		1
Lec7		2
Lec8		2
Lec9		2
Lec10		3
Lec11		2
Lec12		1
Lec13		2
		Total hours: 21

TEACHING TOOLS USED

N1. informative lecture
N2. problem lecture
N3.

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	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Basic of Marketing
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W13, K1ZIP_W18	C1, C2, C3		N1, N2, N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Projektowanie baz danych**
Name in English: **Database design**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **XXX**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			20	
Number of hours of total student workload (CNPS)	60			60	
Form of crediting	Crediting with grade			Crediting with grade	
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	0.6			0.7	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Fundamentals of modeling - algorithms, processes
2. Basic knowledge of computer systems

SUBJECT OBJECTIVES

C1. The aim of the course is to get to know with the process database development
C2. correct identification and modeling needs of future RDBMS users
C3. transfer of the basic knowledge required to use the SQL queries language

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Has a basic knowledge of database design process
PEK_W02 - Has a knowledge of modeling and recognizing the needs of users.
PEK_W03 - Has a knowledge of relational database management systems

II. Relating to skills:
PEK_U01 - Can design a database and use SQL to communicate with databases
PEK_U02 - Can properly identify and model the needs of future users of the database
PEK_U03 - Able to use the relational database management system

III. Relating to social competences:
PEK_K01 - Think and act in a logical manner
PEK_K02 - Can draw logical conclusions and solve the stated problem in orderly manner.
PEK_K03 - Can appropriately define the priorities for implementation tasks specified by you or others.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	The theory of databases - introduction	2
Lec2	Development of databases - data types	2
Lec3	The theoretical basis of database design .	2
Lec4	Designing conceptual, logical and physical database structures	2
Lec5	Database normalization	2
		Total hours: 10
Form of classes – Project		Number of hours
Proj1	Practical basics of database design .	2
Proj2	Designing conceptual, logical and physical database structures - practice	2
Proj3	Getting to know the basics of database administration (setting up a database, user administration, granting rights to objects in the database, backup, replication, etc.).	4
Proj4	Database design to meet defined criteria.	10
Proj5	Project testing	2
		Total hours: 20

TEACHING TOOLS USED

N1. problem discussion
N2. tutorials
N3. self study - preparation for project class
N4. project presentation
N5. 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	Final 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 PEK_K01, PEK_K02, PEK_K03	project defense
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Relacyjne bazy danych Autorzy: Mark Whitehorn, Bill Marklyn Data wydania: 2003/08

Bazy danych SQL. Teoria i praktyka Autor: Wiesław Dudek Data wydania: 2006/11

SECONDARY LITERATURE

SQL. Rusz głową! Autor: Lynn Beighley Data wydania: 2010/11

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Database design
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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;	K1ZIP_W10	C1, C2, C3	Wy1 - Wy5	N5, N2
PEK_U01- PEK_U03	K1ZIP_U10	C1, C2, C3	Pr1 - Pr5	N1, N2, N3, N4
PEK_K01- PEK_K03	K1ZIP_K04	C2	Pr1 - Pr5	N1, N2

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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **university-wide**
Subject code: **XXX**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30	20			
Number of hours of total student workload (CNPS)	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					

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		30
		Total hours: 30
Form of classes – Classes		Number of hours
Cl1		20
		Total hours: 20

TEACHING TOOLS USED
N1.

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
Management and Manufacturing Engineering

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	K1ZIP_W01			1-4
PEK_U01-PEK_U04	K1ZIP_U01			1-4
PEK_K01-PEK_K02	K1ZIP_K11			1-4

Faculty of Mechanical Engineering

SUBJECT CARD

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

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10				
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. Understanding the key management concepts and the basic mainstreams in the evolution of organizational management theory.
2. Understanding basic mechanisms of the organization operating and a skill of indicating solutions for the basic management issues.
3. A skill of information collecting and sharing.

SUBJECT OBJECTIVES

C1. Internalizing knowledge in scope of strategic management and change management in organisations.
C2. Internalizing knowledge about the important mechanisms of information flow and communication in organisations as well as methods and criteria for evaluating organisations.
C3. Internalizing knowledge referring to the new organisational structures, business models and possibilities of their implementation.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - A student can list and identify the most important elements of the strategic management.
PEK_W02 - A student can characterise essence and importance of the information flow and communication in organisations as well as list the basic criteria for an organisation evaluating.
PEK_W03 - A student can explain the advantages and constraints of the new business models.

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Strategic management	2
Lec2	Implementing organisational change, crisis management	2
Lec3	Information and communication in management, methods and criteria for evaluating the organisational operational efficiency	2
Lec4	The modern organisational structures and business models	2
Lec5		2
		Total hours: 10

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	Test
P = kolokwium		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1.Koźmiński A., Piotrowski W., Zarządzanie: teoria i praktyka, Wydawnictwo Naukowe PWN, Warszawa, 2007.
2.Griffin R. W., Podstawy zarządzania organizacjami, Wydawnictwo Naukowe PWN, Warszawa, 2009.
3.Strużycki M., Podstawy zarządzania, Wydawnictwo Szkoły Głównej Handlowej, Warszawa, 2008.

SECONDARY LITERATURE

1.Przybyły M., Organizacja i zarządzanie: podstawy wiedzy menedżerskiej, Wydaw. Akademii Ekonomicznej im. Oskara Langego, Wrocław, 2003.
2.Steinmann H., Schreyögg G., Zarządzanie: podstawy kierowania przedsiębiorstwem: koncepcje, funkcje, przykłady, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2001.
3.Karbowiak K., Wyrzykowska B., Podstawy teorii organizacji i zarządzania, Wydawnictwo SGGW, Warszawa, 2009.
4.Dołhosz M., Fudaliński J., Smutek H., Podstawy zarządzania. Koncepcje – strategie – zastosowanie, Wydawnictwo Naukowe PWN, Warszawa, 2009.
5.Korzeniowski L., Podstawy zarządzania organizacjami, Difin, Warszawa, 2011.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Management Essentials II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W14	C1, C2, C-3	Wy1 - Wy4	N1

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Zarządzanie projektami**
Name in English: **Project Management**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **XXX**
Group of courses: **yes**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20			10	
Number of hours of total student workload (CNPS)	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

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		4
		Total hours: 30
Form of classes – Project		Number of hours
Proj1		2
Proj2		2
Proj3		2
Proj4		2
Proj5		2
Proj6		2
Proj7		3
		Total hours: 15

TEACHING TOOLS USED

N1. informative lecture
N2. problem lecture
N3. self study - preparation for project class
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	
P = F1 i F2		

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, PEK_K02	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Project Management
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W14	C1, C2		N1, N2
PEK_U01, PEK_U02	K1ZIP_U14	C2, C3		N2, N3
PEK_K01, PEK_K01	K1ZIP_K04, K1ZIP_K05	C4, C5		N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Zarządzanie przedsięwzięciem**
Name in English: **Management of an undertaking**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **XXX**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20			10	
Number of hours of total student workload (CNPS)	30			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

C1. Familiarizing yourself with today's knowledge of project management.
C2. Learning the proper preparation of the project.
C3. Learning the proper supervision of the execution of the project.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Knowledge of the project life cycle
PEK_W02 - Knowledge about management of objectives, integration of tasks, time and cost
PEK_W03 - Knowledge about quality and risk management as well as human resources and expenses management

II. Relating to skills:
PEK_U01 - Knowing how to prepare the project (technical development of the project).
PEK_U02 - Knowing how to supervise the implementation of the project.
PEK_U03 - Ability to manage of a project management in a methodical way.

III. Relating to social competences:
PEK_K01 - Awareness of the role of the engineer in the planning of projects and the need for accountability and involvement in one of the most important links in the enterprise management process.
PEK_K02 - Awareness of the legal aspects and impacts of engineering.
PEK_K03 - Understands the need for lifelong learning in the field of business engineering and professional as well as social skills development.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	The life cycle of the project: Initiation, Planning, Commissioning, Control and Monitoring, Closure	3
Lec2	Integration management	3
Lec3	Goals management	3
Lec4	Management of time and costs	4
Lec5	Management of quality and risk	3
Lec6	Management of human ressources and expenses	4
		Total hours: 20

Form of classes – Project		Number of hours
Proj1	Split into project groups and selection of project topic	1
Proj2	Presentation of a subject, goal and range of the project	1
Proj3	Communication	1
Proj4	Detailed goals and analysis of project feasibility	2
Proj5	Activities and ressources	1
Proj6	Schedule	1
Proj7	Estimation of costs	2
Proj8	Quality and risk management	1
		Total hours: 10

TEACHING TOOLS USED

N1. case study
N2. problem exercises
N3. self study - preparation for project class
N4. 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	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 PEK_K01, PEK_K02, PEK_K03	Completion of project task
P =		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. „A Guide to the Project Management Body of Knowledge: Third Edition (PMBOK Guide)”, Project Management Institute, 2004, ISBN: 193069945X

SECONDARY LITERATURE

2. Nancy Mingus „Project management”

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Management of an undertaking
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W14	C1	Lect1 - Lect6	N4
PEK_U01, PEK_U03	K1ZIP_U19	C2	Pr1 - Pr8	N1, N2, N3
PEK_U02	K1ZIP_U14	C3	Pr1 - Pr8	N1, N2, N3
PEK_K01, PEK_K02, PEK_K03	K1ZIP_K09	C1, C2, C3	Pr1 - Pr8	N1, N2, N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Logistyka systemów produkcyjnych**
Name in English: **Logistics of Production Systems**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZMZ000157.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			10	
Number of hours of total student workload (CNPS)	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	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		1
Lec2		2
Lec3		2
Lec4		2
Lec5		2
Lec6		1
		Total hours: 10
Form of classes – Project		Number of hours
Proj1		2
Proj2		2
Proj3		2
Proj4		2
Proj5		2
		Total hours: 10

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. tutorials
N3. self study - preparation for project class
N4. report preparation
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	
P = 1		

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	
P = 1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Logistics of Production Systems
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W17	C1, C2, C3, C4		N4
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U17, K1ZIP_U24, K1ZIP_U25	C1, C2, C3, C4		N1, N2, N3, N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Logistyka produkcji**
Name in English: **Logistic of Production**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZMZ000158**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			10	
Number of hours of total student workload (CNPS)	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	0.6			0.7	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

SUBJECT OBJECTIVES

C1. To acquaint students with the most important concepts of logistics
C2. Acquaintance with the genesis and causes of dynamic development of Logistics
C3. Acquainted with system integration and the role of Logistics
C4. Outline the place of logistics both in the enterprise and throughout the supply chain

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Knows and can describe basic logistics issues
PEK_W02 - Is able to identify basic aspects of customer service
PEK_W03 - can characterize the logistics system of an enterprise

II. Relating to skills:
PEK_U01 - is able to select well the literary issues to develop the topic
PEK_U02 - can use the literature to formulate descriptions and on the basis of them formulate substantive conclusions
PEK_U03 - can work in a design team relating to social competences

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	1. The origin of logistics, the definition of logistics taking into account its integration and systemic role 2. Discussion of changes in the environment in terms of: • Globalization of the economy and competition • Exponential development of technology, information and knowledge • Market changes caused by the evolution of needs and changes in legislation	1
Lec2	3. New business challenges resulting from changes in the environment 4. Traditional logistics functions 5. New challenges for logistics that take account of changes in the environment and allow for a competitive advantage: • New strategies: ECR, CRM • Out of production • Increased product availability: supply chain concept, logistics networks	2
Lec3	6. New logistics functions: logistic geographic, sectoral, functional and system integration 7. The impact of logistics on ROI and balance sheet items	2
Lec4	8. Logistics in the company strategy, strategies of organization of production and distribution: • Customized and advance strategy • Mixed strategy • Strategy for rationalizing production and distribution • Strategy of distribution specialization • Logistic consolidation strategy • Logistic deferral strategy 9. Customer service as one of the most important elements of the marketing mix 10. Basic requirements for the management system Customer Service	2
Lec5	11. Time intervals Customer Service. 12. Transactional, procedural logic to build the right value Customer Service. 13. Characteristics of subsequent stages of Service ofCustomer Service construction	2

Lec6	20. Methods of calculating logistic costs: • ABC analysis • Link costs to the distribution mission • Customer profitability analysis, attributed costs, profitability calculation, customer margin calculation	1
		Total hours: 10
Form of classes – Project		Number of hours
Proj1	Selection and design of the product	2
Proj2	Selection and design of the production process	2
Proj3	Design of the spatial structure of the logistic system.	2
Proj4	Selection of suppliers, cost-effectiveness analysis.	2
Proj5	Pass the course	2
		Total hours: 10

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. self study - preparation for project class
N3. project presentation
N4. report preparation
N5. 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 = 1		

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	Project credit
P = 1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Abt S., Systemy logistyczne, Wydawnictwo AE w Poznaniu, Poznań 2001.
2. Bozarth C.C., Handfield R.B., Wprowadzenie do zarządzania operacjami i łańcuchem dostaw: kompletny podręcznik logistyki i zarządzania dostawami, Helion, Gliwice 2007.
3. Coyle J.J., Bardi E.J., Langley Jr C.J., Zarządzanie logistyczne, PWE, Warszawa 2002.
4. Kasperek M., Planowanie i organizacja projektów logistycznych, Wydawnictwo AE w Katowicach, Katowice 2006.
5. Phohl H-Ch., Systemy logistyczne. Podstawy organizacji i zarządzania, Biblioteka ILiM , Poznań 1998.
6. Simchi-Levi D., Kaminsky P., Simchi-Levi E., Designing and Managing the Supply Chain. Concepts, Strategies and Case Studies, The McGraw-Hill Companies, Inc. 2000.
7. Waters D., Zarządzanie operacyjne. Towary i usługi, PWN, Warszawa 2001

SECONDARY LITERATURE

1. Ciesielski M. (red.), Logistyka we współczesnym zarządzaniu, Wydawnictwo AE w Poznaniu, Poznań 2003.
2. Ciesielski M. (red.), Sieci logistyczne, Wydawnictwo AE w Poznaniu, Poznań 2002.
3. Gołembska E. (red.), Kompendium wiedzy o logistyce, Wydawnictwo Naukowe PWN, Warszawa 2001.
4. Heizer J., Render B., Production and Operations Management. Strategies and Tactics, Allyn and Bacon, a division of Simon & Schuster Inc. 1993.
5. Logistics: The strategic issues, Edited by M. Christopher, Chapman & Hall 1992.
6. Harrison A., van Hoek R., Logistics Management and Strategy, FT Prentice Hall, Pearson Educatio Limited 2005.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Logistic of Production
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W17	C1, C2, C3, C4	Lec	N4
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U17, K1ZIP_U24, K1ZIP_U25	C1, C2, C3, C4	Pr	N1, N2, N3, N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **PRAKTYKA**
Name in English:
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **ZPM002000.**
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
Management and Manufacturing Engineering

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	K1ZIP_U21, K1ZIP_U27			
PEK_K	K1ZIP_K01, K1ZIP_K03, K1ZIP_K04			

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Chemia**
Name in English: **Chemistry**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM031002**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
Number of hours of total student workload (CNPS)	60				
Form of crediting	Crediting with grade				
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. The student should have basic chemical knowledge associated with structure of matter, states of matter.

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 knowledge associated with the structure of metals, alloys, electron conductivity as well as basic organic knowledge associated with fuels and polymers

PEK_W03 - The student should have basic knowledge associated with the optics and nanotechnology

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	The structure of matter, elements, compounds	2
Lec2	Periodic table of elements, structure, groups of elements, allotropy, concentration	2
Lec3	Chemical bonds, molecules	2
Lec4	Liquids, solids, gases	2
Lec5	Basic crystallography, unit cell, symmetry elements, crystallographic defect	2
Lec6	Solid state band theory.metals and alloys structure	2
Lec7	Selected topics of organic chemistry- fuels, polymera	4
Lec8	Basic optics - the Effects of electromagnetic waves on matter	2
Lec9	Qualifying class –test	2
		Total hours: 20

TEACHING TOOLS USED

N1. informative lecture
N2. tutorials
N3. traditional lecture with the use of transparencies and slides
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_W02, PEK_W03	test
P = F1		

PRIMARY AND SECONDARY LITERATURE

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

SECONDARY LITERATURE
selected web sites,

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Chemistry
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W02	C1, C2, C3	Lec1-Lec8	N1, N2, N3, N4

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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM031047**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			10	
Number of hours of total student workload (CNPS)	30			30	
Form of crediting	Crediting with grade			Crediting with grade	
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. The knowledge from mathematics on the secondary school level confirmed with positive grade in the school certificate.
2. The knowledge of an spreadsheet e.g. Excel.

SUBJECT OBJECTIVES

C1. Acquiring the basic knowledge from linear and network programming area with its application.
C2. Ability to formulate optimization models in the decision taking process from the management field, e.g.: transport services market, distribution of limited resources, project planning, optimization of design, technology and systems.
C3. Acquiring the skills of solving of linear optimization problems using computer programs.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - A course participant has the basic knowledge on the supporting methods of taking optimum decisions.
PEK_W02 - A participant knows the algorithms of linear programming and knows how a sensitivity analysis of the optimum solution should be done.
PEK_W03 - A participant has the basic knowledge on the modelling and solving of optimization problems from network programming field.

II. Relating to skills:

PEK_U01 - A course participant knows how to formulate linear optimization models from engineering and management field.
PEK_U02 - A course participant can use algorithms of linear and network programming to a support decision making process.
PEK_U03 - A course participant knows how to use computer programs when solving mathematical optimization problems.

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction to Operations Research (OR): basic definitions, OR in a decision making process, OR history, classification of OR methods and algorithms.	1
Lec2	The graphical method of linear model solving. Interpretation of its results. Sensitivity analysis of the optimum solution.	2
Lec3	Dualism in linear programming: primal and dual model formulation, dual problem solving, results interpretation in the relation to the primal model.	2
Lec4	The Simplex method.	2
Lec5	The network programming: the Critical Path Method (CPM)	2
Lec6	Final test.	1
		Total hours: 10
Form of classes – Project		Number of hours
Proj1	Organizational issues. Formulating of linear decision models for chosen examples of engineering and management application: identification of decision variables, problem constraints and an objective function.	2
Proj2	Application of the graphical method to linear optimization. Sensitivity analysis of the optimum solution.	2
Proj3	Application of the dual approach to linear programing cases: formulation of primal and dual form of a linear model, dual model solution, results interpretation.	2
Proj4	Linear programming models with a greater number of variables – the simplex method with slack and artificial variables.	2
Proj5	Critical path method application in an example: identification of operations in the project, their sequence, activities graph construction, identification of project duration, critical activities and slack times.	2

	Total hours: 10

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. problem discussion
N3. self study - preparation for project class
N4. 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_U03	evaluation of partial tasks during the semester
P = ocena średnia uzyskana na podstawie ocen cząstkowych		

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] Operations research an introduction /Hamdy A. Taha. Boston [etc.] : Pearson, cop. 2011
[2] Introduction to operations research /Frederick S. Hillier, Gerald J. Lieberman. New York: McGraw-Hill, cop. 2005.
[3] Operations research /Michał Kulej ; Wrocław University of Technology. Wrocław : Wrocław University of Technology ; Łódź : PRINTPAP, 2011

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Operations research
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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_W, PEK_U	K1ZIP_U19, K1ZIP_W13	C1, C2	Le1-Le4, Proj1 - Proj5	N1-N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Wprowadzenie do wytwarzania**
Name in English: **Introduction to manufacturing**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032005.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
Number of hours of total student workload (CNPS)	60				
Form of crediting	Crediting with grade				
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
		Total hours: 20

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	
F2	PEK_W01 PEK_W02	
P = 0,25*F1 + 0,75*F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Introduction to manufacturing
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W08	C1 - C4		N1 - N4

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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032011**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		20		
Number of hours of total student workload (CNPS)	60		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. 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:
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:
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 - He can make the selection of appropriate test equipment and set it up depending on the task measuring. Can use measuring equipment used in engineering to measure the geometrical quantities.
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 – Lecture		Number of hours
Lec1	Organizational matters. Basic concepts of metrology. Quantities and units of measurement. Integrated measurement units. SI units, measurement standards, a hierarchical system of measurement standards.	1

Lec2	Measurement, measurement types, method and measurement principle.	1
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.	2
Lec5	GPS - geometrical tolerance according to ISO 1101. Geometrical deviations mesurements.	2
Lec6	Description of geometric structure of surfaces - roughness and waviness, and their measurement.	2
Lec7	Tolerance and machine parts measurement.	2
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	hods and means of mechanization and automation of measurements.	2
Lec11	Analysis of dimension. Fundamentals of statistical control of dimensions.	1
Lec12	Fundamentals of coordinate measurement techniques.	1
		Total hours: 20
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.	2
Lab4	Direct and indirect measurements of cones.	2
Lab5	Identification and measurement of threads.	2
Lab6	Assessment of the geometrical structure of the surface.	2
Lab7	Identification and measurement of cylindrical gears.	2
Lab8	Measurements of selected shape deviations.	2
Lab9	Measurements of selected displacement.	2
Lab10	Measurements of machine parts with pneumatic measurement equipment.	2
		Total hours: 20

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. laboratory experiment
N3. report preparation
N4. self study - preparation for laboratory class
N5. 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 = 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; 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
Management and Manufacturing Engineering

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	K1ZIP_W06	C1; C2; C3; C4; C5; C6	Wy1 - Wy12	N1; N5
PEK_U01; PEK_U02; PEK_U03	K1ZIP_U06	C1; C2; C3; C4; C5; C6	Wy1 - Wy12	N2; N3; N4; N5
PEK_K01; PEK_K02; PEK_K03	K1ZIP_K04, K1ZIP_K05	C1; C2; C3; C4; C5; C6	La1 - La10	N3; N4; N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy projektowania mechanizmów**
Name in English: **Basics of mechanism design**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032013**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20			10	
Number of hours of total student workload (CNPS)	90			60	
Form of crediting	Crediting with grade			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. 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 machines
C2. Understanding the properties of selected groups of planar and spatial mechanisms (linkages, gears, cams and manipulators)

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - has a theoretical knowledge of analysis of kinematic system
PEK_W02 - has a theoretical knowledge of design of kinematic systems

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 machines and mechanisms, basics of structural analysis	3
Lec2	Methods for the type synthesis of mechanisms	2
Lec3	Kinematic analysis of mechanisms - methods for determining the new positions, velocities and accelerations	3
Lec4	Elements of dynamic analysis - forces in kinematic systems, kinetostatics (vector method)	3
Lec5	Linkage mechanisms - property characterization, analysis and application	2
Lec6	Manipulators (serial, parallel) -construction, characteristics, applications, kinematics manipulators	2
Lec7	Planetary gear mechanisms - analysis, characteristics, applications	2
Lec8	Cam mechanisms- characteristics, applications, analysis and design	2
Lec9	Test	1
		Total hours: 20
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)	2
Proj2	Basics of computer modeling of mechanisms in program SAM (Simulation and Analysis of Mechanism)	2
Proj3	Linkages mechanisms - kinematic analysis (vector method), (project and short test)	2
Proj4	Modeling and computer simulations of linkage mechanisms (project)	2
Proj5	Modeling and computer simulations of planetary gear mechanisms (project)	2
		Total hours: 10

TEACHING TOOLS USED

N1. problem lecture
N2. multimedia presentation
N3. self study - preparation for project class
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	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 PEK_K01, PEK_K02	Evaluation of the project, Evaluation of the short test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Gronowicz A. i inni: Teoria maszyn i mechanizmów. Zestaw problemów analizy i projektowania. Oficyna wydawnicza PWr. Wrocław 2000.
2. Gronowicz A.: Podstawy analizy układów kinematycznych. Oficyna wydawnicza PWr. Wrocław 2003.
3. Miller S.: Teoria maszyn i mechanizmów. Analiza układów mechanicznych. Oficyna wydawnicza PWr. Wrocław 1996.

SECONDARY LITERATURE

1. Morecki A., Knapczyk J., Kędzior K..: Teoria mechanizmów i manipulatorów. WNT 2002
2. Olędzki A.: Podstawy teorii maszyn i mechanizmów. WNT 1987
3. Miller S.: Układy kinematyczne. Podstawy projektowania. WNT 1988.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Basics of mechanism design
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W05	C1, C2	Le1-Le8	N1, N2, N3
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U05	C1, C2	Pr1 - Pr5	N2, N3, N4
PEK_K01, PEK_K02	K1ZIP_K04, K1ZIP_K09	C1, C2	Pr1 - Pr5	N2, N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Procesy i techniki wytwarzania II**

Name in English: **Manufacturing Processes and CAM II**

Main field of study (if applicable): **Management and Manufacturing Engineering**

Level and form of studies: **I level, part-time**

Kind of subject: **obligatory**

Subject code: **ZPM032021.**

Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		20		
Number of hours of total student workload (CNPS)	90		60		
Form of crediting	Crediting with grade		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
		Total hours: 20

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
		Total hours: 20

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. 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	
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_U03	
P = F		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Manufacturing Processes and CAM II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W08, K1ZIP_W12	C1; C2; C3		N1
PEK_U01-PEK_U03	K1ZIP_U08, K1ZIP_U12	C1; C2; C3		N2; N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Ekologia**
Name in English: **Ecology**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032037**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
Number of hours of total student workload (CNPS)	60				
Form of crediting	Crediting with grade				
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. Has the basic knowledge of chemistry, biology and ecology.
2. Makes use of reference literaturę, exploits available sources, both via the Internet and in print form.

SUBJECT OBJECTIVES

C1. To get the student acquainted with the basic problems of ecology and environmental protection.
C2. To get to know threats resulting from human activity.
C3. Familiarisation with modern solutions serving environmental protection.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Has the basic knowledge of the hazards arising from the industrial activities.
PEK_W02 - Has theknowledge of the international conventions and Polish environmental regulations.
PEK_W03 - Can characterize modern solution for environmental protection.

II. Relating to skills:

III. Relating to social competences:
PEK_K01 - Has the awareness regarding the importance of non-technical impacts of anthropogenic activity.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction. Basic concepts and definitions of ecology and environmental protection.	2
Lec2	Opportunities and threats associated with non-renewable energy resources.	2
Lec3	Non-renewable energy resources.	2
Lec4	Fuel combustion processes.	2
Lec5	The negative environmental effects related with atmosphere pollution.	2
Lec6	Ways to reduce emissions from fuel combustion processes.	2
Lec7	Renewable energy resources	2
Lec8	Energy storage.	2
Lec9	Waste management.	2
Lec10	Final test.	2
		Total hours: 20

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. tutorials
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_W03	
F2	PEK_K01	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Authoritative internet sources.

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Ecology
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W20	C1-C3	Lec1 ÷ Lec9	N1, N2, N3
PEK_K01	K1ZIP_K08	C1-C3		

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy zarządzania**
Name in English: **Essentials of Management**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032040**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
Number of hours of total student workload (CNPS)	60				
Form of crediting	Crediting with grade				
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. No initial prerequisites are required.

SUBJECT OBJECTIVES

C1. Acquiring knowledge about the process of management and basic trends and concepts of management.
C2. Acquiring knowledge about the nature and mechanisms of an organization.
C3. Acquiring knowledge about the analysis of management problems.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - The student is able to characterize different trends occurring in the evolution of organization and management theory, and to describe the most important concepts of both traditional and modern management.

PEK_W02 - The student is able to characterize basic mechanisms of organization, to distinguish between types of organizational structures, to list components of the organization and its environment.

PEK_W03 - The student is able to describe the process of management and how to implement various functions in the organization and management style.

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Organization and its resources. Introduction of the process of management.	2
Lec2	Organization's environment. Manager and manager's work.	2
Lec3	The evolution of the theory of management.	2
Lec4	The function of planning in organization. Decision making process. Strategy and strategic management.	2
Lec5	The function of organizing. Organizational structures. Human resources management.	2
Lec6	The function of leading. Motivating.	2
Lec7	The function of controlling. Steps and levels of control.	2
Lec8	Knowledge in organization as a basis of competitive advantage. Knowledge management.	2
Lec9	Changes in organizations. Change management. Innovations and innovations management.	2
Lec10	Test.	2
		Total hours: 20

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_W03	Test.
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Griffin R.W., Podstawy zarządzania organizacjami, PWN, Warszawa 2017.
2. Koźmiński A.K., Piotrowski W., Zarządzanie. Teoria i praktyka, PWN, Warszawa, 2013.
3. Masłyk-Musiał E., Rakowska A., Krajewska-Bińczyk E., Zarządzanie dla inżynierów, PWE, Warszawa, 2012.

SECONDARY LITERATURE

1. DeCenzo D.A., Robbins S.P., Podstawy zarządzania, PWE, Warszawa, 2002.
2. Hatch M.J., Teoria organizacji, PWN, Warszawa, 2002.
3. Hopej M., Kamiński R., Struktury organizacyjne współczesnych organizacji, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław, 2010.
4. Malara Z., Przedsiębiorstwo w globalnej gospodarce. Wyzwania współczesności, PWN, Warszawa 2013.
5. Miesięcznik Harvard Business Review Polska.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Essentials of Management
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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.	K1ZIP_W14	C1, C2, C3	Lec1-Lec10	N1

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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032042**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10	20			
Number of hours of total student workload (CNPS)	60	60			
Form of crediting	Crediting with grade	Crediting with grade			
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	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 of the geometric structures restitution based on Monge's projections.
C3. Acquisition of the practical skills to apply Monge's method for geometric structures mapping on the drawing's plane.

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 can indicate an appropriate solution algorithm of mapping of the position and the relationship tasks between geometric structures in the space.

PEK_W03 - Student has knowledge on restitution basis of the geometric structures represented by Monge's projections.

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's plane.

PEK_U02 - Student can set the actual sizes characterized the measuring taska of the descriptive geometry.

PEK_U03 - Student is able to interpret the drawing, made by the Monge's method, showing the position of the geometric structure in the space.

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Basi definitions and principles of the parallel and orthogonal projection by Monge, the mapping of basic geometric elements (point, line, plane).	2
Lec2	Edges and breakdown points. Transformation of the position (rotation, revolved section) and the reference system. Solids - definitions.	2
Lec3	Section of the solid (with projecting plane) as a set of the common solid's and cutting plane points, breakdown points of a solid by straight line, cutting of a solid by set of the cutting planes.	2
Lec4	Penetration of the solids - transmission line definitions, the use of auxiliary cutting planes and reference system transformation. Projections onto three orthogonal planes.	2
Lec5	Completing the missing solid's projection - use of the axonometric projection. Final test (1 hr.).	2
		Total hours: 10
Form of classes – Classes		Number of hours
Cl1	Information on the drawing utensils and principles of the geoemtric constructions drawing. Projection of a point and a straight line, the mapping of a plane using her traces; localization of the basic elements in the space using two orthogonal projection planes.	2
Cl2	Belonging of the basic geometric elements, completion of the missing projection. Edge as a set of common points of two planes.	2
Cl3	Breakdown point as a common point of a line and plane. the edge between flat figures. Identification and construction of parallel and perpendicular relationship of basic geoemtric elements.	2

Cl4	Rotation and revolved section of basic geometric elements (line's segment, plane) - application for measuring tasks solving (actual size of the line's segment, an angle of a plane figure determination).	2
Cl5	Reference system transformation application in measuring tasks and localization identification. The mappuing of elementary solids using Monge's projection, points and straight lines belonging to the solid's walls.	2
Cl6	Determination of the croos sectionas of polyhedra and solids of revolution cutted by projection planes.	2
Cl7	Determination of a transmission line of the polyhedra. Transmission line determination of the solids of revolution.	2
Cl8	Mapping the solid on three orthogonal planes. Solid modyfying by projecting plane.	2
Cl9	Solid mapping with axonometric projection. Determination of the missing projection of the solid modified by cutting planes. Relationship between Monge's projections and axonometric view.	2
Cl10	Final test	2
		Total hours: 20

TEACHING TOOLS USED

N1. problem lecture
N2. problem exercises
N3. self study - preparation for project class
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	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, PEK_U02, PEK_U03	Final test, good rating is nedeed (min. 3.0); positive evaluation of the 4 projects (sheets) - F2

P = F1*3/4+F2*1/4

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
Management and Manufacturing Engineering

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	K1ZIP_W04	C1, C2, C3	Lec1 - Lec 5	N1, N4
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U04	C1, C2, C3	Cl1 - Cl9	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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032045**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		10		
Number of hours of total student workload (CNPS)	90		60		
Form of crediting	Crediting with grade		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 basic knowledge of matematic, chemistry and physics of solids. Ability of transpositon of equations into graphs and their interpretation.

SUBJECT OBJECTIVES

C1. Students' familiarization with criteria of engineering materials types and kinds of such materials.
C2. Acknowledgements with state, properties and applications of metallic materials, polymers, ceramics and composites.
C3. Learning of interpretation and usage of equilibrium phase graphs in planning of properties of engineering materials.
C4. Ability of usage of system analysis to solving materials-related problems.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Knows groups of engineering materials and criteria of their clasiffication.

PEK_W02 - Can specify the basis properties and fields of usage and kinds of polymers, composites, ceramics and non-iron alloyed metals.

PEK_W03 - Knows types of iron alloys, can interprete their microstructures and specify their properties.

II. Relating to skills:

PEK_U01 - Can choose constructional materials to specified application.

PEK_U02 - Can analyse the influence of material chemical composition and its microstructure on strength properties and others (corrosive resistance, cracking ability, wear resistance).

PEK_U03 - Can present and give alternative option in reference to specified part of construction

III. Relating to social competences:

PEK_K01 - Broads the knowledge about the role of materials in social life

PEK_K02 - Gets acquainted with metodology on system analysis not solely in the area of technical issues

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Systems and criteria of materials classification, overall characteristic of materials groups	2
Lec2	Metals and alloyed metals. Crystal latticed and defects of structure.	2
Lec3	Polymers, ceramics	2
Lec4	Composite materials. The introduction to system analysis.	2
Lec5	System analysis in solving technical issues	2
Lec6	Equilibrium and equilibrium criteria. Crystallization	2
Lec7	Phase equilibrium graphs - part 1	2
Lec8	Iron-carbon diagrams - part 2	2
Lec9	Iron-carbon diagram	2
Lec10	Test	2
		Total hours: 20
Form of classes – Laboratory		Number of hours
Lab1	Macroscopic investigations of surfaces and fractures	2
Lab2	Macroscopic and microscopic investigations of composites with polymer matrix	2
Lab3	Analysys of equilibrium dual-phases diagrams	2
Lab4	Microscopic investigations of single- and multiplephases metals	2
Lab5	The analysis of structures in the iron-carbon diagram	2
		Total hours: 10

TEACHING TOOLS USED

N1. Traditional lecture with the use of transparences and slides
N2. Self study - self studies and preparation for examination
N3. Self study - preparation for laboratory class
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, 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, PEK_U03	The report from laboratory class
F2	PEK_K01, PEK_K02	The report from laboratory class
P = F1+F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Haimann.R, Metaloznawstwo, Wyd.PWr,2000;
[2] Grabski.M, Kozubowski.M.W, Inżynieria materiałowa - geneza,istota, perspektywy, Wyd. PW,2003;
[3] Dudziński.W, Widanka.K, Ćwiczenia laboratoryjne z materiałoznawsrwa, Wyd. PWr, 2005

SECONDARY LITERATURE

[4] Dobrzański. L.A, Postawy nauki o materiałach, WNT, 2002

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Materials Science I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W02	C1, C2, C3, C4	Lecture1-Lecture6	N1, N2, N3
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U02	C3, C4	Laboratory1-Laboratory5	N1, N3, N5
PEK_K01, PEK_K02	K1ZIP_K11	C1, C4	Laboratory1-Laboratory5	N1, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Statystyka inżynierska**
Name in English: **Statistic for Engineers**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032048**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			10	
Number of hours of total student workload (CNPS)	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	0.6			0.7	

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. Gaining basic knowledge of probability and mathematical statistics, taking into account aspects of application
C2. The acquisition of numerical data mining skills in the field of construction and operation of machinery, organization and management, and optimization of design, technology and systems
C3. Gaining skills development (reduction) of data using 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 characteristics of discrete and continuous, has a basic knowledge of rules of estimation of confidence intervals for the average value characteristics and its dispersion 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 variance.

PEK_W03 - He knows 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 and regression analysis 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 and unable to correctly select the type of statistical test and perform testing hypotheses about the average and distribution features

PEK_U03 - is able to analyze the correlation characteristics in multivariate categorical data table and 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:

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. Preparation and presentation of statistical material. The grouping of data - ranks easy and distribution. Histogram and empirical cumulative distribution	2
Lec2	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. confidence intervals	2
Lec3	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

Lec4	Nonparametric hypothesis testing. Chi-squared test, Kolmogorov-Smirnov. Test of independence Pearson chi-square. Depending measures based on chi-square. The odds ratio. Nonparametric tests. Analysis of correlation and regression. The method of least squares. Pearson correlation coefficients and Spearman.	2
Lec5	One-way analysis of variance (ANOVA). Table analysis of variance of one variable for the jednoczynnikowego. Analysis of the dynamics. Time series without any periodicity and periodicity. Methods of prediction. Development trend - a trend	2
		Total hours: 10
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. Construction ranks distribution. Graphical presentation of data collection - Histogram and empirical cumulative distribution and a graph frame area.	2
Proj2	Basic distributions encountered in mathematical statistics: the normal distribution, Student, chi-square, F Snedecor. The probability density function and cumulative distribution. Point and interval estimation of the expected value, the rate structure (faction), variance and standard deviation.	2
Proj3	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. Student test for paired test the homogeneity of many medium (ANOVA).	2
Proj4	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 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
Proj5	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 multiple correlation. Curvilinear regression. Logistic regression.	2
		Total hours: 10

TEACHING TOOLS USED

N1. calculation exercises
N2. self study - preparation for project class
N3. traditional lecture with the use of transparencies and slides
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_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_U03	test
P = F1		

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

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Statistic for Engineers
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W01	C1, C2, C3	Wy1, Wy2, Wy3	N1, N2
PEK_W02	K1ZIP_W01	C1, C2, C3	Wy2, Wy3, Wy4	N1, N2
PEK_W03	K1ZIP_W01	C1, C2, C3,	Wy3, Wy4, Wy5	N1, N2
PEK_U01	K1ZIP_U01	C1, C2, C3	Pr2, Pr3, Pr4, Pr5	N3, N4
PEK_U02	K1ZIP_U01	C1, C2, C3	Pr2, Pr3, Pr4, Pr5	N3, N4
PEK_U03	K1ZIP_U01	C1, C2, C3	Pr2, Pr3, Pr4, Pr5	N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Procesy i techniki wytwarzania I**
Name in English: **The processes and manufacturing techniques I**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032049**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		20		
Number of hours of total student workload (CNPS)	90		60		
Form of crediting	Crediting with grade		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	1.2		1.4		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Student should has a basic knowledge about the basic mechanical properties of engineering materials; has ordered knowledge about the types of metallic engineering materials - their structure, properties, applications and principles of selection; has detailed knowledge about the structures of steel and cast iron, the principles of classification and labeling; has a basic knowledge about heat and thermo-chemical treatment, has a knowledge about alloy steels and non-ferrous metals and alloys. It can analyze the macroscopic fractures, microstructure of materials, technological defects; is able to determine the characteristics of the microstructure of metallic materials; is able to identify the phases on the basis of equilibrium diagrams; can distinguish between the microstructure in terms of carbon content in steel, the influence of heat treatment; can read and interpret the drawings and diagrams used in technical documentation

SUBJECT OBJECTIVES

C1. To familiarize students with the processes and manufacturing techniques of production from the liquid metal, through the plastic molding and welding techniques.
C2. Acquisition of knowledge about the basic techniques of chipless processing and skills of parameters selection of these processes .
C3. The acquisition and consolidation of social skills including emotional intelligence involving the ability to work in a group of students with a view to effective problem solving. Responsibility, honesty and fairness in the acting; observance of customs in academia environment and society.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Knows the basic technologies of casting
PEK_W02 - Knows the basic technologies of plastic forming of elements
PEK_W03 - Knows the basic methods of welding and process parameters, and has the knowledge about the applications of welding processes, bonding and brazing in the manufacture of products.

II. Relating to skills:
PEK_U01 - Can choose a suitable casting technology and define the basic parameters of the process.
PEK_U02 - Can choose the technology of plastic forming and define the basic parameters of the process.
PEK_U03 - Can 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 - Searching for the information and critical analysis,
PEK_K02 - Objective evaluation of arguments to justify, the rational translation and his own point of view using the knowledge about the casting, plastic forming and welding.
PEK_K03 - Observance with the customs and rules of the academic environment,

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Basic concepts and algorithms for the manufacture of casts, materials used for the production of molding and core sands as well as methods for producing and testing the properties of these sands.	2
Lec2	Methods for manual and automatic production of foundry molds and mold cores. Production of molds and cores from the chemo-and thermohardening sands	2
Lec3	Production of castings in permanent molds, casting alloys.	2
Lec4	Effect of strain on the structure and properties of the material. Cold and hot forming	2
Lec5	Sheet metal, volume machining	2
Lec6	Metal Forming Tools	2
Lec7	The types of joints and welds, welding positions, gas welding	2

Lec8	Arc welding with coated electrode, in protective gases (MAG, MIG, TIG) and under the flux	2
Lec9	Soldering and Brazing	2
Lec10	Resistance and friction welding. Final Test.	2
		Total hours: 20
Form of classes – Laboratory		Number of hours
Lab1	Study of the materials and molding sands. hHnd and machine production of foundry molds and cores.	2
Lab2	Production of castings in forms of chemo-and thermohardening sands	2
Lab3	Production of castings in permanent molds, study the properties of alloys.	2
Lab4	Cold deformation and annealing of metals Rolling the metal sheets and profiles	2
Lab5	Metallurgical extrusion of machinery parts, fabrication of metal products in the process of drawing	2
Lab6	Punching-cutting, bending and stamping	2
Lab7	Health and safety of welding, gas welding, thermal cutting	2
Lab8	Arc welding with coated electrode, in protective gases (MAG, MIG, TIG) and under the flux	2
Lab9	Resistance and friction welding.	2
Lab10	Soldering and Brazing, welding stresses, Final lab test	2
		Total hours: 20

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. self study - preparation for laboratory class
N3. laboratory experiment
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_W02, PEK_W03	Final 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_U03 PEK_K01, PEK_K02, PEK_K03	entrance test- short test, quiz, oral answers, written tests
P = F		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Perzyk M. i inni; Odlewnictwo WNT Warszawa 2000Granat K. Laboratorium z odlewnictwa, skrypt PWr., Wrocław 2007 Gronostajski J., Obróbka plastyczna metali, Wrocław 1974 http://www.metalplast.pwr.wroc.pl/instrukcje.html Ambroziak A. (red.): Techniki Wytwarzania. Spawalnictwo. Laboratorium. Pwr, Wrocław 2011, http://Www.Dbc. Wroc.Pl/Content/7156/Techniki_Wytwarzania_Spawalnictwo_A.Ambroziak_Linkowane.Pdf

SECONDARY LITERATURE

Poradnik inżyniera – Odlewnictwo WNT Warszawa 1986Romanowski P., Poradnik obróbki plastycznej na zimno, Wydawnictwo Naukowo- Techniczne, W-wa 1976Pilarczyk J. (red.): Poradnik Inżyniera. Spawalnictwo. T. I i II, WNT Warszawa, 2003, 2005Klimpel A.: Spawanie, Zgrzewanie i Ciecie Metali., WNT, Warszawa, 1999

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
The processes and manufacturing techniques I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W08	C1, C2	Lec1 - Lec10	N1, N4
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U08	C1, C2, C3	Lab1- Lab10	N2, N3
PEK_K01, PEK_K02, PEK_K03	K1ZIP_K04	C3	Lab1- Lab10	N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Grafika inżynierska 3D**
Name in English: **3D Engineering Graphics**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032050**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)				20	
Number of hours of total student workload (CNPS)				60	
Form of crediting				Crediting with grade	
Group of courses				X	
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				0.7	

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 the use of CAD systems to creative and innovative design

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 – Lecture		Number of hours
Lec1	CAx systems for design. Virtual prototyping. 3D geometry modeling - parts. Solid and surface models.	2
Lec2	3D modeling - assemblies. Relationships, bonds, adaptability and variability of the model.	2
Lec3	The analysis of the virtual prototype. The analysis of the prototype on the virtual model (kinematic, dynamic).	2
Lec4	Creative design. Innovation and quality in the design	2
Lec5	The model presentations. The methodology of the engineer work. Organization of work of the design team (data exchange formats, teamwork). Completion of the course	2
		Total hours: 10
Form of classes – Project		Number of hours
Proj1	Introduction to solid modeling - basic solid modeling operations, the rules of creation of a 2D sketch, fittings in the sketch (geometric and dimensional fittings)	2
Proj2	Basic solid modeling - advanced operations on 2D sketches, solid modeling with extrude methods	2
Proj3	Solid Modeling Basics - operations on solids: chamfering, rounding, tilting walls, constructions (point, axis, plane), the creation of the ribs, the holes wizard, duplication of the solid operations	2
Proj4	The project of assembly: the concept,solid modeling with rotation, one and multibody modeling	2
Proj5	The project of assembly: solid operations - sweep, loft, split, scroll	2
Proj6	The project of assembly: parts assembling, parts editing in an assembly, a library of standard parts	2
Proj7	The project of assembly: parts modeling in the assembly environment, the adaptability of the parts	2

Proj8	The project of assembly: analysis of the functional correctness of the assembly (parameters analysis, kinematic analysis, analysis of collision) rectify design faults.	2
Proj9	The project of assembly: 2D technical drawings of parts - manufacturing parts drawings, assembly drawings	2
Proj10	Completion of the course: work during classes	2
		Total hours: 20

TEACHING TOOLS USED

N1. problem discussion
N2. self study - preparation for project class
N3. independent work on the computer under the tutor supervision

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 = FW		

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	test, participate in problem discussions
P = 0,4*F1+0,6*FW		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1]Stasiak Fabian, Autodesk Inventor. START!, ExpertBooks 2008
[2]Stasiak Fabian, Zbiór ćwiczeń Autodesk Inventor 2012, ExpertBooks 2012

SECONDARY LITERATURE

[1]http://autodesk-inventor-pl.typepad.com/
[2]http://autodesk-inventor-pl.blogspot.com/

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
3D Engineering Graphics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_U04, K1ZIP_U05, K1ZIP_U35	C1, C2	Pr1 - Pr9	N2, N3
PEK_K01	K1ZIP_K07	C3	Pr1 - Pr9	N1

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy projektowania maszyn**
Name in English: **Fundamentals of Machine's Engineering Design**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032051**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20			20	
Number of hours of total student workload (CNPS)	120			60	
Form of crediting	Examination			Crediting with grade	
Group of courses					
Number of ECTS points	4			2	
including number of ECTS points for practical (P) classes				2	
including number of ECTS points for direct teacher-student contact (BK) classes	2.4			1.4	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge:
- student has knowledge on the fundamentals of mechanics, strength of materials and materials technology;
- student knows the basic rules of the technical drawing.
2. Skills:
- student can use the knowledge on mechanics, strength of materials and materials technology in practice;
- the student can graphically present technical objects.
3. Competences:
- the student understands and is aware of what the technological activity is and how it influences the environment.

SUBJECT OBJECTIVES

C1. To familiarize students with the design and operation principle of basic machine components, units and systems.
C2. To familiarize students with the rules of the engineering design process.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - As a result of the classes, the student should be able to recognize and select the basic machine elements, units and systems.

PEK_W02 - As a result of the classes, the student should be able to present the basic rules of the engineering design process.

II. Relating to skills:

PEK_U01 - As a result of the course, the student should be able to prepare the technical drawings of basic mechanical components, units and systems.

PEK_U02 - As a result of the classes, the student should be able to select and to make engineering calculations of the basic machine elements, units and systems.

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Engineering design process.	1
Lec2	Welded joints.	2
Lec3	Load-carrying structures.	1
Lec4	Screw joints and mechanisms.	2
Lec5	Axes and shafts.	2
Lec6	Bearings and sealings.	2
Lec7	Couplings and breaks.	2
Lec8	Gear transmissions.	4
Lec9	Belt transmissions.	2
Lec10	An example of practical designing of a machine or a device.	2
		Total hours: 20
Form of classes – Project		Number of hours
Proj1	Development of the design assumptions for the built drive system	2
Proj2	Analysis of the problem, determination of the quantitative data and the operational conditions	2
Proj3	Making the basic engineering calculations and selection of elements for the built drive system	6
Proj4	Making the technical documentation comprised of the assembly drawing and at least one working drawing as a handwritten draft and drawings made by means of CAD software	8
Proj5	Summary and conclusions	2
		Total hours: 20

TEACHING TOOLS USED

N1. informative lecture
N2. tutorials
N3. traditional lecture with the use of transparencies and slides
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_W02	Examination
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	Partial evaluation of the project
P = F1 + F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Osiński Z. i inni: Podstawy konstrukcji maszyn, PWN, Warszawa 1999,
2. Dietrich M. i inni: Podstawy konstrukcji maszyn. T.1-3, WNT, Warszawa 1995

SECONDARY LITERATURE

1. Pahl G., Beitz W.: Nauka konstruowania, WNT, Warszawa 1984,
2. Kurmaz L., Kurmaz O.: Projektowanie węzłów i części maszyn, Wydawnictwo Politechniki Świętokrzyskiej, Kielce 2003.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Fundamentals of Machine's Engineering Design
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W04, K1ZIP_W05	C1, C2	Lec1-Lec10	N1, N2, N3, N4
PEK_U01, PEK_U02	K1ZIP_U05	C2	Proj1-Proj5	N2, N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy programowania**
Name in English: **Fundamentals of computer programming**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032052.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			20	
Number of hours of total student workload (CNPS)	60			60	
Form of crediting	Crediting with grade			Crediting with grade	
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	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		1
Lec5		1
Lec6		1
Lec7		1
		Total hours: 10
Form of classes – Project		Number of hours
Proj1		2
Proj2		2
Proj3		4
Proj4		2
Proj5		2
Proj6		2
Proj7		2
Proj8		2
Proj9		2
		Total hours: 20

TEACHING TOOLS USED

N1. informative lecture
N2. multimedia presentation
N3. report preparation
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	
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	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Fundamentals of computer programming
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W10	C1, C2, C3		N1, N2
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U10	C4		N3-N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Zarządzanie produkcją i usługami I**
Name in English: **Production and Services Management I**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032053.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20			10	
Number of hours of total student workload (CNPS)	90			60	
Form of crediting	Crediting with grade			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	1.2			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		1
Lec2		2
Lec3		2
Lec4		1
Lec5		2
Lec6		2
Lec7		4
Lec8		1
Lec9		3
Lec10		2
		Total hours: 20
Form of classes – Project		Number of hours
Proj1		1
Proj2		1
Proj3		2
Proj4		3
Proj5		3
		Total hours: 10

TEACHING TOOLS USED

N1. multimedia presentation
N2. self study - preparation for project class
N3. tutorials
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, PEK_W02, PEK_W03	
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, PEK_K03	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Production and Services Management I
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W14, K1ZIP_W15	C1, C2		N1, N3
PEK_U01 - PEK_U03	K1ZIP_U14, K1ZIP_U15	C1, C2, C3		N2, N3, N4
PEK_K01- PEK_K03	K1ZIP_K01	C1, C2, C3		N2, N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Technologia montażu**
Name in English: **Technology of Assembly**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032054**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20			10	
Number of hours of total student workload (CNPS)	90			30	
Form of crediting	Examination			Crediting with grade	
Group of courses					
Number of ECTS points	3			1	
including number of ECTS points for practical (P) classes				1	
including number of ECTS points for direct teacher-student contact (BK) classes	1.2			1.4	

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. It has a basic knowledge of description and analysis processes. He knows the rules of process engineering design and construction and operation of basic components, assemblies and systems machine. It has a basic knowledge about methods of design and analysis of the various mechanisms found in machine and plant construction. It has a basic knowledge of manufacturing and shaping properties of engineering materials, processes shaping the structure and properties of metal alloys. He has ordered knowledge about treatment of erosive and other technologies shaping geometric form and surface treatment and thermo-chemical.
2. It has the skills writing design and creation of technical documentation of mechanical structures and to read it. Can measure the specific machine parts, quantities characterizing the quality of the surface and estimate the errors of measurements and develop measurement results. He can use the manufacturing technologies in order to shape the form, structure and properties of the products.
3. He is aware of the responsibility for own work and a willingness to comply with the principles of teamwork and responsibility for jointly implemented tasks.

SUBJECT OBJECTIVES

C1. Acquisition of basic knowledge about the methods and organization of production processes
C2. Gaining the ability to analyze the structure of the team and select the right technology, combining elements and basic principles of the organization of the assembly process
C3. Search for information and the ability to analysis and evaluation methods of the assembly process
C4. Acquiring the ability to design process uncomplicated installation team

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - The student has ordered knowledge of the design of production processes
PEK_W02 - The student knows the methods and techniques of the organization of production processes
PEK_W03 - The student has ordered knowledge of methods, techniques and tools for the reorganization and optimization of technological processes assembly

II. Relating to skills:
PEK_U01 - The student has the ability to develop a record of creating and reading technical documentation logical assembly of mechanical structures
PEK_U02 - The student is able to analyze the manufacturability of the design due to the installation and use appropriate methods of shaping and joining components
PEK_U03 - Student can design a technological process uncomplicated installation team

III. Relating to social competences:
PEK_K01 - search for information and its critical analysis
PEK_K02 - awareness of responsibility for own work and a willingness to comply with the principles of teamwork and responsibility for jointly implemented tasks
PEK_K03 - objective evaluation of arguments, rational translation and justifying their own point of view, the use of knowledge in the field of production processes

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	The assembly process in the production process	2
Lec2	Stages of the assembly process planning	2
Lec3	Description of the structure of products, assembly seqence planning and the development schemes and plans of assembly	2
Lec4	Producibility machines due to assembly	3
Lec5	Methodology "Design for Assembly" as a tool for structural analysis	3
Lec6	Manual assembly, ergonomics and mechanization of work as the primary design criteria assembly stands	2
Lec7	Assembly operations, connection types, classes part-mounted	2
Lec8	The methodology and analysis of standardization work time: MTM	4
		Total hours: 20

Form of classes – Project		Number of hours
Proj1	Analysis of the input data and the structure of the unit to be mounted	2
Proj2	Evaluation of manufacturability product design	2
Proj3	Assembly sequence planning and the development schemes and plans of assembly Determining the content of operations and assembly operations	2
Proj4	The design assessment of the product due to the installation of DFA method	2
Proj5	Standardization of the assembly process using the MTM method	2
		Total hours: 10

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. self study - preparation for project class
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_W02, PEK_W03	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_U02, PEK_U03	evaluation of the final project
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Bruno Lotter: Wirtschaftlische Montage, VDI Verlag 1992
[2] Jerzy Łunarski, Wiktor Szabajkowicz: Automatyzacja procesów technologicznych montażu maszyn, WNT Warszawa 1993
[3] T. Sawik, „ Planowanie i sterowanie produkcji w elastycznych systemach montażowych” . WNT Warszawa 1993
[4] G. Boothyroyd: „Assembly Automation and Product Design”, Marcel Dekker., NewYork, 1992

SECONDARY LITERATURE

[1] Kwartalnik Technologia i automatyzacja montażu
[2] H.J.Warnecke: „Die Montage im flexiblen Produktionsbetrieb”, Springer-Verlag Berlin 1996

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Technology of Assembly
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W08	C1	Wy1 - Wy10	N1, N3, N4
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U08	C2, C3	Pr1 - Pr5	N2, N3
PEK_K01, PEK_K02, PEK_K03	K1ZIP_K08, K1ZIP_K09	C4	Pr1 - Pr5	N2, N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Maszyny i urządzenia technologiczne**
Name in English: **Technological machines and devices**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032058**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		10		
Number of hours of total student workload (CNPS)	90		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 student has basic knowledge relating to the design-construction process and the structure and working of machine components and units.
2. The student has sound knowledge relating to the basic manufacturing techniques and the role of technological machines.
3. The student can read and interpret the figures and schematics used in machine engineering documentation.

SUBJECT OBJECTIVES

C1. The student is to learn the structure of principal technological machines, especially their drive, control and measuring systems.
C2. The student is to learn the basic technical-operational characteristics of modern technological machines.
C3. The student is to learn the principles and possibilities of using technological machines to perform specific machining tasks.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - The student knows the structure and principles of operation of modern technological machines, especially their kinematics and the principles of controlling their operation.

PEK_W02 - The student knows the principles of selecting technological machines to perform specific machining tasks.

PEK_W03 - The student knows the basic testing methods used to assess the condition of technological machines.

II. Relating to skills:

PEK_U01 - The student can evaluate technological machines from the point of view of their suitability for specific machining tasks.

PEK_U02 - The student can define how a technological machine is to function.

PEK_U03 - The student can determine the basic parameters characterizing the operation of a technological machine.

III. Relating to social competences:

PEK_K01 - The student knows how to search for and use the literature recommended for the course and acquire knowledge on her/his own.

PEK_K02 - The student can exploit basic knowledge relating to the methods of controlling the operation of technological machines.

PEK_K03 - The student understands the necessity of systematic and unassisted work in order to master the course material.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Significance and development of manufacturing technology. General characteristics of manufacturing machines and their classification. Technical and operational parameters. Basic requirements.	2
Lec2	Geometrical and kinematic structures of the machines. Parts, mechanisms and components of manufacturing machines: bodies, spindle and guiding assemblies, tooling and workpiece systems.	2
Lec3	Main drive and feeding systems of modern manufacturing machines (basic requirements, exemplary solutions). Measurement, diagnostics and supervision systems.	2
Lec4	Basics of automatic control of manufacturing machines. Classification of control systems (NC, CNC, DNC, AC and PLC systems). Elements of programming CNC machines.	2
Lec5	Cutting machine tools for machining rotating and flat surfaces - lathes, drills, milling machines, boring machines. The technical and utility characteristics and function of the machines.	2
Lec6	Cutting machine tools for machining rotating and flat surfaces - grinders, planers and slotters. Machine tools for special technical shapes (threads and teeth). The technical and utility characteristics and function of the machines.	2

Lec7	Multitasking machines (in-line transfer machines). Machines for electrical discharge and laser machining. The technical and utility characteristics and function of the machines.	2
Lec8	Selected structures of NC machines for chipless machining. CNC machining centres, autonomous machining stations. The role of robots and manipulators in production automation.	2
Lec9	Multimachine robotized manufacturing systems. Computer-integrated manufacturing systems (CIM).	2
Lec10	Trends in development of CNC manufacturing machines (machines for HSC machining, hexapods, intelligent and hybrid machine tools).	2
		Total hours: 20
Form of classes – Laboratory		Number of hours
Lab1	The measurement of power losses during non-load operation and the overall efficiency of a machine.	2
Lab2	The assessment of machine loudness	2
Lab3	The change of rotational motion to rectilinear motion in technological machines.	2
Lab4	Measurements of energy losses in spindle rolling bearings.	2
Lab5	Selected problems relating to the dynamic properties of machine tools.	2
		Total hours: 10

TEACHING TOOLS USED

N1. the 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. 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	Written examination.
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 PEK_K01, PEK_U02, PEK_K03	Short tests on the particular laboratory topics.
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Honczarenko J.: Flexible automation of manufacture. Machine tools and machining systems. WNT, Warszawa, 2000.
Kosmol J.: Automation of machine tools and machining. WNT, Warszawa, 2000.
Honczarenko J.: Numerically controlled machine tools. WNT, Warszawa, 2009.
Wrotny L. T.: Machine tools for metal cutting. WNT, Warszawa, 1979.
Białek M. : Technological machines. Oficyna Wydawnicza Politechniki Warszawskiej, 1995.

SECONDARY LITERATURE

Paderewski K.: Vademecum of machine tools. WNT, Warszawa, 1979.
Dmochowski J., Uzarowicz A.: Machining operations and machine tools. PWN, Warszawa, 1980.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Technological machines and devices
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W08	C1, C2, C3	Wy1 - Wy10	N1, N2, N4
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U12	C1, C2, C3	La1 - La5	N2, N3
PEK_K01, PEK_U02, PEK_K03	K1ZIP_K04	C1, C2, C3	La1 - La5	N1 - N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy automatyzacji**
Name in English: **Fundamentals of Automation**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032059.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		10		
Number of hours of total student workload (CNPS)	90		30		
Form of crediting	Examination		Crediting with grade		
Group of courses					
Number of ECTS points	3		1		
including number of ECTS points for practical (P) classes			1		
including number of ECTS points for direct teacher-student contact (BK) classes	1.2		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 devices used in automation.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - It has knowledge in the basics of automation, robotics and automation.
PEK_W02 - Can describe the construction of automation components
PEK_W03 - Can explain the operation of control systems

II. Relating to skills:
PEK_U01 - Can apply automation components for process automation
PEK_U02 - Can program the selected control elements
PEK_U03 - Is able to operate automated manufacturing processes

III. Relating to social competences:
PEK_K01 - Searching information and their critical analysis
PEK_K02 - Work in a team and relying on improving methods for the selection of a strategy to optimally solve the problems assigned to the group.
PEK_K03 - Respect the traditions and rules in academia and society

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction to the course, signal concept, types of signals.	2
Lec2	Automation systems and their classification. Boolean algebra, logic (combination and sequential), examples.	2
Lec3	Description of linear automation systems: transfer function, time characteristics, frequency response, frequency characteristics.	2
Lec4	Combined logic and sequential logic	2
Lec5	Two-sided and three-sided control	2
Lec6	Controllers: PI, PD, PID	2
Lec7	Industrial control system. PLCs	2
Lec8	Controllers: PI, PD, PID	2
Lec9	HMI and SCADA systems	2
Lec10	Discrete automatic control.	2
		Total hours: 20
Form of classes – Laboratory		Number of hours
Lab1	Introduction, OSH training. Synthesis of combination control systems.	2
Lab2	Synthesis of sequential control systems	2
Lab3	Control systems equipped with P, PI, PID control	2
Lab4	Components and systems of pneumatics and hydraulics	2
Lab5	Modeling of automated manufacturing processes, programming CNC machines	2
		Total hours: 10

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. problem exercises
N3. self study - preparation for laboratory class
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_W02, PEK_W03	
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	
P = F1+F2		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Fundamentals of Automation
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W07	C1, C2, C3		N1, N2, N3, N4
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U07	C1, C2, C3		N1, N2, N3, 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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032063**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20			20	
Number of hours of total student workload (CNPS)	60			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. Basic knowledge of descriptive geometry.
2. Basic drawing skills and service of computer equipment.
3. The skill to use the Internet digital resources.

SUBJECT OBJECTIVES

C1. The acquisition of knowledge and skills in axonometric projection and rectangular in mapping the elements of space on the plane and the rules for engineering drawing with the use of views, sections, and lays in the engineering drawings.
C2. The acquisition of knowledge and skills in the dimensioning and tolerancing of dimensions of machine parts, as well as the identification of their surface features and shape and position tolerances.
C3. The acquisition of knowledge and skills in the field of graphic representation of connections of machines and rules for standardization in constructions drawings, as well as elements drawings (manufacturing drawings) and complex systems (assembly drawings) and the principles of schematization.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - The student knows and is able to explain the rules of constructions drawings and creating the technical documentation of elements and mechanical components.
PEK_W02 - The student knows how to call the basic parameters characterizing the geometric features of a product and propose how to save these information.
PEK_W03 - The student knows the principles of graphic representation of joint of machine elements and drawing the standard machine elements.

II. Relating to skills:
PEK_U01 - Student is able to make in a handwritten way, or by using the drawing instruments and computer drawing software (AutoCAD) construction drawing and schematization of technical systems.
PEK_U02 - The student knows how to read the record of the technical documentation of the machine component and complex technical systems and schematic drawing.
PEK_U03 - Student can identify and record the basic standardized connection of machine parts.

III. Relating to social competences:
PEK_K01 - The student has the ability to critically assess the correctness in drawing the technical documentation of machine component and complex technical systems.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	The importance of the engineering drawing. Rules for structure drawings. The basics of creating handwritten drawings and using them Computer programs (CAD). Rectangular and axonometric projections.	2
Lec2	The views, sections and lays in the engineering drawing.	2
Lec3	Principles of dimensioning in the engineering drawing.	2
Lec4	Tolerances and fits of machine parts.	2
Lec5	Surface roughness of machine parts, deviations of form and position.	2
Lec6	Drawing of joints of machine elements - rules for drawing disconnect connections.	2
Lec7	Drawing of joints of machine elements - rules for drawing inseparable connections.	2
Lec8	Drawing of standard machine elements. Rules of schematization.	2
Lec9	Final test.	2
Lec10	Discussion of the colloquium and the course summary.	2
		Total hours: 20
Form of classes – Project		Number of hours

Proj1	Introduction: the rules and organization of activities, the purpose of the course, a framework program of the course, credit conditions. Issue of topic I: based on axonometric drawing from the chapter 6 [3] should the freehand drawing element in three rectangular views be drawn. Basics AutoCAD – performing the simple drawings: the organization of the graphical editor, create the prototype drawing. Basic drawing functions (line, circle, arc, etc.) - Exercises in drawing.	2
Proj2	On the basis of freehand drawing element from the chapter 6 [3] the drawing of this element in AutoCAD should be made. Apply the respective sections in order to see the inside of the element. Podstawy AutoCAD-a c.d., narzędzia edycji (wymaż, utnij, wydłuż itp.).	2
Proj3	Principles of dimensioning in AutoCAD. AutoCAD dimensioning styles. Dimensioning of the drawing from previous classes (from Ch. 6 [3]). Draw the element specified in the 1st topic in isometric using AutoCAD. Use a isometric jump, switching planes and isometric drawing in those planes.	2
Proj4	Task assesment - the 1st subject. topic II issue: the task from chap. 3 [3] – freehand drawing. Drawing topic II in AutoCAD, dimensioning with taking the tolerated dimensions into consideration, explicitly specify the size of tolerated deviations, entering the text in AutoCAD - notes, drawing attention.	2
Proj5	Colloquium about the existing material (1 hr.). Receive task - the subject II. Topic III: drawing of construction elements that are more complex in geometric form, tasks from the chapter. 5.1 [3]. Correcting the freehand drawing (roller type) from Ch. 5.1 [3] and starting the drawing in AutoCAD. (dimensioning rules - subordinate to the plans, views, sections, examples).	2
Proj6	Continuation of topic III from chapter III. 5.1 [3] - dimensioning of element in AutoCAD. Building Blocks, broadcast attributes (Determination of surface roughness), deviations of form and position in AutoCAD, explicitly specify the size deviations tolerated, additional information (as due) - Enter text in AutoCAD.	2
Proj7	Topic IV: the construction task. Any subject - set by the teacher. Recommendations: little complicated engineering system, consisting of several parts (5 to 10), eg .: hinge bolt from the chapter 4 [3], the flexible coupling inseparable PN, bearing puller, a car jack (indicated models of these bands). Performing its documentation - exploded view drawings and selected 3 interacting with each other elements.	2
Proj8	Execution of assembly drawing of machine assembly using AutoCAD (discussing the substance of an assembly drawing, a drawing tablet, saving the typical connections and machinery components of standardization in the record structure).	2
Proj9	Execution of drawings of components of the machine assembly using AutoCAD. Subject V - performing the schematic drawing of the kinematic assembly of the subject VI or a new topic - based on the assembly drawing (by hand and by AutoCAD).	2
Proj10	Pick the subject IV and V. A course.	2
		Total hours: 20

TEACHING TOOLS USED

N1. Traditional lecture with the use of transparencies and slides.
N2. Consultations.
N3. Own work - preparing the draft.
N4. Independent work on the computer under the guidance of lecturer.
N5. Presentation of the project.

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	Colloquium
P = F1 = Fw		

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	Quiz, oral answers, assessment of individual work in the design class.
F2	PEK_U01 , PEK_U02 , PEK_U03 , PEK_K01	Evaluation of project preparation.
F3	PEK_U01 , PEK_U02 , PEK_U03 , PEK_K01	Test.
P = 0,4*F1 + 0,3*F2 + 0,3*F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Dobrzański T., Rysunek Techniczny Maszynowy. WNT, Warszawa, 2009.
[2] Rydzanicz I., Zapis konstrukcji. Podstawy. Oficyna Wyd. PWr., Wrocław 2000.
[3] Rydzanicz I., Rysunek techniczny jako zapis konstrukcji. Zadania. WN-T, Warszawa 2004.

SECONDARY LITERATURE

[4] Rysunek techniczny i rysunek techniczny maszynowy. Zbiór Polskich Norm.
[5] Kurmaz L., Kurmaz O., Projektowanie węzłów i części maszyn. Wyd. Politechniki Świętokrzyskiej, Kielce 2004.
[6] Potrykus J., red. Poradnik mechanika (praca zbiorowa). Wyd. REA s.j., Warszawa 2008.
[7] http://www.plan-rozwoju.pcz.pl/wyklady/mechatronika/Wybrane_zagadnienia_projektowania.pdf
[8] http://www.cad.pl/kursy/

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Engineering Graphics - Engineering Drawing
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W04, K1ZIP_W05	C1, C2, C3		N1, N2, N3
PEK_U01 - PEK_U03	K1ZIP_U04	C1, C2, C3		N2, N3, N4, N5
PEK_K01	K1ZIP_K10	C1, C2, C3		N2, N3, N4, N5

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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032064**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		10		
Number of hours of total student workload (CNPS)	120		60		
Form of crediting	Examination		Crediting with grade		
Group of courses					
Number of ECTS points	4		2		
including number of ECTS points for practical (P) classes			2		
including number of ECTS points for direct teacher-student contact (BK) classes	2.4		1.4		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. The passed lecture Materials Science I and laboratory classes Materials Science I (the requirement does not have formal character - it is related with knowledge and abilities given in course card - Materials Science I)

SUBJECT OBJECTIVES

C1. The familiarization (with details) with microstructures, properties and applications of metallic constructional materials
C2. Presentation (with theoretical background) of strengthening methods of such materials through heat treatment, chemical-heat treatment, solution strengthening and plastic deformation
C3. Presentation of the influence of alloying elements on microstructure, specific properties and application of metal alloys

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Knows kinds and symbols (according to current International and Polish Standards) of metal alloys.
PEK_W02 - Is able to determine the microstructure and properties in the equilibrium state basing on proper eqiulibrium diagrams.
PEK_W03 - Can specify and explain the chosen type of alloy strengthening

II. Relating to skills:
PEK_U01 - Can choose alloy grade to specified application, basing on chemical composition and its microstructure in the equilibrium conditions
PEK_U02 - Can propose 'technology card' of heat treatment (or another), with alloy properties appropriate to specified usage.
PEK_U03 - Can explain different kind of alloys, chosen for similar application.

III. Relating to social competences:
PEK_K01 - Broads the knowledge in the field of new materials in the daily usage.
PEK_K02 - Learn the economic background and the applications of new metallic materials in the industry

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Microstructures of steels, liquid steels and cast iron	2
Lec2	Theoretical basics of heat treatment - the introduction, Pearlite-austenite transition	2
Lec3	Austenite-pearlite transition, Bainitic and martensitic transformations	2
Lec4	TTTi and TTTc diagrams and their interpretation	2
Lec5	Tempering processed, The influence of heat treatment on structures, properties and applications of steel	2
Lec6	The heat treatment	2
Lec7	The influence of alloying elements on steels structures	2
Lec8	The heat treatment of alloying steels and their application	2
Lec9	Alloys of non-iron metals	2
Lec10	Metallic materials dedicated to special purposes	2
		Total hours: 20
Form of classes – Laboratory		Number of hours
Lab1	Cast iron - microstructures and properties	2
Lab2		2
Lab3		2
Lab4	Alloying steels with special properties - microstructures	2
Lab5		2
		Total hours: 10

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. tutorials
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	Exam
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_K02	Report from laboratory classes, intro test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] Haimann. R, Metaloznawstwo, Wyd. PWr, 2000
[2]Przybyłowicz.K, Metaloznawstwo, Wyd. WNT,2007
[3]Dudziński.W, Widanka.K, Ćwiczenia laboratoryjne z materiałoznawstwa, Wyd. PWr, 2005

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Materials Science II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W02	C1, C2, C3	Lec1-10	N1, N2, N4
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U01, K1ZIP_U02	C1, C2, C3	La1-5	N3, N4, N5
PEK_K01, PEK_K02	K1ZIP_K06, K1ZIP_K11	C2, C3	La1-5	N1, N2, 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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032065**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20	10	10		
Number of hours of total student workload (CNPS)	60	30	30		
Form of crediting	Examination	Crediting with grade	Crediting with grade		
Group of courses					
Number of ECTS points	2	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	1.2	0.7	0.7		

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. Understanding of the basics and applications of deformable body mechanics in homogeneous and heterogeneous bodies
C2. Performing strength analysis of machine components and calculating stresses and strains
C3. Students are able to experimentally determine the mechanical properties of materials and calculate permissible stresses

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Understanding of the basics of vector analysis and its application in continuum theory
PEK_W02 - Students know the most important group of mechanics equations describing a continuum: geometric relationships,
constitutive equations and equilibrium equations
PEK_W03 - Students know the most useful failure criteria and their application and possess the knowledge necessary to solve the classic tasks of mechanics

II. Relating to skills:
PEK_U01 - Students can use vector analysis in solving problems of strength of materials
PEK_U02 - Students can calculate stress and displacement in prismatic or thin-walled rods, simply or complex loaded, as well as in detachable and non-detachable joints
PEK_U03 - Students can design a rod under compression that is resistant to loss of stability

III. Relating to social competences:
PEK_K01 - Students can use vector analysis in solving problems of strength of materials
PEK_K02 - Students able to objectively evaluate arguments, rationally explain and justify their own point of view using knowledge of strength of materials
PEK_K03 - Students shall observe the rules and regulations of the academic community

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Basic assumptions, concepts and experimental foundations of strength of materials. Calculation of stresses for straight tension members in statically determinate cases	2
Lec2	Strength design of members in hyperstatic cases. Influence of temperature and own weight	2
Lec3	Stress and strain theory	2
Lec4	Torsion of circular, rectangular and thin-walled shafts	2
Lec5	Technological shearing. Screw springs	2
Lec6	Bending of straight members. Internal forces and stresses. Unsymmetrical bending	2
Lec7	Displacements in beams. Deflection line of a beam	2
Lec8	Buckling of rods under compression	2
Lec9	Failure criteria. Combined modes of loading	2
Lec10	Time and temperature dependent loads: fatigue, creep and relaxation	2
		Total hours: 20
Form of classes – Classes		Number of hours
Cl1	Tension and compression – statically determinate and indeterminate cases	2
Cl2	Transformation of plane stresses. Calculation of strains based on generalized Hooke's law	2

Cl3	Torsion of circular shafts. Technological shearing. Calculating riveted, welded, pin and keyway joints	2
Cl4	Calculation of bending members. Determination of displacements by the Clebsch method	2
Cl5	Written test	2
		Total hours: 10
Form of classes – Laboratory		Number of hours
Lab1	Introduction. Investigation of mechanical properties of metals. Tensile test.	2
Lab2	Strain gauge analysis	2
Lab3	Determination of fatigue limit	2
Lab4	Loss of rod stability - buckling. Compression test	2
Lab5	Summary of laboratories and examination	2
		Total hours: 10

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	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_U02,	Written test, oral answers
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,	Entrance quiz, report on laboratory classes
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1.Niezgodziński M., Niezgodziński T., Wytrzymałość materiałów, PWN, 1998,
2.Dyląg Z., Jakubowicz A., Orłoś Z., Wytrzymałość materiałów, t. 1, WNT, 1999,
3.Zakrzewski M, Zawadzki J. „Wytrzymałość materiałów", PWN Warszawa 1983
4.Brzoska Z., Wytrzymałość materiałów, PWN, 1974,
5.Malinin N., Rżysko J., Mechanika materiałów, PWN, 1981,
6.Niezgodziński M., Niezgodziński T., Zadania z wytrzymałości materiałów, PWN, 2000

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
Management and Manufacturing Engineering

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	K1ZIP_W03	C1	Lec1-Lec10	N1
PEK_U01, PEK_U02	K1ZIP_U03	C2	Cl1-Cl4	N2

SUBJECT SUPERVISOR

dr inż. Robert Jasiński email: robert.jasinski@pwr.edu.pl

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Podstawy logistyki**
Name in English: **Fundamentals of logistics**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032067**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20	10			
Number of hours of total student workload (CNPS)	90	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 przesiębiorstwa

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	Basic concepts and definitions. System and logistics process. The classification criteria.	2
Lec2	Logistics supply. Inventory management. Just In Time Strategy.	2
Lec3	Logistics of production. Range of computer support: MRP I, MRP II, ERP.	2
Lec4	Logistics distribution. Forecasting demand.	2
Lec5	Reverse logistics. Ekologistyka	2
Lec6	Information technology, automatic identification method, EDI	2
Lec7	Packaging. Basic functions. Logistic label.	2
Lec8	Technologies of handling and storage.	2
Lec9	Transport technologies. Linear infrastructure .	2
Lec10	Logistics centers.Point infrastructure .	2
		Total hours: 20

Form of classes – Classes		Number of hours
Cl1	Introduction to exercise. Overview of the exemplary embodiment of the supply chain	2
Cl2	Inventory management. Classification ABC / XYZ.	2
Cl3	Forecasting demand	2
Cl4	Simulation of a Kanban production system	2
Cl5	Transport management in the context of supply chain	2
		Total hours: 10

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	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, PEK_K01	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
Management and Manufacturing Engineering

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	K1ZIP_W17	C1, C3	Lec1, Lec2, Lec8 - Lec15	N1
PEK_W02	K1ZIP_W17	C2	Lec2 - Lec7	N1
PEK_U01	K1ZIP_U17	C2	Cl1 - Cl7	N2, N3
PEK_U02	K1ZIP_U17	C2	Cl1 - Cl7	N2, N3
PEK_K01	K1ZIP_K02	C1	Cl1 - Cl7	N2, N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Struktury danych w inżynierii produkcji**
Name in English: **Data structures in production engineering**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032068**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			20	
Number of hours of total student workload (CNPS)	60			60	
Form of crediting	Crediting with grade			Crediting with grade	
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. Fundamentals of modeling - algorithms, processes
2. Basic knowledge of computer systems

SUBJECT OBJECTIVES

C1. The aim of the course is to get acquainted with the process of designing data structures for engineering data modeling
C2. Correct identification and modeling needs of future users of database systems
C3. transfer of the basic knowledge required to use the SQL queries language
C4. The ability to create complex data structures

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Has basic knowledge of the process of designing data structures
PEK_W02 - Has a knowledge of modeling and recognizing the needs of users.
PEK_W03 - Has a knowledge of relational database management systems

II. Relating to skills:
PEK_U01 - Can design a data structures and use SQL to communicate with databases
PEK_U02 - Can properly identify and model the needs of future users of the database
PEK_U03 - Able to use the relational database management system

III. Relating to social competences:
PEK_K01 - Think and act in a logical manner
PEK_K02 - Can draw logical conclusions and solve the stated problem in orderly manner.
PEK_K03 - Can appropriately define the priorities for implementation tasks specified by you or others.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Theory of management / data collection - introduction	2
Lec2	Development of databases - data types	2
Lec3	The theoretical basis of data structures design .	2
Lec4	Designing conceptual, logical and physical data structures	2
Lec5	Database normalization	2
		Total hours: 10
Form of classes – Project		Number of hours
Proj1	Practical basics of data structures design .	2
Proj2	Designing conceptual, logical and physical data structures - practice	2
Proj3	Getting to know the basics of database administration (setting up a database, user administration, granting rights to objects in the database, backup, replication, etc.).	4
Proj4	Database design to meet defined criteria.	10
Proj5	Project testing	2
		Total hours: 20

TEACHING TOOLS USED

N1. problem discussion
N2. tutorials
N3. self study - preparation for project class
N4. project presentation
N5. 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	Final test
P =		

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, PEK_K03	project defense
P =		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Relacyjne bazy danych Autorzy: Mark Whitehorn, Bill Marklyn Data wydania: 2003/08

Bazy danych SQL. Teoria i praktyka Autor: Wiesław Dudek Data wydania: 2006/11

SECONDARY LITERATURE

SQL. Rusz głową! Autor: Lynn Beighley Data wydania: 2010/11

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Data structures in production engineering
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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;	K1ZIP_W10	C1, C2, C3	Wy1 - Wy5	N5, N2
PEK_U01- PEK_U03	K1ZIP_U10	C1, C2, C3	Pr1 - Pr5	N1, N2, N3, N4
PEK_K01- PEK_K03	K1ZIP_K04	C2	Pr1 - Pr5	N1, N2

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Przetwórstwo tworzyw sztucznych**
Name in English: **Processing of plastics**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032070**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		10		
Number of hours of total student workload (CNPS)	90		60		
Form of crediting	Crediting with grade		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. It has a basic knowledge of the material and mechanical properties of engineering materials

SUBJECT OBJECTIVES

C1. Acquisition of basic knowledge on the classification, properties, and methods of processing plastics.
C2. Acquisition of skills identification and selection of polymeric materials for technical applications.
C3. The acquisition and consolidation of social skills including emotional intelligence skills relying on cooperation in the group of students with a view to effective problem solving. Responsibility, honesty and fairness in the procedure observance force in academia and society.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - knows the types and basic properties of polymeric materials
PEK_W02 - knows the basic method of processing of polymeric materials
PEK_W03 - has knowledge of the basics and applications of polymeric materials processing

II. Relating to skills:
PEK_U01 - able to identify polymeric materials
PEK_U02 - processing method is able to select the type of polymeric material
PEK_U03 - able to select a polymer material for technical applications

III. Relating to social competences:
PEK_K01 - search for information and its critical analysis
PEK_K02 - objectively examine the arguments, rational translations and justify their own point of view, using knowledge of plastic processing
PEK_K03 - observance and rules in academia

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Organizational matters. Definitions of polymers and plastics. Methods for the preparation of polymers. The chemical and physical structure of polymers. Basic concepts of polymer materials.	2
Lec2	Modification of polymers. Types and effects of additives on the properties of plastics. Properties of polymeric materials for the metal.	2
Lec3	Construction, variety, properties and applications of selected polymers.	2
Lec4	Classification of methods of plastics processing. Methods of preparation. Selected methods of direct forming.	2
Lec5	Plastic extrusion technology. Variations of the process extrusion. Calendering.	2
Lec6	Plastic injection molding technology.	2
Lec7	Methods for forming the intermediate plastics. Processing of plastics - finishing methods.	2
Lec8	Issues relating to the exploitation and consumption of polymeric materials.	2
Lec9	The problem of plastic waste. Classification of waste. Methods of polymer waste.	2
Lec10	Polymer composites.	2
		Total hours: 20
Form of classes – Laboratory		Number of hours
Lab1	Organizational matters. Identification of plastics.	2
Lab2	Methods of joining of plastic products.	2
Lab3	The study of friction and abrasive wear of polymeric materials.	2
Lab4	Injection molding technology.	2

Lab5	Extrusion and thermoforming technology.	2
		Total hours: 10

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. multimedia presentation
N3. laboratory experiment
N4. self study - preparation for laboratory class
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	Writting test, Oral 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, PEK_U03; PEK_K01, PEK_K02, PEK_K03	quick quiz, oral answer, laboratory reports, written tests
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

Robert Sikora, tytuł: Processing of macromolecular materials, Wydawnictwo Edukacyjne Zofii Dobkowskiej, rok: 1993

SECONDARY LITERATURE

K.Wilczynski, tytuł: Processing of plastics

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Processing of plastics
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W02, K1ZIP_W08, K1ZIP_W27	C1	Lec1-Lec10	N1, N2, N5
PEK_U01 - PEK_U03	K1ZIP_U02, K1ZIP_U08	C1, C2	Lab1-Lab5	N3, N4
PEK_K01, PEK_K02, PEK_K03	K1ZIP_K02	C3	Lab1-Lab5	N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Systemy informatyczne w zarządzaniu przedsiębiorstwem ERP**
Name in English: **Information systems in the enterprise management**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032071**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			10	
Number of hours of total student workload (CNPS)	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. Basic knowledge of the operation of the business in terms of materials management.
2. The ability to acquire information from the documents and their interpretation.
3. Computer skills.

SUBJECT OBJECTIVES

C1. Introduction to the problems of integrated management systems
C2. Getting the student from the basic knowledge of the mode of action and implementation of MRP II and ERP
C3. Acquisition of basic umiętności using MRP II and ERP

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Knowledge of integrated manufacturing systems
PEK_W02 - Knowledge of the concepts used in Integrated Information System - stuktura production, purchasing position, route and schedule of technology
PEK_W03 - Knowledge of Integrated Information System applications in production

II. Relating to skills:
PEK_U01 - Ability to use integrated management system, for example IFS Application
PEK_U02 - Ability to use technology production structure
PEK_U03 - Ability to design a technological route in Integrated Information System

III. Relating to social competences:
PEK_K01 - Able to work in a group, went through various roles in the organization of enterprises
PEK_K02 - Recognizes the importance of data quality in Integrated Information System

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Batch, Characteristics of the production cycle	2
Lec2	Stocks Production, Production Planning	2
Lec3	Management Information Systems, MRP I and MRP II	2
Lec4	Workflow systems	2
Lec5	Methods for identifying the functions of the company, depending on the function diagrams, entity relationship diagrams	2
		Total hours: 10
Form of classes – Project		Number of hours
Proj1	Preliminary information on the operation of IFS Applications. Generating companies in IFS Applications. Defining the structure of production.	2
Proj2	Defining the position of purchase. Defining costs. Sales.	2
Proj3	Entering data storage products. Define the product structure.	2
Proj4	Defining the position of product in different production lines. Routes production.	2
Proj5	Entry of items in shopping. Generate schedule. Generating MRP report.	2
		Total hours: 10

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. problem exercises
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	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 PEK_K01, PEK_K02	Presentation and defense of the MRP report
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Zintegrowany system zarządzania przedsiębiorstwem IFS Applications : ćwiczenia z obsługi : wybrane moduły : praca zbiorowa / pod red. Leszka Kiełtyki ; Politechnika Częstochowska.
2. Oracle : system zarządzania bazą danych : podręcznik użytkownika / Michał Lentner. Warszawa : Akademicka Oficyna Wydawnicza EXIT, 2001.

SECONDARY LITERATURE

SAP - zrozumieć system ERP / Jerzy Auksztol, Piotr Balwierz, Magdalena Chomuszko. Warszawa : Wydawnictwo Naukowe PWN, 2012.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Information systems in the enterprise management
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W10, K1ZIP_W15	C1, C2, C3	Lec1 - Lec5	N1, N2
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U15, K1ZIP_U23	C2, C3	Pr1 - Pr5	N3
PEK_K01, PEK_K02	K1ZIP_K11	C2, C3	Pr1 - Pr5	N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Technologie rozwoju produktu**
Name in English: **Technologies of product development**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032072**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20		10		
Number of hours of total student workload (CNPS)	90		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 on organisation of engineering in a company - tasks of construction designer, technology designer etc.
2. Knowledge and skills from courses of "Engineering graphics", "Geometrical drafting", "Construction drafting" or similar
3. Knowledge and skills from courses of "Engineering graphics 3D", "CAD modeling" or similar

SUBJECT OBJECTIVES

C1. Teaching students the METHODS of new product design with computer aided technologies
C2. Teaching students the TECHNOLOGIES of computer aided design and verification of new products
C3. Allowing the students to acquire skills of using selected technologies supporting new product development

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Students know the stages of new product development and computer technologies utilised there
PEK_W02 - Students have the knowledge on methods of product design and are aware of their progress
PEK_W03 - Students have basic knowledge on creating and processing 3D models of products

II. Relating to skills:

PEK_U01 - Students can indicate the steps leading to designing new product
PEK_U02 - Students use some modern methods and computer technologies in new product development
PEK_U03 - Students can use selected methods of creating and processing 3D models of products

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Applications of computer technologies in product development	2
Lec2	2D and 3D wireframe models, surface models. Solid and CAD models and methods of their representation. Higher level functionality of CAD systems. Advanced modeling and analysis tools in CAD systems. Geometric data exchange.	6
Lec3	Visualisation of CAD models. Virtual reality.	2
Lec4	Techniques of creating concepts, creativity, aspects influencing product development. Bionics - designing technical systems patterned or mimicking the nature.	4
Lec5	New product management, criteria of product modeling: esthetics-functionality-technology	2
Lec6	Applications of reverse engineering in product development	2
Lec7	Written exam	2
		Total hours: 20
Form of classes – Laboratory		Number of hours
Lab1	Organisation of the laboratory. Rules of modeling in selected CAD system.	2
Lab2	Product modeling in a CAD system with higher level functions, e.g. assemblies, part families, etc.	4
Lab3	Basic methods of design analysis in a CAD system, e.g. kinematics modeling	4
		Total hours: 10

TEACHING TOOLS USED

N1. informative lecture
N2. multimedia presentation
N3. case study
N4. 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	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_U01, PEK_U02, PEK_U03	report from laboratory classes
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

E. Chlebus, "Techniki komputerowe CAx w inżynierii produkcji", WNT, Warszawa 2000

SECONDARY LITERATURE

E. Chlebus, T. Boratynski, B. Dybała, M. Frankiewicz, P. Kolinka, "Innowacyjne technologie Rapid Prototyping - Rapid Tooling w rozwoju produktu", Oficyna Wydawnicza, Wrocław 2003

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Technologies of product development
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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,	K1ZIP_W23	C1-C2	Lec1-Lec10	N1-N3
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U18, K1ZIP_U20	C3	Lab1-Lab3	N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Rachunek kosztów dla inżynierów**
Name in English: **Engineering Economy: Costs Analyses for Engineers**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032076**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20			10	
Number of hours of total student workload (CNPS)	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. a basic knowledge on accounting, production proces organization and production organization
2. ability of using spreadshit (Excel) and simple model designing
3. a basic knowledge on free market economy

SUBJECT OBJECTIVES

C1. to learn basic terms and problems of the managerial decisions making based on costs; to gain knowledge on techniques and methods product costing and proces costing
C2. to gain ability of distinguishing product and proces cost categories and apply them in decision making
C3. To learn budgeting and how to use cost in decision making analysis (buy or manufacture; sell now or proces further, should an old machine be reaplaced by a new one).

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - Student has a knowledge on costs, expenses and expenditures.

PEK_W02 - Student knows cost accounting for direct and indirect production costs and cost accounting for decision making; knows the place of costs in pro-forma financial statements

PEK_W03 - Student knows the budgedting methods and variance analysis of the budget.

II. Relating to skills:

PEK_U01 - Student is able to select and analyse costs relevant for decision making

PEK_U02 - Student is able to build a model based on costs that helps to make short- and long- term decisions

PEK_U03 - Student is able to prepare pro forma financial statements

III. Relating to social competences:

PEK_K01 - Student is able to cooperate with the representatives of different organization units while gethering data for cost analysis

PEK_K02 - Student is able to evaluate managerial decision from the economic and social points of view

PROGRAMME CONTENT

Form of classes – Lecture	Number of hours

Lec1	Introduction - the essence of cost accounting in an entreprise, managerial accounting and financial accounting, designing production costs - cost engineering. The idea of cost; expense vs cost; expenditure vs cost. Systematic cost accounting; cost accounting for decision making; criteria and cost categories. Cost behavior patterns. Cost accounting models; total manufacturing costing, variable costing; costs in financial statements. Costs on decision making; Cost-Volume-Profit analysis; Break Even Point analysis; BEP for one and many products. Acytivity Based Costing method. The difference betwen "traditional" one driver costing and ABC method. Target costing and kaizen costing. Standard costing; variance analysis of observed and standard costs. Service departament costs allocation; transfer price. Period costs; fixed assets depreciacion; costs of direct material usage. Budgetig - how to prepare budget - from sales forecast to cash budget in a manufacturing and marchandise company. Budget variance analysis; static budget, flexible budget; levels of analysis. Budgeting organizational projects; budgeting investment projects; evaluating investment/capital projects. Cost accounting, income statement - pro forma financial statements. Final test.	20
		Total hours: 20
Form of classes – Project		Number of hours

Proj1	Introduction: contents of the project; class schedule and methods used in the class; evaluation criteria. What will be produced and sell; production process, resourses required by the product and the proces. Fixed and variable costs, introduction to quantity model of BEP. Midterm: required BEP model prepared in Excel. Budgeting model for operational activities. Model of budgeted income statement. Model of budgeted balance sheet and budgeted cash flow statement. Projects presentation in the classroom, project evaluation and grading.	10
		Total hours: 10

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. cases and numerical examples
N3. work in a small groups - working together on projects
N4. self study and preparation for the final test

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_K02	final 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	midterm for the project evaluation
F2	PEK_U03	final project evaluation
F3	PEK_K02	project presentation at the classroom and peer review

P = F1+F2+F3

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] J.Matuszek, M.Kołosowski, Z.Krokosz-Krynke; Cost Accounting for Engineers. PWE Warszawa 2011 - in Polish
[2] Lecture handouts available on instructor's web page
[3] Project handouts available on instructor's web page.

SECONDARY LITERATURE

[1] Atkinson A.A., Management Accounting. IRWIN, 2004
[2] Bruns W., J. Jr., Accounting for Managers, South-Western, 1994
[3] Garrison R.H., Noreen E.W., Managerial Accounting, IRWIN, 1994
[4] Horngren Ch.T., Datar S.M., Foster G., Cost Accounting. A Managerial Emphasis. Prentice Hall, 2003
[5] Krokosz-Krynke Z., Simulation in managerial accounting - model of BEP, in : Symulacja systemów społecznych i gospodarczych II, Oficyna Wyd. PWr, 2007 - in Polish
[6] Vanderbeck E.J., Principles of Cost Accounting, South-Western, 2002

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Engineering Economy: Costs Analyses for Engineers
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_U19	C1; C2; C3	Pr	N1; N2; N3; N4
PEK_W01, PEK_W02, PEK_W03	K1ZIP_W19	C1; C2; C3	Lec	N1; N2; N3; N4
PEK_K01, PEK_K02	K1ZIP_K02, K1ZIP_K05	C1; C2; C3	Lec, Pr	N1; N2; N3; N4

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Planowanie technologiczne CAD/CAM**
Name in English: **Technology planning CAD/CAM**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **ZPM032077**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			10	
Number of hours of total student workload (CNPS)	30			30	
Form of crediting	Crediting with grade			Crediting with grade	
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 geometric modeling and CAD systems.
2. Fundamentals on technology designing.
3. Basic knowledge about numerically controlled machine tools.

SUBJECT OBJECTIVES

C1. Gaining knowledge in the field of technology design for CNC machine tools using CAD/CAM systems.
C2. Presentation of modern tools supporting manufacturing.
C3. Discussion of issues related to project management in the field of structural design and technology.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Knowledge about existing solutions supporting structural design and technology.
PEK_W02 - Ordered knowledge of technological design in CAM systems.
PEK_W03 - Knowledge regarding the selection, integration and implementation of CAD/CAM systems in enterprises.

II. Relating to skills:
PEK_U01 - Student should be able to analyze parts taking into account that will be manufactured on CNC machine tools. Analysis of the structure manufacturability.
PEK_U02 - Student should be able to prepare geometric data necessary to carry out project work.
PEK_U03 - Student should be able to prepare a technological process for CNC machine tools using selected CAD /CAM systems.

III. Relating to social competences:
PEK_K01 - Ability to work in a design team.
PEK_K02 - Ability to critically evaluate the results and their impact on the functioning of the company.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Introduction to CAD/CAM. A review of available solutions.	2
Lec2	Project management in an environment of CAD/CAM system. Relationship between documents. Generating the documentation.	2
Lec3	Technological design in CAM systems. The steps and tasks performed.	2
Lec4	Processes verification through computer simulation.	2
Lec5	Final test.	2
		Total hours: 10
Form of classes – Project		Number of hours
Proj1	Presentation of the selected environment of CAD/CAM system.	2
Proj2	Preparation of geometric data. Developing a plan of treatment for the sample.	2
Proj3	Generating tool paths for machining. Machining simulation. Management of the project.	2
Proj4	Generating technical documentation. NC code generation.	2
Proj5	Receive and evaluation of projects.	2
		Total hours: 10

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. multimedia presentation
N3. problem discussion
N4. self study - preparation for project class
N5. 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 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, PEK_K01, PEK_K02	Evaluation of a project
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1.Augustyn, Krzysztof. NX CAM : programowanie ścieżek dla obrabiarek CNC / Gliwice : Helion, 2010.
2.Kacprzyk, Zbigniew. Komputerowe wspomaganie projektowania : podstawy i przykłady / Warszawa: Oficyna Wydawnicza Politechniki Warszawskiej, 2012.

SECONDARY LITERATURE

1.Kief, Hans B.: FFS-Handbuch : Einfuhrung in flexible Fertigungssysteme und deren Komponenten : CNC, DNC, CAD, CAM, FFS, FMS, CAQ, CIM. 1998 r.
2.Kief, Hans B.: NC/CNC handbuch 2007/08 : CNC, DNC, CAD, CAM, CIM, FFS, SPS, RPD, LAN, NC-Maschinen, NC-Roboter, Antriebe, Simulation, Fach- und Stichwortverzeichnis . 2007r.
3.Singh, D. K.: Fundamentals of manufacturing engineering. 2008r.

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Technology planning CAD/CAM
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W23	C1, C3	Lec1, Lec2, Lec3, Lec4, Lec5	N1, N2, N5
PEK_U01, PEK_U02, PEK_U03, PEK_K01, PEK_K02	K1ZIP_K04, K1ZIP_U20	C2, C3	Pr1, Pr2, Pr3, Pr4, Pr5	N2, N3, N4, N5

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Zarządzanie produkcją i usługami II**
Name in English: **Production and Services Management II**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032079.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			10	
Number of hours of total student workload (CNPS)	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		1
Lec2		2
Lec3		2
Lec4		1
Lec5		1
Lec6		2
Lec7		1
		Total hours: 10
Form of classes – Project		Number of hours
Proj1		2
Proj2		2
Proj3		3
Proj4		3
		Total hours: 10

TEACHING TOOLS USED

N1. multimedia presentation
N2. self study - preparation for project class
N3. case study
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	
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, PEK_K03	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Production and Services Management II
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W14, K1ZIP_W15	C1, C2, C3		N1, N3, N4
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U14, K1ZIP_U15	C2, C3		N2, N3, N4
PEK_K01, PEK_K02, PEK_K03	K1ZIP_K01, K1ZIP_K02	C2, C3		N2, N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Lean Management**
Name in English: **Lean Management**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032080**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				10
Number of hours of total student workload (CNPS)	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

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	Presentation of Toyota history and Lean Manufacturing roots and how it was popularized worldwide. Explanation of "Toyota Production System house".	2
Lec2	Presentation of 8 types of wastes in production processes. Explanation of value adding activities. Presenting 5 Lean principles of Womack and Jones. Explaining Value Stream Mapping method.	2
Lec3	System 5S. Total Productive Maintenance.	2
Lec4	Setup time reduction methodology. Designing continuous flow production lines and cells. Definitions of takt time, cycle time, planned cycle time, operator cycle time and lead time.	2
Lec5	Standardized Work.	2
Lec6	Designing Lean internal plant logistics. Methodology for calculating the maximum stock level for each purchased part in the supermarket.	2
Lec7	Designing pull system for the control of the production flow. Different types of pull system: replenishment pull, sequential pull, mixed pull system. Methodology for calculating the maximum stock level for both finished product and central supermarkets. Types of kanbans. Hejiunka.	2
Lec8	Lean Transformation Framework. Lean Product and Process Development.	2
Lec9	Introduction to Six Sigma. Design for Six Sigma.	2
Lec10	Final test.	2
		Total hours: 20
Form of classes – Seminar		Number of hours
Sem1	Explaining the seminar organizational framework, rules to prepare presentation and guidelines for discussions. Assigning presentation topics and dates to students.	2
Sem2	1. Toyota Way - 14 Toyota's Management Principles. 2. Glenday sieve and improving high mix production in batches. 3. Employee suggestion system. 4. TWI (Training within Industry) Job Instruction.	2
Sem3	5. TWI (Training within Industry) Job Method. 6. TWI (Training within Industry) Job Relation. 7. A3 method. 8. Mapping the consumption and provision stream.	2
Sem4	9. Lean Office. 10. Lean healthcare. 11. Lean dealership. 12. Lean Government. 13. Toyota Kata.	2
Sem5	13. Toyota Kata. 14. Hoshin Kanri. 15. Extended Value Stream Mapping. 16. Implementing Lean in company – case study.	2
		Total hours: 10

TEACHING TOOLS USED

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

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Liker, Jeffrey K. Droga Toyoty: 14 zasad zarządzania wiodącej firmy produkcyjnej świata / Warszawa: Wydawnictwo MT Biznes, cop. 2005.
2. Glenday, Ian. Przejdź na logikę przepływu: przestań gasić pożary i popraw obsługę klienta / Wrocław: Lean Enterprise Institute Polska, 2010.
3. Kaizen na hali produkcyjnej / Wrocław: ProdPublishing.com, 2010.
4. Imai, Masaaki (1930-). Kaizen: klucz do konkurencyjnego sukcesu Japonii / Warszawa: Wydawnictwo MT Biznes, cop. 2007
5. Imai, Masaaki (1930-). Gemba kaizen: zdroworozsądkowe, niskokosztowe podejście do zarządzania / Warszawa: Wydawnictwo MT Biznes, cop. 2006.
6. Łukasz Dekier, Adrian Grycuk: PROGRAMY SUGESTII PRACOWNICZYCH: Doświadczenia polskich przedsiębiorstw, Wrocław 2014: http://leanpolska.org/wp-content/uploads/Raport-SLMP-Programy-sugestii-pracowniczych-2014.pdf
7. Graupp, Patrick., Wrona, Robert J. Podręcznik TWI: doskonalenie niezbędnych umiejętności przełożonych / Wrocław: Wydawnictwo Lean Enterprise Institute Polska, 2010.
8. Liker, Jeffrey K., Meier, David. Toyota talent: rozwijaj swoich pracowników na sposób Toyoty / Warszawa: MT Biznes, cop. 2008.
9. Shook, John. Zarządzać znaczy uczyć: rozwiazywanie problemów i rozwój pracowników z wykorzystaniem metody A3 / Wrocław: Lean Enterprise Insititute Polska, 2010.
10. Sobek, Durward K., Smalley, Art. Understanding A3 thinking: a critical component of Toyota's PDCA management system / Boca Raton [etc.]: CRC Press/Taylor & Francis Group: Productivity Press, cop. 2008.
11. Womack, James P., Jones, Daniel T. Szczupłe rozwiązania czyli Jak przedsiębiorstwa i ich klienci mogą pomnażać korzyści ze wzajemnej współpracy stosując zasady Lean Mangement / Wrocław: Wydawnictwo Lean Enterprise Institute Polska, 2010.
12. Fabrizio, Tom., Tapping, Don. 5S w biurze: organizacja miejsca pracy i eliminacja marnotrawstwa / Wrocław: ProdPublishing, 2010.
13. Tapping, Don., Shuker Tom Zarządzanie strumieniem wartości w biurze / Wrocław: ProdPublishing
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MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Lean Management
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W14, K1ZIP_W16			
PEK_U01	K1ZIP_U14, K1ZIP_U16			

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **BLOK HUMANISTYCZNY**
Name in English:
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **ZPM032081BK.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
Number of hours of total student workload (CNPS)	60				
Form of crediting	Crediting with grade				
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		20
		Total hours: 20

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
Management and Manufacturing Engineering

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_W	K1ZIP_W24, K1ZIP_W25			

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Mechanika**
Name in English: **Mechanics**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032082**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20	20			
Number of hours of total student workload (CNPS)	90	60			
Form of crediting	Crediting with grade	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).
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	1
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.	1
Lec3	The resultant of any set of forces.	1
Lec4	Plane forces system. Reactions in the statically determinate systems	1
Lec5	Concurrent forces system.	1
Lec6	Conditions of static equilibrium of forces system. Plane forces system reduction.	1
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.	1
Lec10	Moments of inertia. Product of inertia. Parallel–axis theorem.	2
Lec11	Rotation transformation of Moments of inertia, Iinertia tensor, inertia ellipsoid. Principal axes.	2
Lec12	Kinematics, motion of particle, trajectory, one–dimensional model. Velocity, acceleration.	1
Lec13	Velocity and acceleration in natural coordinates. Classification of motions	1
Lec14	Velocity and acceleration in the plane motion.	1
Lec15	Test	2
		Total hours: 20

Form of classes – Classes		Number of hours
Cl1	The examples for Conditions of static equilibrium of forces system. Plane forces system reduction.	1
Cl2	Plane forces system. Determination of reactions in the supports.	1
Cl3	Resultans for Plane forces systems. Equations of equilibrium.	1
Cl4	Analytical methods of trusses solving. The Ritter's methods.	1
Cl5	Internal forces in beams (analytical methods, diagrams).	2
Cl6	Internal forces in beams (analytical methods, diagrams). Beams with Joints.	2
Cl7	Resultant using for Internal forces in Frames.	1
Cl8	Internal forces in Frames (analytical methods, diagrams).	1
Cl9	Test 1.	2
Cl10	Centroid of Area. The center of Gravity of discrete Multi-mass structures.	1
Cl11	Determination of Moments of inertia & inertia products. Parallel–axis theorem.	2
Cl12	Determination of the centroidal and Principal axes and Moments.	1
Cl13	Kinematics of particle in orthogonal coordinates.	1
Cl14	Velocity in a plane motion.	1
Cl15	Test 2	2
		Total hours: 20

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	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, PEK_U03	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
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W03	C1	Lec1 - Lec15	N1, N4, N5
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U01, K1ZIP_U03	C2	Cl1 - Cl15	N2, N3, N4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Modelowanie i symulacja procesów**
Name in English: **Modeling and simulation of processes**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **ZPM032101**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20			10	
Number of hours of total student workload (CNPS)	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. Basic programming skills in any object-oriented programming language (preferably Java)
2. Expanded knowledge of the structure and organization of the production system

SUBJECT OBJECTIVES

C1. Acquiring knowledge and skills in object-oriented modeling of production systems
C2. Acquiring knowledge and skills in the development, execution and analysis of the simulation project results (taking into account the specifics of the manufacturing environment), and perform optimisation experiments using multiple criteria optimisation
C3. Getting to know the "AnyLogic" simulation package and object-oriented modelling language UML

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - The student has basic knowledge in the area of object-oriented modeling of production systems

PEK_W02 - The student has basic knowledge in the area of design, execution and analysis of results of the project simulation using multi-criteria optimization

PEK_W03 - The student has a general knowledge of object-oriented modeling language UML, and detailed in terms of three basic diagrams (Use Case, Class and State Machine)

II. Relating to skills:

PEK_U01 - The student is able to independently develop a simple object model of the production system on selected examples using UML language

PEK_U02 - The student is able to use (extended range) the "AnyLogic" simulation package and develop a models of systems in continuous and discrete version

PEK_U03 - The student is able to design and perform an simulation experiment in "AnyLogic" package using the built-in optimizer OptQuest and then perform the analysis of the results of the experiment

III. Relating to social competences:

PEK_K01 - The student is able to work in a team of three persons, to take over the leading role and objectively evaluate their colleagues

PEK_K02 - The student is able to prepare and present an analysis of project results

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	- Discussion of the course, presentation of credit conditions. - Elements of UML - class diagram - Object Model System - Elements of UML - Use Case and State Machine diagram	2
Lec2	- Java Basics - Presentation of the package "AnyLogic"	2
Lec3	- Introduction to the theory of the experiment - Basic statistical tools - Introduction to methods of optimizing production problems	2
Lec4	- Methods of modelling and simulation systems (continuous, discrete event, system dynamics, agents, hybrid) - Continuous systems - modelling approach - Discrete systems - modelling approach	2
Lec5	- AnyLogic - Library "Process" Part 1 - Basic objects, Extended objects	2
Lec6	- AnyLogic - Library "Process" Part 2 - Resources modelling, Warehouses modelling	2
Lec7	- AnyLogic - Modeling using SD diagrams	2
Lec8	- AnyLogic - Agent-based modelling	2
Lec9	- Summary of knowledge about the AnyLogic package - presentation of real projects	2
Lec10	- End test	2
		Total hours: 20

Form of classes – Project		Number of hours
Proj1	- The organization of classes, - Discussion of the course, scoring system presentation and assessment methodology. - Presentation of the schedule for individual projects and introduction to the subject. - Introduction to the package AnyLogic - Introduction to Java - Introduction to UML	2
Proj2	Project 1. Object Model of continuous system	2
Proj3	Project 2. Object Model of discrete system	6
		Total hours: 10

TEACHING TOOLS USED

N1. self study - preparation for project class
N2. laboratory experiment
N3. report preparation
N4. problem lecture
N5. 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	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	Project mark
P = F1 + F2 + F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

[1] G. Booch, J. Rumbaugh, i I. Jacobson, „UML - przewodnik użytkownika”, Wyd. 2. Warszawa: Wydawnictwa Naukowo-Techniczne, 2002.
[2]„AnyLogic Help”, Xjtek, http://www.xjtek.com/anylogic/help/
[3]„Learning the Java Language”, Oracle, http://docs.oracle.com/javase/tutorial/java/index.html

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Modeling and simulation of processes
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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 - W03	K1ZIP_IRP_W01	C1, C2, C3	L1-14	N4, N5
PEK_U01, PEK_U02, PEK_U03	K1ZIP_IRP_U01	C1, C2, C3	P1-3	N1 - N3
PEK_K01, PEK_K02	K1ZIP_K04, K1ZIP_K08	C1, C2, C3	P1-3	N1 - N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Ergonomia i BHP**
Name in English: **Ergonomics and safety**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **ZPM032102**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
Number of hours of total student workload (CNPS)	90				
Form of crediting	Crediting with grade				
Group of courses					
Number of ECTS points	3				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.8				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. has basic knowledge from range of characteristic and properties of hazardous physical agents (electric energy, mechanical vibrations, lighting, electromagnetic field, dusts), chemical and biological agents.
2. has systematical knowledge from range of mathematics, physics, chemistry and informatics.

SUBJECT OBJECTIVES

C1. Acquirement of basic knowledge from areas of labor law, as well as work accidents and occupational diseases
C2. Acquirement of basic knowledge from areas of ergonomics and labor biomechanics
C3. Acquirement of basic knowledge from analysis and protection before dangerous, harmful and strenuous factors in work environment

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - It knows basic regulations and standards of work safety

PEK_W02 - It has basic knowledge from ergonomics area and it is conscious for capability of its practical application in designing and manufacturing of products

PEK_W03 - It knows basic threats at work stands and methods of protection before them.

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Labor protection, work safety regulations and principles	2
Lec2	Accidents at work and occupational diseases. Estimate of professional risk on work positions	2
Lec3	Ergonomics as interdisciplinary science	2
Lec4	Labor biomechanics - science about threats for employee health discovering, being result of executable work	2
Lec5	Dangerous and harmful agents in work environment	2
Lec6	First pre-medical aid	2
Lec7	Fire protection	2
Lec8	Threats and work protection at transport manual labour. Heights work and closed-containers work as especially dangerous works.	2
Lec9	Sitting work geometry, computer work stand. Breaks at work, shift work. Stress at work.	2
Lec10	Work physiology. Work environment microclimate. Ventilation and air conditioning at accomodation.	2
		Total hours: 20

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. problem discussion
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_W02, PEK_W03	test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

CIOP - Science about work - safety, sanitation, ergonomics, CIOP, Warsaw 2000 , B. Rączkowski - Industrial Safety in practice - BHP, ODDK, Gdansk 2012

SECONDARY LITERATURE

D. Idczak - Ergonomics as forming of work conditions, L. Skuza - Accidents at work from A to Z

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Ergonomics and safety
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W21	C1	Lec1, Lec2, Lec3, Lec6, Lec7, Lec8, Lec9, Lec10	N1, N2, N3, N4
PEK_W02	K1ZIP_W21, K1ZIP_W24, K1ZIP_W25	C2	Lec3, Lec4, Lec9	N1,N2, N3,N4
PEK_W03	K1ZIP_W20, K1ZIP_W21	C3	Lec5, Lec6, Lec7, Lec8, Lec9, Lec10	N1,N2, N3,N4

SUBJECT SUPERVISOR

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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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **ZPM032112.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					10
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		2
Sem2		2
Sem3		2
Sem4		4
		Total hours: 10

TEACHING TOOLS USED

N1. multimedia presentation
N2. tutorials
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_U02, PEK_U03	
F2	PEK_K01, PEK_K02, PEK_K03	
P = 0,8*F1+0,2*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
Management and Manufacturing Engineering

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	K1ZIP_U33, K1ZIP_U34	C1, C2, C4		N1, N2
PEK_K01, PEK_K02, PEK_K03	K1ZIP_K01, K1ZIP_K03, K1ZIP_K06	C3		N3

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Metoda elementów skończonych**
Name in English: **Finite Element Method**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **ZPM032120.**
Group of courses: **no**

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

TEACHING TOOLS USED

N1. problem exercises
N2. problem discussion
N3. self study - preparation for project class
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_W02, PEK_W03	
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	
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Finite Element Method
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W05	C1, C2, C3		N2, N4
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U02, K1ZIP_U03, K1ZIP_U05	C1, C2, C3		N1, N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Sterowanie numeryczne**
Name in English: **numerical control**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **ZPM032121.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10		10		
Number of hours of total student workload (CNPS)	30		30		
Form of crediting	Crediting with grade		Crediting with grade		
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
		Total hours: 10
Form of classes – Laboratory		Number of hours
Lab1		2
Lab2		2
Lab3		2
Lab4		2
Lab5		2
		Total hours: 10

TEACHING TOOLS USED

N1. informative lecture
N2. tutorials
N3. self study - preparation for laboratory class
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_W1	
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	

P = P

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
numerical control
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W12	C1		N1, N2
PEK_U01	K1ZIP_U12	C1		N3, N4

SUBJECT SUPERVISOR

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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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032152.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)				10	
Number of hours of total student workload (CNPS)				360	
Form of crediting				Crediting with grade	
Group of courses					
Number of ECTS points				12	
including number of ECTS points for practical (P) classes				12	
including number of ECTS points for direct teacher-student contact (BK) classes				12.0	

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

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

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
Management and Manufacturing Engineering

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	K1ZIP_U32, K1ZIP_U33	1-3		1-3
PEK_K01-PEK_K03	K1ZIP_K01, K1ZIP_K05, K1ZIP_K06	1-3		1-3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Operacyjne sterowanie wytwarzaniem**
Name in English: **Operational control of manufacturing**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **ZPM032201**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10			10	
Number of hours of total student workload (CNPS)	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 the operation of the manufacturing enterprise.
2. Knowledge of technological processes in manufacturing.
3. Computer skills (Windows).

SUBJECT OBJECTIVES

C1. Get to know the essence of manufacturing operational control in various industries.
C2. Getting familiar with the methods and problems of scheduling of production orders
C3. Gathering scheduling skills using a dedicated IT tool.

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:
PEK_W01 - Knowledge of the principles and methods of construction schedules for production orders.
PEK_W02 - Knowledge of the basic criteria for optimizing schedules.
PEK_W03 - Knowledge of scheduling strategies in companies from various industries.

II. Relating to skills:
PEK_U01 - Ability to prepare a schedule for production orders.
PEK_U02 - Ability to use tools for building schedules.
PEK_U03 - Ability to apply schedule optimization based on selected criteria.

III. Relating to social competences:
PEK_K01 - Awareness of the role of the engineer in the planning of production and demand for accountability and involvement in one of the most important links of the production process in the company.
PEK_K02 - Awareness of the legal aspects and impacts of engineering.
PEK_K03 - Understands the need for lifelong learning in the field of business engineering and professional and social skills development.

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Manufacturing operational control in various industrial sectors.	2
Lec2	Methods and techniques of manufacturing operational control.	2
Lec3	Scheduling of production orders on the example of selected information tool.	2
Lec4	An example of operational control of manufacturing in a chosem manufacturing company	2
Lec5	Scheduling algorithms and methods to optimize scheduling	2
		Total hours: 10
Form of classes – Project		Number of hours
Proj1	Establishing a simple schedule.	2
Proj2	Shortening the time of production orders in the prepared schedule.	2
Proj3	Scheduling of assembling processes.	2
Proj4	Self construction of a schedule and the use of known methods of shortening the lead time.	2
Proj5	Construction and comparison of different versions of the schedule.	2
		Total hours: 10

TEACHING TOOLS USED

N1. case study
N2. problem exercises
N3. traditional lecture with the use of transparencies and slides
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_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, PEK_U03	Completion of a project task
F2	PEK_K01, PEK_K02, PEK_K03	Defense of a project
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

1. Czesław Smutnicki, Algorytmy szeregowania, Akademicka Oficyna Wydawnicza EXIT, ISBN: 83-87674-39-7
2. Muhlemann A., Oakland J., Lockyer K.: Zarządzanie Produkcja i Usługi, Wydawnictwo Naukowe PWN, Warszawa 2001

SECONDARY LITERATURE

1. Brzeziński M.: Organizacja i sterowanie produkcją, Placet, Warszawa 2002
2. Durlik I.: Organizacja i zarządzanie produkcją, Warszawa 2002

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Operational control of manufacturing
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_ZPW_W01	C1, C2	Lect1 - Lect5	N1, N3
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U15, K1ZIP_ZPW_U02	C3	Pr1 - Pr5	N2, N4
PEK_K01, PEK_K02, PEK_K03	K1ZIP_K07	C1	Pr1 - Pr5	N3

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Bezpieczeństwo, normowanie i ergonomia w organizacji pracy**
Name in English: **Safety, standarization and ergonomics in work organization**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **ZPM032202**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	20				
Number of hours of total student workload (CNPS)	90				
Form of crediting	Crediting with grade				
Group of courses					
Number of ECTS points	3				
including number of ECTS points for practical (P) classes					
including number of ECTS points for direct teacher-student contact (BK) classes	1.8				

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. has basic knowledge from range of characteristic and properties of hazardous physical agents (electric energy, mechanical vibrations, lighting, electromagnetic field, dusts), chemical and biological agents.
2. has systematical knowledge from range of mathematics, physics, chemistry and informatics.

SUBJECT OBJECTIVES

C1. Acquirement of basic knowledge from areas of labor law, as well as work accidents and occupational diseases
C2. Acquirement of basic knowledge from areas of ergonomics and labor biomechanics
C3. Acquirement of basic knowledge from analysis and protection before dangerous, harmful and strenuous factors in work environment

SUBJECT EDUCATIONAL EFFECTS

I. Relating to knowledge:

PEK_W01 - It knows basic regulations and standards of work safety

PEK_W02 - It has basic knowledge from ergonomics area and it is conscious for capability of its practical application in designing and manufacturing of products

PEK_W03 - It knows basic threats at work stands and methods of protection before them.

II. Relating to skills:

III. Relating to social competences:

PROGRAMME CONTENT

Form of classes – Lecture		Number of hours
Lec1	Labor protection, work safety regulations and principles	2
Lec2	Accidents at work and occupational diseases. Estimate of professional risk on work positions	2
Lec3	Ergonomics as interdisciplinary science	2
Lec4	Labor biomechanics - science about threats for employee health discovering, being result of executable work	2
Lec5	Dangerous and harmful agents in work environment	2
Lec6	First pre-medical aid	2
Lec7	Fire protection	2
Lec8	Threats and work protection at transport manual labour. Heights work and closed-containers work as especially dangerous works.	2
Lec9	Sitting work geometry, computer work stand. Breaks at work, shift work. Stress at work.	2
Lec10	Work physiology. Work environment microclimate. Ventilation and air conditioning at accomodation.	2
		Total hours: 20

TEACHING TOOLS USED

N1. traditional lecture with the use of transparencies and slides
N2. problem discussion
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_W02, PEK_W03	test
P = F1		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

CIOP - Science about work - safety, sanitation, ergonomics, CIOP, Warsaw 2000 , B. Rączkowski - Industrial Safety in practice - BHP, ODDK, Gdansk 2012

SECONDARY LITERATURE

D. Idczak - Ergonomics as forming of work conditions, L. Skuza - Accidents at work from A to Z

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Safety, standarization and ergonomics in work organization
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W21	C1	Lec1, Lec2, Lec3, Lec6, Lec7, Lec8, Lec9, Lec10	1,2,3,4
PEK_W02	K1ZIP_W21, K1ZIP_W24, K1ZIP_W25	C2	Lec3, Lec4, Lec9	1,2,3,4
PEK_W03	K1ZIP_W20, K1ZIP_W21	C3	Lec5, Lec6, Lec7, Lec8, Lec9, Lec10	1,2,3,4

SUBJECT SUPERVISOR

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Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Programowanie obrabiarek CNC**
Name in English: **Programming of NC machine tools**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **ZPM032211.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	10		10		
Number of hours of total student workload (CNPS)	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

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
		Total hours: 10
Form of classes – Laboratory		Number of hours
Lab1		2
Lab2		2
Lab3		2
Lab4		2
Lab5		2
		Total hours: 10

TEACHING TOOLS USED

N1. informative lecture
N2. tutorials
N3.
N4. 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	
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	

P = F1

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Programming of NC machine tools
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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	K1ZIP_W12	C1, C2, C3		N1, N2
PEK_U01, PEK_U02, PEK_U03	K1ZIP_U12	C1, C2, C3		N3, N4

SUBJECT SUPERVISOR

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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): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **obligatory**
Subject code: **ZPM032212.**
Group of courses: **no**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)					10
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		2
Sem2		2
Sem3		2
Sem4		4
		Total hours: 10

TEACHING TOOLS USED

N1. multimedia presentation
N2. tutorials
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_U02, PEK_U03	
F2	PEK_K01, PEK_K02, PEK_K03	
P = 0,8*F1+0,2*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
Management and Manufacturing Engineering

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	K1ZIP_U33, K1ZIP_U34	C1, C2, C4		N1, N2
PEK_K01, PEK_K02, PEK_K03	K1ZIP_K01, K1ZIP_K03, K1ZIP_K06	C3		N3

Faculty of Mechanical Engineering

SUBJECT CARD

Name in Polish: **Praca przejściowa**
Name in English: **Intermediate project**
Main field of study (if applicable): **Management and Manufacturing Engineering**
Level and form of studies: **I level, part-time**
Kind of subject: **optional**
Subject code: **ZPM032214.**
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)				180	
Form of crediting				Crediting with grade	
Group of courses					
Number of ECTS points				6	
including number of ECTS points for practical (P) classes				6	
including number of ECTS points for direct teacher-student contact (BK) classes				2.8	

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 – Project	Number of hours

Proj1		1
Proj2		2
Proj3		2
Proj4		4
Proj5		3
Proj6		2
Proj7		4
Proj8		4
Proj9		4
Proj10		4
		Total hours: 30

TEACHING TOOLS USED

N1. self study - preparation for project class
N2. tutorials
N3. multimedia presentation
N4. 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_U1, PEK_U2, PEK_U3	
F2	PEK_K3, PEK_U3	
F3	PEK_U1, PEK_U2, PEK_U3, PEK_K1, PEK_K2	
P = 0,6*F1+01*F2+0,3*F3		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE

SECONDARY LITERATURE

MATRIX OF CORRELATION BETWEEN EDUCATIONAL EFFECTS FOR SUBJECT
Intermediate project
AND EDUCATIONAL EFFECTS FOR MAIN FIELD OF STUDY
Management and Manufacturing Engineering

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, PEK_K3	K1ZIP_K01, K1ZIP_K02, K1ZIP_K04, K1ZIP_K05, K1ZIP_U21, K1ZIP_U30, K1ZIP_U32	C1, C2, C3		N1, N2, N3, N4
PEK_K1, PEK_K2	K1ZIP_K01, K1ZIP_K02, K1ZIP_K03, K1ZIP_K04, K1ZIP_K05	C2		N3, N4

SUBJECT SUPERVISOR

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