Courses taught in foreign languages in academic year 2020/21

Content

Institute of Machines and Power Engineering

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Additive Technology**
Course code:	USE/P116
ECTS:	3
Level of course:	bachelor/master degree
Teacher:	Ing. František Klimenda, Ph.D.
Term:	summer/ winter
Language of instruction:	English
Lectures/exercises:	1/2
Completion:	exam
Course goal:	The aim of the course is to introduce students with the basic of Additive technology.
Abstract:	1. History of additive technology 2. 3D printing technology 3. Materials for 3D printing. 4. 3D modeling. 5. Preprocessing of 3D models before printing 6. 3D printing of parts. 7. Post Processing after 3D printing
Notice:	This course will be opened in agreement with the teacher. frantisek.klimenda@ujep.cz

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Automation**
Course code:	USE/P117
ECTS:	3
Level of course:	bachelor/master degree
Teacher:	Ing. Jan Sterba, Ph.D.
Term:	summer/ winter
Language of instruction:	English
Lectures/exercises:	1/2
Completion:	exam
Course goal:	The aim of the course is to introduce students with the basic principles of the automation, logic fuctions, PLC, HMI elements and robotics in real tasks.
Abstract:	1. Introduction to the automation 2. Logic functions 3. Practical use of bimary logic. 4. Logic circuits and functions. 5. Control systems in industrial automation, PLC and HMI elements 6. Programming languages for PLC. 7. Algorithmization and basic programming for PLC and HMI 8. Variable types and data types in PLC programming. 9. Visualization and HMI interface in control systems. 10. Using robots in real tasks, communication Robot - Control system.
Notice:	This course will be opened in agreement with the teacher. jan.sterba@ujep.cz

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**CAD**
Course code:	USE/P080
ECTS:	3
Level of course:	bachelor/master degree
Teacher:	Martin Svoboda, Ing., Ph.D.
Term:	summer, winter
Language of instruction:	English
Lectures/exercises:	2/0 per week
Completion:	exam
Course goal:	The aim of the course is to introduce CAD systems in the branch of mechanical engineering, to explain the principles of engineering projection and drawing, to learn the creation of 2D engineering drawing in AutoCAD system and to outline the creation of 3D drawing and solid modelling in Autodesk Inventor system.
Abstract:	Introduction, requirements. Basic terms. CAD systems - benefits, classification, utilization. 2. AutoCAD - yesterday and today, HW, SW, formats, environment, drawing window, procedure of drawing creation, handling, motion in a drawing. 3. AutoCAD - command selection, command line, short-cut menu, model and paper space, status bar, switches. 4. AutoCAD - object selection, coordinate systems, layers a object attributes, object snap, zoom and pan functions. 5. AutoCAD - basic functions - line, circle, trim/extend, offset. 6. AutoCAD - basic functions - delete, mirror, rotate. 7. AutoCAD - advanced functions - rectangle, polygon, spline, arc, ellipse, polyline. 8. AutoCAD - advanced functions - copy, move, array, scale, break. 9. AutoCAD - advanced functions - chamfer, trim, hatch, explode, inquiry. 10. AutoCAD - text style settings, writing of single line text and multiline text. 11. AutoCAD - dimension style settings, fundamentals of dimensioning. 12. AutoCAD - operations with blocks - creation, insertion, export. 13. AutoCAD - printing, data export, other frequently used and effective functions
Notice:	*This course will be opened in agreement with the teacher.* *martin.svoboda@ujep.cz*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Electrical Experiments**
Course code:	KEE / P105
ECTS:	3
Level of course:	bachelor/master degree
Teacher:	Vladislav Síťař, Ing., Bc.
Term:	summer, winter
Language of instruction:	English
Lectures/exercises:	0/3 per week
Completion:	credit
Course goal:	The aim of course is familiarization of students with the basic electrical variables measurement. Students are acquainted with the electric measurement apparatuses and their application within laboratory experiments in the field of electrical circuit theory.
Abstract:	1. Laboratory safety rules 2. Apparatuses and elements for electric variables measurements 3. DC voltage and current measurement 4. AC voltage and current measurement 5. Voltage and current measurement in non-harmonic circuits 6. Measurement the frequency dependence of measuring instruments 7. Analysis of ideal passive elements behaviour 8. Quantity measurement of ideal passive elements 9. Verification the voltage and current divider rules 10. Verification the Kirchhoff's laws 11. Measurement the V/I characteristics of diodes 12. Power measurement in AC circuits
Notice:	*This course will be opened in agreement with the teacher.* *vladislav.sitar@ujep.cz*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Fluid Dynamics**
Course code:	USE/P118
ECTS:	5
Level of course:	bachelor degree
Teacher:	Doc. Ing. Ludmila Nováková, Ph.D.
Term:	summer/ winter
Language of instruction:	English
Lectures/exercises:	2/2
Completion:	exam
Course goal:	Students will solve problems of hydrostatic, ideal and real fluid flow in pipes and basic problems of potential flow and two-dimensional flow using Navier-Stokes equations.
Abstract:	1. Introduction, basic properties, quantities and units, 2. Fluid statics, pressure variation, Euler equation. 3. Forces on submerged surfaces, buoyancy. Metacentre. 4. Ideal fluid in motion: basic laws - continuity equation. Bernoulli equation, linear momentum equation, discharges from vessels, one-dimensional pipe flow. 5. Frictional and local losses. Darcy-Weisbach equation. Empirical formulas. 6. Unsteady one-dimensional flow. U-tube, piston pump, water hammer. 7. Relative flows – basic concepts in turbo machinery. 8. Force action on fluid jet. Pelton turbine – optimal rotational speed. 9. Laminar flows. Couette flow. Hagen–Poiseuille flow. Turbulent flows. Reynolds shear stress. The logarithmic law. 10. Flow past bodies, boundary layer, drag and lift, wing theory. 11. Navier-Stokes equation.
Notice:	This course will be opened in agreement with the teacher. Ludmila.novakova@ujep.cz

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Model of Energy Flows**
Course code:	USE/P104
ECTS:	4
Level of course:	bachelor/master degree
Teacher:	Martin Kantor, Ing., Ph.D.
Term:	summer, winter
Language of instruction:	English
Lectures/exercises:	0/4 per week
Completion:	Pre-exam credit
Course goal:	The aim of the course is to introduce students with the basic principles of the finite element method and Computational fluid dynamics method and its practical application to various problems in industry. Course is orientated on software systems ANSYS.
Abstract:	1) Introduction to ANSYS, creating and editing geometry; 2) Pre-processing and defining boundary conditions; 3) Evaluation and processing of the result Solutions; 4) stress - strain analysis; 5) Heat Transfer analysis; 6) Fluid flow analysis.
Notice:	*This course will be opened in agreement with the teacher.* *martin.kantor@ujep.cz*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Technical Drawing**
Course code:	KSM/P113
ECTS:	3
Level of course:	bachelor
Teacher:	Ing. Martin Svoboda, Ph.D.
Term:	summer, winter - the course will be opened only by signing in a minimum of 5 students.
Language of instruction:	English
Lectures/exercises:	1/2 per week
Completion:	exam
Course goal:	The subject is an introduction to the creation and reading of the technical documentation, which is the main basis for the realization of the products. Students develop spatial imagination and acquire skills in manual drawing and dimensioning of basic geometric formations and structural components and assembly of components. The aim is to prepare students for the following subjects of structural and technological character.
Abstract:	1. Introduction, requirements, drawing aids. Technical standardization and documentation. 2. Basic imaging methods - overview, rectangular and axonometric projection. 3. Technical drawings - lines, drawing formats, drawing drawings, scales, description field, technical font. 4. Basic rules for rendering machine parts - views, cuts, cross sections. 5. Basic rules for displaying machine parts - showing basic geometric elements of components. 6. Dimensioning - rules, execution, dimensions, dimensions of geometric and structural elements. 7. Tolerance and dimensional accuracy - tolerance writing, unattended dimensions. 8. Tolerance and dimensional accuracy - fitting system, storage, storage order. 9. Geometric accuracy - bases, types of geometric tolerances, meaning. 10. Surface roughness - meaning, current state of prescribing, location of marks. 11. Displays and dimensioning of machine parts and elements - threads, bolts and screw connections, springs, gears and gears. 12. Displays and dimensioning of machine parts and elements - grooving, bearings, sealing rings, centering pits, recesses, glued and solder joints, welds and welds, castings and forgings, heat treatment. 13. Drawing drawings - general principles, positioning, item lists (BOM), semi-finished products and their labeling.
Notice:	*The course will be opened with the attendence of 5 students min.*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Technical English**
Course code:	UTM/ P098
ECTS:	3
Level of course:	bachelor/master degree
Teacher:	Pavla Čechalová, Mgr.
Term:	summer, winter
Language of instruction:	English
Lectures/exercises:	2/0 per week
Completion:	exam
Course goal:	This course covers essentials of technical language skills and aims to encourage fluency and active use of grammar and communicative structures in oral and written ways.
Abstract:	**I. Introductory part** **winter semester, bachelor** Engineering, The History of Engineering, Civil Engineering, Main Branches of Civil Engineering, Engineering Functions, **II. Main part** **summer semester, bachelor** Material Engineering Properties – General Physical Properties, Material Engineering Properties – Mechanical Properties, Material Engineering Properties – Thermal Properties, Material Testing – Tensile Test, Manufacturing Processes **III. Final part** **winter, summer semester – master** Cast Iron, Non-Ferrous Metals, Corrosion, Plastics, Environmental Engineering
Notice:	*This course will be opened in agreement with the teacher.* *pavla.cechalova@ujep.cz*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Thermodynamics**
Course code:	USE/P119
ECTS:	5
Level of course:	bachelor degree
Teacher:	Doc. Ing. Jan Novotny, Ph.D.
Term:	summer/ winter
Language of instruction:	English
Lectures/exercises:	2/2
Completion:	exam
Course goal:	Analyse thermodynamic systems, its equilibrium and energy transfer (work, heat) using First and Second Laws of Thermodynamic and determine the basic thermodynamic properties (internal energy, entropy) . Learn about measurements methods in Thermodynamic and work with diagrams, property tables and relations. Carry out thermodynamic analysis of engine cycles, heat pumps and refrigerator cycles.
Abstract:	1.Fundamental concepts and laws of thermodynamics. Basic quantities of state. Equation of state of an ideal gas. 2. The First Law of Thermodynamics- heat, work, internal energy, enthalpy. The Second Law of thermodynamics, entropy. 3. Reversible and irreversible processes of ideal gases. Phase change. 4. Mixtures of ideal gases. Van der Waals model. The thermodynamics of vapour. Vapour tables and diagrams. The Clausius-Clapeyron Equation. 5.Thermodynamic processes in vapours. 6.Cycles in engineering application. 7. Psychrometry. Thermodynamics of humid air. Definitive quantities, tables, diagram. 8. Heat transfer by conduction, one-dimensional problems 9. Heat transfer by convection, The Similarity Theory in heat convection. 10. Heat transfer by radiation. The basic laws and applications. Heat exchangers. Overall heat transfer, the mean temperature logarithmic gradient. 11. One-dimensional isentropic compressible flow. Basic equations, Mach number. Isentropic flow.
Notice:	This course will be opened in agreement with the teacher. Novotny.jan@ujep.cz

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Quality Control**
Course code:	USE/P107
ECTS:	4
Level of course:	Bachelor's/Master's degree
Teacher:	Milan Dian, Ing., Ph.D., MBA
Term:	Summer, Winter
Language of instruction:	English
Lectures/exercises:	1/2 per week
Completion:	exam
Course goal:	The fundamental objective of the course is to acquaint the students with modern systems of quality control, with top management function, tools and methods used in Quality Assurance System in all phases of manufacturing process and services.
Abstract/Topics:	The principles of quality have long been known and used by professionals across the industry around the globe. The tools, methodologies, and rules of quality are inherently incorporated in each particular company process, product, and activity, being surely a competitive advantage on market place. On the other hand a plethora of discrepancies and problems still remains unsolved on the way to excellence and sustainability. The course presents up to date approach to modern Quality Assurance using a fundamental tools and methodologies in nowadays industrial processes and service. Moreover, it integrates knowledge and experience from contemporary field of Quality Assurance within automotive supply chain. Finally, the stress is put on Total Quality Management approach over the entire industry and service sector. 1. A brief history and Introduction to the Management of Quality. 2. Methods and Quality tools I. (7 fundamental quality tools) and their application. 3. Methods and Quality tools II. (7 advanced quality tools) and their application. 4. Quality Assurance in Pre-serial Production. 5. Quality Assurance in Serial Production. 6. Quality Assurance in Post-production Phases and Aftermarket. 7. Economic Aspects of Quality. 8. Continuous Improvement in Quality Management Systems. 9. Systems of Quality Management based on ISO 9001, IATF 16949 and TQM. 10. Quality Awards, Model of Excellence and New Trends in Management of Quality.
Notice:	This course will be opened in agreement with the teacher. *milan.dian@ujep.cz*

Institute of Technology and Materials

Institute:	Faculty of Mechanical Engineering
Course title:	**Applied Physics**
Course code:	UTM/P089
ECTS:	3
Level of course:	bachelor/master degree
Teacher:	Novotný Jan, PhDr., Ph.D.
Term:	summer, winter
Language of instruction:	English
Lectures/exercises:	1/1 per week
Completion:	Exam
Course goal:	Good knowledge of physics is the basic prerequisite for understanding and design of technical equipment. The aim of the course is to deepen and level up students' secondary school knowledge, to be able to study successfully technical subject.
Abstract:	1. Experimental and theoretical physics. Models and modelling in physics. Vector Calculus introduction: adding and subtraction of vectors. 2. Mass point (primary element) kinematics: reference-coordinate systems, displacement, speed, velocity, acceleration, straight-line, curvilinear and harmonic motions. 3. Kinematic quantities relations, graphs. 4. Mass point dynamics: laws of motion. Forces effects, work, energy, force impulse, momentum. 5. Rigid body (solid): forces and moments equilibrium, rotational motion, moment of momentum, inertia moment, energy. Sliding friction, rolling resistance, physical pendulum. 6. Matters deformation: elastic and plastic deformations, strain-stress diagram explanation. Loading of solids: tension, shear and torque. Hooke´s law, Young´s modulus, Poisson´s ratio. 7. Perfectly and imperfectly elastic impacts: force impulse, momentum, momentum moment, energy. 8. Liquids. Hydrostatics: Pascal´s law and Archimedean principle and hydrostatic paradox and their technical application. Hydrodynamics of ideal liquid, Bernoulli´s equation, hydrodynamics paradox. 9. Ideal and real liquids. Movement of bodies in liquids. Aeromechanics, atmospheric pressure and pressure measurements. Technical application: compressors, vacuum pump, turbines, aviation. 10. Kinetic theory of gases, velocity distribution, root-mean-square speed of molecules. Pressure of gases. Ideal gas fundamental equation. 11. Electricity - Electrostatics, Electrical field strenght E, Electric current, Single electrical circuit, Ohm s law for elecrical circuit part. 12. Formation of the image, Plane mirror, Concave spherical mirror, Lenses, Dioptric power.
Notice:	*This course will be opened in agreement with the teacher.* *jan.novotny@ujep.cz*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**CNC Programing**
Course code:	UTM / P111
ECTS:	3
Level of course:	bachelor/master degree
Teacher:	Pavel Kraus, Ing.
Term:	summer, winter
Language of instruction:	English
Lectures/exercises:	2/0 per week
Completion:	exam
Course goal:	The aim of the course is to outline the usage of CNC programing in frame of using ISO code for turning and milling with practical demonstration of CNC systems and CNC machining.
Abstract:	1. Fundamentals of CNC programming 2. NC, CNC, DNC, 3. ISO Code 4. CNC systems 5. CNC turning 6. CNC milling
Notice:	*This course will be opened in agreement with the teacher.* *pavel.kraus@ujep.cz*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Corrosion and Protection of Material**
Course code:	UTM/P097
ECTS:	4
Level of course:	bachelor/master degree
Teacher:	Jaroslava Svobodová, Ing., Ph.D.
Term:	winter semester
Language of instruction:	English
Lectures/exercises:	2/1 per week
Completion:	exam, semestral project
Course goal:	The material is exposed to a number of influences in technical practice that cause its deterioration, corrosion and other degradation. Knowledge of the degradation reason and reducing of the environment impact is an important factor in the design of structures, structural components and protection of goods prior to export from the factory. In the automotive and aerospace engineering are still solving this problems. Insight into the influence of environment on the product, material and methods of protection of materials and products are the object of this course.
Abstract:	1. The Gist of the Corrosion 2. Types of Corrosion 3. The Distribution and Types of Corrosion Attack 4. Thermodynamic Stability and Corrosion Nobility of Metals 5. Corrosion Protection Methods 6. Metal coatings 7. Practical exercise
Notice:	*This course will be opened in agreement with the teacher.* *jaroslava.svobodova@ujep.cz*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Degradation of material**
Course code:	KTMI / P101
ECTS:	5
Level of course:	bachelor/master degree
Teacher:	Sylvia Kuśmierczak, doc. Ing., Ph.D.
Term:	summer semester
Language of instruction:	English
Lectures/exercises:	2/1 per week
Completion:	exam , semestral project
Course goal:	The course approaches the issue of material degradation and introduces students with the classification of degradation processes, to give their reasons and their consequences. Student information obtained in this field.
Abstract:	1. Classification of degradation processes 2. Fractures materials: theoretical strength, the influence of defects etc. 3. Fatigue of materials: fatigue static, dynamic fatigue creep 4. Wear materials: abrasion, adhesion, erosion, cavitation 5. Degradation of sudden temperature changes, chemical decomposition at high temperatures. 6. Degradation radiation: UV degradation, radiation damage Materials resistant to certain types of degradation.
Notice:	*The course will be opened in agreement with the teacher.* *sylvia.kuśmierczak@ujep.cz* *To complete this course, students must have previous knowledge of technical materials in the appropriate range.*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Fundamentals of Fractography**
Course code:	UTM/P120
ECTS:	4
Level of course:	bachelor/master degree
Teacher:	Jaroslava Svobodová, Ing., Ph.D.
Term:	Summer semester
Language of instruction:	English
Lectures/exercises:	2/1 per week
Completion:	Exam, semestral project
Course goal:	Fractography is an area of physical metallurgy dealing with evaluation of the fracture planes of fractures. The course is focused on the theory of different types of fractures, mechanism of this processes and methods of investigation. It also deals with concrete cases of fractography in steels, aluminium alloys and application of fractography in energetics.
Abstract:	1. Introduction of Fractography 2. Selected notes on corrosion fractures 3. Criteria for evaluation of fracture faces 4. Selected notes on the theory of fatigue fractures 5. Selected notes on the theory of ductile fractures 6. Selected notes on the theory of brittle failures - cleavage fractures 7. Selected notes on the theory of creep fractures 8. Notes on the fractography of aluminium alloys 9. Notes on the fractography of stainless steels 10. Application of fractography in energetics
Notice:	*This course will be opened in agreement with the teacher.* *jaroslava.svobodova@ujep.cz*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Materials in Energetics**
Course code:	UTM/P121
ECTS:	5
Level of course:	bachelor/master degree
Teacher:	Jaroslava Svobodová, Ing., Ph.D.
Term:	Summer semester
Language of instruction:	English
Lectures/exercises:	2/1 per week
Completion:	Exam, semestral project
Course goal:	The course aims to explain the characteristics of steels applied in power engineering. We will deal with the properties of materials and the processes that can affect the behaviour and the lifetime of the materials and products in this field. Students become acquainted with degradation processes, fractography and creep processes of materials used in energetics. They will also get an overview of trends and developments in this area.
Abstract:	1. Introduction 2. Characteristics of steels applied in power engineering 3. Creep process 4. Degradation processes due to corrosion 5. Fractography in energetics 6. Material inspection, residual life prediction 7. The world trend of steel and its requirements 8. The world trend of research of nuclear reactors and applied steels in them 9. Overview of the most applied steels in heat power engineering 10. New stainless steels, research and application
Notice:	*This course will be opened in agreement with the teacher.* *jaroslava.svobodova@ujep.cz*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Jigs and Fixtures**
Course code:	UTM/P122
ECTS:	3
Level of course:	bachelor/master degree
Teacher:	Nataša Náprstková, doc. Ing., Ph.D.
Term:	winter/summer
Language of instruction:	English
Lectures/exercises:	2/0 per week
Completion:	exam, semestral project
Course goal:	The course introduces students to the basics of design and use of jigs and fixtures not only for machining. They will be introduced to the kinds of components and using of fixtures for different types of production.
Abstract:	1. What is it fixture? 2. Uses and advatages of jigs and fixtures. 3. Application for jigs and fixtures. 4. Design principles common tu jigs and fixtures. 5. Types and dividing of fixtures. 6. Fundamenatl components of fixtures. 7. Specific components for fictures. 8. Exapmles of fixtures.
Notice:	*The course will be opened in agreement with the teacher.* *natasa.naprstkova@ujep.cz*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Manufacturing Technology**
Course code:	UTM/P090
ECTS:	5
Level of course:	bachelor/master degree
Teacher:	Jaroslava Svobodová, Ing., Ph.D.
Term:	Summer semester
Language of instruction:	English
Lectures/exercises:	2/1 per week
Completion:	Exam, semestral project
Course goal:	The aim of the course is to obtain knowledge in the manufacturing processes that deal with the production of components used in engineering in the construction machinery and industrial equipment.
Abstract:	1. Introduction into manufacturing technology 2. Distribution of technical materials 3. Machining processes – basic concepts 4. Turning 5. Milling 6. Drilling and boring 7. Grinding 8. Planing and slotting 9. Finishing operations 10. Manufacture of threads and gearing 11. Special machining methods 11. Production quality
Notice:	*This course will be opened in agreement with the teacher.* *jaroslava.svobodova@ujep.cz*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Non-cutting Technologies**
Course code:	UTM/P095
ECTS:	5
Level of course:	bachelor/master degree
Teacher:	Jaroslava Svobodová, Ing., Ph.D.
Term:	Winter semester
Language of instruction:	English
Lectures/exercises:	2/1 per week
Completion:	Exam, semestral project
Course goal:	The aim of the course is to explain the principle and technological processes of the non-cutting technologies. We will deal with the basic technologies of casting, progressive casting technology, forming, welding, powder metallurgy, heat treatment and chemical-thermal treatment of materials.
Abstract:	1. Properties of metals and alloys 2. Partition of the production processes 3. Casting methods and technology 5. Progressive casting technology 6. Forming of material 7. Welding methods and technology 8. Powder Metallurgy 9. Heat treatment and chemical-thermal treatment
Notice:	*This course will be opened in agreement with the teacher.* *jaroslava.svobodova@ujep.cz*

Faculty/Institute:	Faculty of Mechanical Engineering
Course title:	**Physics of Metals**
Course code:	UTM/P114
ECTS:	5
Level of course:	bachelor/master degree
Teacher:	Jan Novotný, Dr., Ph.D.
Term:	summer, winter
Language of instruction:	English
Lectures/exercises:	2/2 per week
Completion:	exam
Course goal:	Good knowledge of physics of metals as the basic prerequisite for understanding and design of technical materials. Subjects presents a definitive account of a major field of modern physics and will be of value to both experimental and theoretical solid state physicists and metallurgists seeking a clear explanation of the physical phenomena occurring in metals
Abstract:	Internal structure of metals and alloys 1. Fundamentals of crystallography 2. Dislocations and between dislocations and plastic deformation during forming 3. Ways of strengthening metals. 4. Precipitation hardened alloy 5. Solidification of metals and their alloys 6. Grain boundaries: definition and description. Properties of grain boundaries. 7. Diffusion 8. Chemical treatment of metal surfaces and diffusion processes in metal heat treatment 9. Ways and nature of the surface wear of materials. 10. Violation of the fracture, the mechanism of fracture, fracture types and their origin.
Notice:	*This course will be opened in agreement with the teacher.* *jan.novotny@ujep.cz*