The List of English Taught Courses Preliminary Available for Erasmus+ Incoming Students at the Faculty of Mechanical Engineering 2024/2025

Students may combine courses from different levels of study provided they meet the prerequisites.

WINTER SEMESTER (WS = September – January)

Theory of Heat Treatment Dept.: KMT **Course code: TTZ*M**	Doc. Ing. Adam Hotař, Ph.D.	WS / 5 ECTS	Master level
Annotation			
The aim of the course is to acquire and extend the knowledge of physical and metallurgical basics of heat treatment, especially steels, cast iron and non-ferrous alloys. Students will deepen their knowledge of diffusion processes in heat treatment and get an overview of various types of heat treatment, such as annealing, quenching, tempering, hardening, aging etc. In addition, the chemical-thermal treatment, thermomechanical treatment and surface heat treatment will be also explain.			
Prerequisites: Basic knowledge of material science (crystal structure of metals, defects of crystal lattices, properties of materials and their testing, equilibrium binary diagrams, Fe-C diagrams, basics of phase transformations of steels in solid state, basics of thermal and chemical-thermal processing)			

Design Materials Dept.: KMT **Course code: KM*M**	Doc.Ing. Adam Hotař, Ph.D. /prof. Ing. Petr Louda, CSc.	WS / 3 ECTS	Master level
Annotation			
The aim of the course is to acquire and extend the knowledge of physical and metallurgical basics of heat treatment, especially steels, cast iron and non-ferrous alloys. Students will deepen their knowledge of diffusion processes in heat treatment and get an overview of various types of heat treatment, such as annealing, quenching, tempering, hardening, aging etc. In addition, the chemical-thermal treatment, thermomechanical treatment and surface heat treatment will be also explain.			
Prerequisites: basic knowledge of materials engineering			

Applied Cybernetics Dept.: KSA **Course code: AK-B** **Minimum 2 students**	Ing. Radek Votrubec, Ph.D.	WS / 4 ECTS	Bachelor level
Annotation			
Dynamic systems, mathematical model, linearization, identification of static and dynamic characteristics, numerical simulation. Laplace transformation, frequency analyses, stability verification, feedback control, PID controller, methods of optimisation of PID parameters, numerical control system, simulation in Matlab-Simulink environment, instrumentation and control by means of LabVIEW.			
Prerequisites: none			

Additive Technology Dept.: KSA **Course code: ADIT** **Minimum 5 students** **Maximum 10 students**	Ing. Petr Keller, Ph.D.	WS / 5 ECTS	Bachelor level Master level
Annotation			
Introduction to additive technologies, comparison with other manufacturing technologies. History and development of additive technologies and methods of Rapid Prototyping. General principles of 3D objects printing, requirements for input data and their quality. Classification of additive technologies, possibilities and differences of individual methods, possibilities of usage. Future of additive technologies, hybrid technology.			
Prerequisites: CAD I, II			

Production Machines I / Dept.: KSA **Course code: VS1**	Ing. Petr Zeleny, Ph.D.	WS / 4 ECTS	Master level
Annotation			
Description of machine tools, their characteristics and specific feasibility of machines. Precision, stiffness. Forces, Power transmission. Design for rigidity and performance, requirements. Design principles and Characteristics of various parts-e.g. spindles, feed mechanisms, guides, drives, clamping devices, frames, manipulation, control, automation.			
Prerequisites: Machine parts, Elasticity and Stresses			

3D Digitization and Reverse Engineering Dept.: KSA **Course code: 3DR*M** **Minimum 5 students** **Maximum 10 students** (all students in the subject)	doc. Ing. Radomir Mendricky, Ph.D.	WS / 4 ECTS	Master level
Annotation			
The aim of the subject is to acquaint students with the modern methods of 3D measurement and optical digitization in engineering and its use in technical practice. Attention is paid to the processing of measured data, dimensional and shape inspection and methods of reverse engineering.			
Prerequisites: n/a			

Operation Analysis Dept.: KSA **Course code: OA*M** **Minimum 5 students** **Maximum 12 students**	Ing. Frantisek Koblasa, Ph.D.	WS / 4 ECTS	Master level
Annotation			
The course deals with methods of operational analysis e.g. linear programming, network analysis, game theory, queuing theory. Furthermore, methods of network analysis, CPM & PERT method, the method of dynamic programming, game theory and optimal decision making are explained on real world problems.			
Prerequisites: none			

Artificial Intelligence Dept.: KSA **Course code: UI*M**	Ing. Miroslav Vavrousek, Ph.D.	WS, SS / 5 ECTS	Master level

Annotation
Introduction into artificial intelligence, the central problems of artificial intelligence. Traditional computational models, state space, fitness function. Recognition and synthesis of audio and video, signal processing, image segmentation. Biologically inspired algorithms, neural networks, genetic algorithms, cellular automaton and other applications of artificial neural networks.
Prerequisites: none

Digital Factory Dept.: KSA **Course code: DIP*M** *Substituting old course Simulation of manufacturing systems* **Minimum 5 students** **Maximum 12 students** (all students in the subject)	Ing. Frantisek Koblasa, Ph.D.	WS / 5 ECTS	Master level
Annotation			
The course introduces students to the basics of discrete event simulation. Introduces them to issues in the field of Digital Factory (DF), Digital Twin. Simulation tools in the field of queuing theory, material flows, logistics and ergonomics are presented. The methodological procedure of simulation study and the possibility of using optimization methods with the support of the systematic design of experiments are explained. Subsequent interpretation of simulation outputs is discussed. The condition is the independent elaboration of the project work in the selected simulation system. Exercises are focused on the practical application of selected methods in simulation studies.			
Prerequisites: none			

Fluid Mechanics Dept.: KEZ **Course code: MT** **Minimum 3 students**	Ing. David Šimurda, Ph.D.	WS / 5 ECTS	Bachelor level
Annotation			
The basic properties of liquids, the hydrostatics, the relative equilibrium, the hydrodynamics of viscous and inviscid incompressible fluid, the laminar and turbulent flow, the hydraulic losses, the devices to transport and compression of fluid.			
Prerequisites: Mathematics, Physics			

Experimental Methods in Fluid Mechanics and Thermodynamics Dept.: KEZ **Course code: EXMT** **Minimum 3 students**	Ing. Jan Novosad, Ph.D.	WS / 4 ECTS	Master level
Annotation: The basic view into experimental methods – theoretical base + practical measurement			
Prerequisites: in process			

Piping systems and their Regulation Dept.: KEZ **Course code: PSR** **Minimum 3 students**	Ing. Ondřej Burian	WS / 4 ECTS	Master level

Annotation
Lay - out and calculation of pipe systems for transportation of liquids, gases and vapours. Operation characteristics and properties of some groups of control elements.
Prerequisites: in process

Heat and Mass Transfer Dept.: KEZ **Course code: PTH** **Minimum 3 students**	Ing. Jan Novosad, Ph.D.	WS / 5 ECTS	Master level
Annotation			
The course is focused on basic mechanisms of transport phenomena. The main topics are: Balance equations, Euler and Lagrangian description, the basic mechanisms of heat transfer, steady and unsteady heat conduction, and convective heat transfer, heat transfer with phase change, radiation heat transfer, and radiation coefficient calculation methods. Molecular diffusion mass transfer, convective mass transfer, simultaneous heat and mass transfer, Reynolds analogy, Chilton-Colburn analogy.			
Prerequisites: Thermodynamics, Fluid Mechanics			

Technical Building Equipment Dept.: KEZ **Course code: TZAB** **Minimum 3 students**	doc. Ing. Milos Müller, Ph.D.	WS / 5 ECTS	Master level
Annotation			
The lectures introduce students into the fundamentals in design of the ventilation and the air conditioning systems. It includes the definition of the parameters defining the buildings microclimate, the thermal properties of constructions, the calculation of the buildings heat load, fundamental calculations of the air conditioning air treatment, the design of the air distribution systems, components of the ventilation and the air conditioning systems, chillers and heat sources for the air conditioning, air conditioning systems and reheat systems. The lectures introduce students also into the fundamentals of the design and calculation of base types of heating systems and its components, including selected heating sources and into the design of the warn air heating.			
Prerequisites: Thermodynamics, Fluid Mechanics			

Mechanics II (Kinematics) Dept.: KMP **Course code: KIN**	prof. Ing. Iva Petrikova, Ph.D.	WS / 5 ECTS	Bachelor level
Annotation			
Kinematics of particle translation, rotation, general plane motion spherical motion and general spatial motion of a rigid body, simultaneous motions. Kinematical geometry of general plane motion of rigid body. Kinematics of mechanisms, analytical and graphical analysis. Mechanisms with constant gear train. Principle of virtual power.			
Prerequisites: Basic knowledge of the subjects STA and M1A.			

Mechanical Vibration Dept.: KMP **Course code: KMS*M**	prof. Ing. Iva Petrikova, Ph.D.	WS / 5 ECTS	Master level Bachelor level
Annotation			

The course presents the fundamentals of vibrations of mechanical systems. Single degree of freedom system. Excitation Forces. Frequency response on a periodic excitation. Discrete systems with multidegree of freedom. Dynamic absorber. Vibrations of nonlinear systems. Vibrations of linear continuous system. Finite elements method for vibration problems. Eigenvalue problem and modal analysis. Fundamentals of rotor dynamics. Machines with impact and periodic forces.
Prerequisites: Basic knowledge of the subjects PP2 and DYN.

Mechanics of Composite and Advanced Materials Dept.: KMP **Course code: MKPM**	doc. Ing. Tran Huu Nam, Ph.D.	WS / 6 ECTS	Master level Bachelor level
Annotation			
Fundamentals of anisotropic elasticity, composite materials and their mechanics properties. Stress analysis of laminate structures (beams, plates, shells), strength of composites, mechanical testing.			
Prerequisites: Basic knowledge of the subject "Strength of materials.".			

Metrology Dept.: KOM **Course code: MET** **Minimum 2 students**	doc. Ing. Stepanka Dvorackova, Ph.D. Ing. Artur Knap	WS / 5 ECTS	Master level
Annotation			
The aim of the course is to get acquainted with metrology at national and international level. The course focuses on legislative and technical documents in metrology, corporate metrology, calibration and verification of gauges, measurement uncertainty and design and evaluation of the measurement experiment.			
Prerequisites: none			

Robots and Manipulators Dept.: KSR **Course code: ROBM**	doc. Ing. Marcel Horak, Ph.D.	WS / 5 ECTS	Master level
Annotation			
The subject presents overview and distribution of basic industrial and service robots, explains basics of robot mechanics and describes overview and characteristics of used drives and peripheries. It presents basic design of motional axis, robot control and programming. It also characterizes robot's application potential.			
Prerequisites: none			
Electro Pneumatic Actuators Dept.: KSR **Course code: EP**	doc. Ing. Marcel Horak, Ph.D.	WS / 4 ECTS	Master level
Annotation			
Systems analysis of pneumatic circuits, determination of pneumatic actuators, valves, shock absorbers and accessories, vacuum circuits, step diagrams, sequential control. Synthesis of electro pneumatic control with using of PLC. Basic types programming of programmable logic controllers (PLC). Solving of boundary and safety conditions and their practical verification.			
Prerequisites: none			

Statistics for Engineering Dept.: KVM **Course code: IS**	Ing. Katerina Andrlova	WS / 4 ECTS	Bachelor level Master level

Annotation
Basic concepts of the number of probabilities, numerical characteristics of random variables, description of properties and use of discrete and continuous random variables, parameter estimations, methods of analysis of experimental data, testing of statistical hypotheses, regression analysis. Basic concepts of product reliability theory, failures and their classification, reliability test and evaluation, bath curve, system reliability, statistical scrutineering, operational characteristics of acceptance plans, calculation of parameters of operational characteristics.
Prerequisites: Subjects in basic studies - mathematics.

Design Project II Dept.: KVM **Course code: KPII**	Ing. Robert Vozenilek, Ph.D.	WS / 4 ECTS	Master level Bachelor level
Annotation			
The solution of individual allocated work (namely designing character). The work opens up on the results of the term work from the subject "Project I". The work contains the basic calculation solution (thermal and strength problems). The result of this work is defended at the end of term before students' group and head of subject.			
Prerequisites: none			

Modelling and Simulation II Dept.: KVM **Course code: MS2**	Ing. Pavel Brabec, Ph.D. Ing. Robert Vozenilek, Ph.D.	WS / 4 ECTS	Master level Bachelor level
Annotation			
Modelling of linear and nonlinear dynamic engineering systems. Dimensional analysis and modelling, with application to flow problems and hydrostatic mechanisms, pneumatic mechanisms, thermal systems, and improving the dynamic performance characteristics of vehicle, modelling of combustion engines.			
Prerequisites: Theory of vehicles, Driving Units I, Driving Units II, Vehicles I, KMS, EPS			

Driving Units I Dept.: KVM **Course code: POJ1**	Ing. Pavel Brabec, Ph.D.	WS / 4 ECTS	Master level Bachelor level
Annotation			
Theory, processes. -The core of the subject is the acquisition of basic theoretical knowledge from the field of thermo-chemistry and thermo-mechanics in terms of the working process of piston combustion engines, as well as experience with the application of computations and the experimental verification of their principal parameters. The aim is to familiarize students with the operational-emission properties and characteristics of vehicle engines (piston combustion engines and partly electric engines and gas turbines).			
Prerequisites: Subjects in basic studies (mathematics, chemistry, thermodynamics, kinematics and machine parts).			

Driving Units III Dept.: KVM **Course code: POJ3**	Ing. Aleš Dittrich	WS / 4 ECTS	Master level Bachelor level
Annotation			
The course focuses on: Fuel components of diesel engines, gasoline engines. Piston combustion engine control systems. Blowers and turbochargers. Electrical accessories for motors (battery, alternator, starter, ignition). PSM cooling systems. Exhaust silencers. Air, fuel and engine oil filtration equipment. Catalytic reactors and particle filters.			

Prerequisites: Subjects in basic studies (mathematics, chemistry, thermodynamics, kinematics and machine parts). Driving Units I.

Mechanical Engineering Dept.: KVM **Course code: STR**	doc. Dr. Ing. Elias Tomeh	WS / 2 ECTS	Bachelor level
Annotation			
The subject shows the mechanical engineering as the field of the technical science. The attention is focused to the history of technical discoveries and knowledges of the natural laws. The subject occupies with the technology branches and also with the science of machines. The subject shows the faculty of mechanical engineering as the education and science-research institution.			
Prerequisites: The students participate in the teaching in the above-mentioned scope. The exercises will be carried out in blocks. Students will be assigned material for independent study according to the subject areas. Students will be given independent assignments throughout the semester. The end of the course is in the form of submission of an independent term paper and a credit paper. Consultations are available during the class or the teacher can be contacted: robert.vozenilek@tul.cz, +420485353154			

Machine Parts and Mechanisms II Dept.: KST **Course code: CSII**	prof. Ing. Lubomir Pesik, CSc. Ing. Radka Jirova, Ph.D.	WS / 5 ECTS	Bachelor level
Annotation			
Differentials and planetary spur and bevel gear trains. Helical and worm gears. Compression, extension and torsion springs, metallic or non-metallic. Antivibration and shock mounts. Couplings for shafts, flange and jaw type, couplings for angular and lateral misalignment, universal joints, friction and flexible clutches. Design of pins and shafts, critical speed of shafts. Special gear trains.			
Prerequisites: Technical Mechanics, Elasticity and Strength (Entrance test) and Technical Drawing. Passing an entrance test on the basics of mechanics (statics, kinematics, dynamics) and elasticity and strength (critical section of the part, stress types, limit stressis and limit deformations).			

Design Exercise Dept.: KST **Course code: KC**	prof. Ing. Ladislav Sevcik, CSc.	WS / 3 ECTS	Bachelor level
Annotation			
Engineering design of the actuator consisting of a two-stage belt drive or chain drive, multi-stage gearbox with helical and bevel gears to shift, respectively with worm gearbox and clutch.			
Prerequisites: Completion of the course KST/CSI			

CA Technology Dept.: KST **Course code: CAT*M**	prof. Ing. Ladislav Sevcik, CSc.	WS / 4 ECTS	Master level
Annotation			
Subject include encompassments of CAD and FEM technologies, especially CAD technology of surface design, welded design and sheet metal, thin plastic parts, cast parts and changes of import geometry, mold CAD technology and design of pipe systems.			
Prerequisites: Students should be able to handle CAD and FEM technology, especially technology creation welded assemblies, sheet metal, sheet and free-surface modelling. They should be able technologies making thin plastic parts, casting technology development and technology repair of imported geometry, technology and forms of virtual machining module, piping systems.			

Innovation Engineering Dept.: KST **Course code: INI*M**	doc. Ing. Petr Lepsik, Ph.D.	WS / 6 ECTS	Master level
Annotation			
The subject is focused on theory and questions connected with innovation cycle. The concept of simultaneous engineering will be presented and explained. Students will learn the tools of simultaneous (concurrent) engineering for reduction of time for design and manufacturing of new products. Seminars are oriented on training of essential methods during team-project centered on complex innovation of simple product.			
Prerequisites: Students, in this course should know the theory and the problems associated with the innovation cycle, students should learn to work with tools to reduce time to introduce a new product into production. They should master the basic methods of training within the innovation team project team focused on complex product innovation from a simple design, the design process.			

Principles of Product Design Dept.: KST **Course code: PNV*M**	prof. Ing. Ladislav Sevcik, CSc.	WS / 5 ECTS	Master level
Annotation			
The course is focused to autonomous innovation design working. The subject includes the basic principles and methods of design, innovation methods DFA, DFD, DFM, DFMA. In subjects are used experiences from design and assemble of gearboxes, forget and cast pieces, plastics parts of care. Product evaluation of parts and assemblies is made from point of view of function, design, assembly, disassembly and manufacturing.			
Prerequisites: Students should develop independent innovative work in product design. The course includes principles and methods of design work, innovative methods of basic DFA, DFD, DFM, DFMA .. Based on experience with the development of gear boxes, forgings and plastic car parts. It also includes elements of safety features. It shows the possibility of product reviews and reports with regard to functionality, appearance, its assembly, disassembly, and manufacturing. It is also familiar with the economic views of the individual machine units.			

Technical Communication Dept.: KST **Course code: TEK*M**	doc. Ing. Vitezslav Fliegel, CSc. Ing. Pavel Srb, Ph.D.	WS / 3 ECTS	Master level
Annotation			
Technical communication as a topic of the branch administration and management of information includes processes creation, maintenance, spread, storage and ultimate disposition of sort out dates, information of proposal, project, product, trade, and legislation. It provides the critical links among people, ideas, and ICT that are necessary for success of the PLM. Technical communication provides an overview of the following major processes: Engineering Data management, Prodat Data Management, Product Lifecycle Management, Project Management, Enterprise Content Management & Enterprise Resource Planning, CAD Management, Content Management.			
Prerequisites: Students should know the process of organizing and disseminating data on the procedures in the field. Should use communications technologies, which are necessary for successful product lifecycle management. Technical communication gives an overview of the following major processes: systems for creating and managing documents, systems management products, systems, product lifecycle management, management of proposals and projects, information systems, manage CAD projects, content management .			

Calculations of Polymer and Composite Parts Dept.: KST **Course code: VPKD**	doc. Ing. Michal Petrů, Ph.D.	WS / 5 ECTS	Master level
Annotation			
The subject line looks at the use of numerical methods for the study and analysis of the mechanical properties of plastic and composite parts. First, the basic concepts of strength calculations for elastic, elastic-elastic and plastic materials, such as tautness, stiffness, pliability, deformation, Hooke's Law, and the distribution of anisotropic materials, will be given to guide students into the use of modelling in solving the problems of linear and non-linear equations. The methods of modelling individual layers of laminates will be given below, and how they will affect the mechanical properties of the laminate, such as single or multi-axial tension due to tension, pressure, bending, cruelty or temperature change. In conclusion, macro-mechanical breach criteria for plastic and composite parts will be approached. Students get an overview of the strength calculations of plastic and composite parts, learn how to formulate problems and then solve them numerically and verify the correctness of these solutions. On exercises, examples are solved both analytically and numerically using the final elements method in Ansys and Ansys Workbench.			
Prerequisites: Mechanics, theory of elasticity, basis of FEM, static calculations, contacts.			

Experimental Methods Dept.: KTS **Course code: EXPM** **Minimum 2 students**	doc. Ing. Martin Bilek, Ph.D. Ing. Jiri Komarek, Ph.D. doc. Ing. Petra Dančová, Ph.D. Ing. Aleš Dittrich, Ph.D. doc. Ing. Vlastimil Hotar, Ph.D. doc. Ing. Radomír Mendřický, Ph.D.	WS / 4 ECTS	Master level
Annotation			
Principles of measuring non-electrical quantities in engineering practice. The most commonly used non-electrical quantities sensors: Sensors of kinematic variables, force and pressure sensors, vibration measurement, measurement microphones, thermometers, etc. Non-Contact object digitalization and principles of non-contact 3D measurements. Experiments aimed at internal combustion engines and vehicles; evaluation of its operational parameters, particularly power, noise and emission parameters. Measurement of temperature, contact and noncontact methods, surface and fluids temperature measurement, heat transfer coefficient measurements, the measurement of rapid changes in temperature. Measurement of pressure and rapid changes in pressure. Measurement of fluid flow velocity: vane anemometer, hot-wire anemometer, CTA, the basics of optical methods.			
Prerequisites: not specified			

Numerical Simulation in Machine Design Dept.: KTS **Course code: NSM**	Ing. Petr Zabka, Ph.D. Ing. Jan Kracik, Ph.D. prof. Ing. Jaroslav Beran, CSc.	WS / 4 ECTS	Master level
Annotation			
The aim of the course is to gain experience with the application of the finite element method and finite volume method in the design of equipment and machines. Students will learn to use FEM and CFD software to solve advanced linear and nonlinear engineering problems. They will also learn how to create geometry and mesh, including the connection to CAD software; using the principles of effective modelling; properly defining boundary conditions; ensuring the solution's accuracy; evaluating and presenting simulation results. Students are expected to be already familiar with FEM fundamentals.			
Prerequisites: FEM fundamentals, Modelling and simulation			

Modelling of Mechanical Systems Dept.: KTS **Course code: MMSV** **Minimum 2 students**	doc. Ing. Martin Bilek, Ph.D. doc. Ing. Jan Valtera, Ph.D. Ing. Petr Zabka, Ph.D.	WS / 5 ECTS	Master level
Annotation			
Static, kinematic and dynamic analysis and synthesis of mechanical systems. Simulation of dynamic systems in Matlab/Simulink. Modelling in a system for analysis of coupled mechanical systems (Creo, MSC.Adams). Using CAD systems to create geometric model. Model parameterization, sensitivity analysis and optimization, creation of rigid and flexible bodies and constrains. Modelling of selected processes regarding specialization (a floating needle system, a clearance in kinematic joints, a yarn ballooning etc.).			
Prerequisites: not specified			

Modelling and Simulation Dept.: KTS **Course code: MOD** **Minimum 2 students**	Ing. Petr Zabka, Ph.D. Ing. Martin Konecny, Ph.D.	WS / 4 ECTS	Bachelor level
Annotation			
An introductory course to computer modelling of technical problems using FEM. Fundamentals of computer model creation: model simplification, element types, mesh generation, boundary conditions. Finite Element Method in linear problems of mechanics. Mathematical fundamentals of variational formulation of FEM - deformation variant. Effective data handling. Modelling errors. Practical problem-solving using FEM software products.			
Prerequisites: Elasticity and strength I.			

Project II. / PR2*M	Ing. Simon Kovar, Ph.D.	WS / 4 ECTS	Master level
Annotation			
The aim of the project is to acknowledge design skills by solving specific design tasks in the field of single-purpose and textile machines and machines for production of nanofibers. The design is supported by analyses, syntheses and experiments.			
Prerequisites: Machine Parts and Mechanisms.			

Mechanism Design Dept.: KTS **Course code: SM** **Minimum 2 students**	prof. Ing. Jaroslav Beran, CSc.; doc. Ing. Martin Bilek, Ph.D. Ing. Simon Kovar, Ph.D.	WS / 5 ECTS	Master level
Annotation			
Methods of complex design of mechanisms and machine subsystems, structural, type and geometrical optimizations of mechanisms. Planar and spatial kinematic chains. Geometrical precision of the position of mechanism member, trajectory analysis, the transmission angle. Graphical, analytical and computer methods of mechanism synthesis. Synthesis of cam and special mechanism, Design of cam function motion, cam design. Mechanisms modelling in MSC.ADAMS software.			
Prerequisites: not specified			

Fibre and Nanofibre Production Machines Dept.: KTS **Course code: SVN**	doc. Ing. Martin Bilek, Ph.D. Ing. Simon Kovar, Ph.D.	WS / 4 ECTS	Master level

Minimum 2 students	doc. Ing. Jan Valtera, Ph.D.		
Annotation			
Textile materials, their structure and basic mechanical and physical properties. Use of textile materials in the construction practice. Technology of yarn production, material preparation for weaving and knitting, weaving technology, knitting and braiding technology. Basic classification, principles and functions of spinning, weaving and knitting machines. Their performance and technical parameters. Nonwovens mechanically joined, bonded and laminated. Nanofiber Production Methods (electrospinning, force spinning, drawing, meltblown). Principles of production of various types of nanofibrous structures.			
Prerequisites: not specified			

Experimental Methods in Metal Forming Dept.: KSP **Course code: EMMF**	Ing. Jiri Sobotka, Ph.D.	WS / 5 ECTS	Master level
Annotation			
The aim of the course is to acquire deeper knowledge in the field of analysis and monitoring metal forming technological processes. Student will get detailed information about methods and possibilities of scanning technical quantities involved in the process and outcome of the metal forming process. The principle, course and methodology of evaluation the basic destructive and non-destructive tests used in metal forming for evaluation material and technological properties of processing metals will be explained. Moreover, the importance of standardized and technological forming tests for technical practice will be explained as well. For typical representatives of materials designed for forming (deep-drawing steels and strength materials, Al alloys, corrosion-resistant materials, etc.) will be performed the focused experimental tests necessary for the definition of basic and advanced numerical deformation models used in the branch of metal forming. The education of course also familiarizes student´s knowledge in low-cycle and high-cycle fatigue testing of different types of materials and formed products. On the basis of performed experiments, mathematical approximations of the measured data will be explained and realized and examples of their further processing by the statistical hypothesis tests.			
Prerequisites: Knowledge of the metal forming technologies and material science.			

SUMMER SEMESTER (SS = February - June)

Surface Treatments Dept: KMT **Course code: PÚ*M**	Ing. Totka Bakalova, Ph.D.	SS / 5 ECTS	Master level
Annotation			
The course aims to acquaint students with methods and procedures used in surface modification of materials. Emphasis will be put on the methodology of preparation of surface treatments, the actual formation of coatings and the determination of parameters of coating technologies. The lectures will introduce the basic types of surface modifications, their application in engineering and fundamental financial and environmental aspects. The individual exercises will present the theoretical and practical aspects of the possibility of surface treatment of technical materials.			
Prerequisites: basic knowledge of surface modification of materials			

Programming and Servicing of CNC Machines Dept.: KSA **Course code: CNC*M** **Minimum 5 students** **Maximum 10 students**	Ing. Petr Keller, Ph.D.	SS / 5 ECTS	Bachelor level Master level
Annotation			
Basic characteristics of different types of CNC machines and control systems. Individual functions and commands of ISO programming code. Creation of NC programs by CAD/CAM systems with focus on multi-axis machining. Editing and setting of programs on machines and part production. Introduction to control systems, servicing and maintenances of CNC machines.			
Prerequisites: none			

Production Machines II Dept.: KSA **Course code: VS2*M**	Ing. Petr Zeleny, Ph.D.	SS / 6 ECTS	Master level
Annotation			
Description of forming machines: characteristics precision, stiffness, forces, power transmission. Design for rigidity and performance. Design principles and feasibility of various parts. A mechanical press, mechanisms, devices, clutches, brakes, frames. Manipulation, control, security and safety. Devices, automation. Design of hydraulic presses. Machine hammers. Assembly machines. Design of clutches, brakes, frames. Safety.			
Prerequisites: Machine parts, Elasticity and Stresses			

Machine Drives and Servomechanisms Dept.: KSA **Course code: PSS*M** **Minimum 5 students** **Maximum 10 students**	doc. Ing. Radomir Mendricky, Ph.D. Ing. Petr Keller, Ph.D.	SS / 4 ECTS	Master level
Annotation			
The subject introduces the basics of automation and control of production machines. The main attention is given to positional servomechanisms (principles of execution, interpolation errors, static and dynamic characteristics) and peripheries that enable and influence CNC machine control (measuring elements, control systems, design principles). The design of control loops and verification of principles of position control is also based on computer simulations in SW Matlab - Simulink.			
Prerequisites: n/a			

Informatic Systems of Production Planning Dept.: KSA **Course code: ISRPP** **Minimum 5 students** **Maximum 12 students**	Ing. Frantisek Koblasa, Ph.D.	SS / 4 ECTS	Master level
Annotation			
The course will explain the methods of production management, especially using business management information systems as ERP, APS, MES. The topics of creating structural BOMs, both technical and business management will be discussed in detail - documentation, Master production schedule, Material Requirements Planning, Manufacturing Resource Planning, Capacity plan, division and overlapping of orders, production scheduling, management and order tracking (information and material flow).			

Prerequisites: N/A

Programmable Logic Systems Dept.: KSA **Course code: PLS*M**	Ing. Radek Votrubec, Ph.D.	SS / 5 ECTS	Master level
Annotation			
Automatons, principle and their graphs. Automaton implementation on Arduino Board. Design and implementation of control systems based on PLC controllers. Methods of PLC programming, contact diagrams, flowcharts, programming in their native language. Practical applications to real training systems. Ways to connect peripheral devices to PLC, such as sensors, electrical and pneumatic components.			
Prerequisites: none			

Artificial Intelligence Dept.: KSA **Course code: UI*M**	Ing. Miroslav Vavrousek, Ph.D.	WS, SS / 5 ECTS	Master level
Annotation			
Introduction into artificial intelligence, the central problems of artificial intelligence. Traditional computational models, state space, fitness function. Recognition and synthesis of audio and video, signal processing, image segmentation. Biologically inspired algorithms, neural networks, genetic algorithms, cellular automaton and other applications of artificial neural networks.			
Prerequisites: none			

Production Logistics Dept.: KSA **Course code: VLOG** **Minimum 5 students** **Maximum 15 students** **incl. PI*M** (all students in the subject)	Ing. Frantisek Koblasa, Ph.D.	SS / 4 ECTS	Bachelor level Master level
Annotation			
The goal of this course is to understand and be able to use the most used tools of industrial engineering methods in Production logistics. It includes Analytical tools (Pareto, Ishikawa, Spagetty material flow design principles, Sankey, R / L), Warehouse management (ABC), Explains the use of various methods used in business logistics (eg Kanban, ConWIP, Milk-run, Heijunka), Concurrent engineering. Automatic identification systems, visualization. The course will present selected CIM and present practical knowledge from a number of industrial projects. Part of the course are presentations of practitioners.			
Prerequisites: **Student can choose VLOG or PI*M (Industrial Engineering), not both.**			

Industrial Engineering Dept.: KSA **Course code: PI*M** **Minimum 5 students** **Maximum 12** **Including VLOG** (all students in the subject)	Ing. Frantisek Koblasa, Ph.D.	SS / 6 ECTS	Master level
Annotation			
The course is focusing on the theory and problems of selected industrial engineering methods related to the innovation cycle. Emphasis is put on the methods usable in the product and production design phase			

(eg labour workload measurement, ergonomics), the consequences of the chosen design solution of the innovated product for business processes (eg Lean Design, Value Stream Mapping, logistics, process indicators) and technical solutions of machines and workplaces promoting high productivity and quality in the production of innovative products (eg rapid tool changes, Poka-yoke, Karakuri, maintenance). The seminars are focused on the practical application of selected methods of industrial engineering within an innovative team project focused on the design of technical elements for the production workplace.
Prerequisites: Student can choose VLOG (Production Logistics) or PI*M (Industrial Engineering), not both.

Experimental Methods Dept.: KEZ **Course code: TM** **Minimum 3 students**	Ing. Jan Novosad, Ph.D.	SS / 4 ECTS	Bachelor level
Annotation			
Pressure measurement. Temperature measurement. Humidity of Gasses measurement. Velocity and Flow measurement of Fluids. Torque and mechanical Revolution measurement.			
Prerequisites: Physics, Physical laboratory			

Thermodynamics and Heat Transfer Dept.: KEZ **Course code: TST** **Minimum 3 students** **Under discussion!**	Ing. Magda Vestfálová, Ph.D	SS / 5 ECTS	Bachelor level
Annotation			
Thermodynamic laws, thermodynamics of ideal gas, solving simple processes and cycles. Thermodynamics of real gases and vapours. Mixtures of ideal gases. Humid air. Selected irreversible processes. Fundamentals of heat (conduction, convection and radiation).			
Prerequisites: Mathematics, Physics			

Design of Thermal Machines Dept.: KEZ **Course code: TSK** **Minimum 3 students**	doc. Ing. Milos Müller, Ph.D.	SS / 6 ECTS	Master level required!
Annotation			
This subject presents the basic information about power engineering and power machines. The designer approach to selected power machines is used. That means not only the good understanding of the machine theory and characteristics, but the calculation of basic dimensions, the choice of appropriate materials and so on.			
Prerequisites: Thermodynamics/TST!!!, Fluid Mechanics			

Internship Dept.: KEZ **Course code: EX*M** **Minimum 3 students**	Ing. Jan Novosad, Ph.D.	SS / 3 ECTS	Master level
Annotation			
One week technical excursion about power and thermal equipment.			
Prerequisites: none			

Project I Dept.: KEZ **Course code: PR1*M** **To be agreed with the teacher before registration of this course** **Under discussion!**	Ing. Jan Kracík, Ph.D	SS / 3 ECTS	Master level
Annotation			
The subject of Project I. follows from scientific or research activities of the Department or from the industrial demands. Individual order can follow Project I and can be one of the sources for Diploma work.			
Prerequisites: N/A			

Mechanics III (Dynamics) Dept.: KMP **Course code: DYN**	doc. Ing. David Cirkl, Ph.D.	SS / 5 ECTS	Bachelor level
Annotation			
Dynamics of particle, systems of particles. Dynamics of translation, rotation, general plane motion and general spatial motion of a rigid body. Dynamic of simultaneous, multibody dynamics. Linear vibration of system with one degree of freedom. Body with changing mass. Basics of impact theory. Lagranges equation of 2'nd kind.			
Prerequisites: Basic knowledge of the subjects DYN, STA and FYI.			

Elasticity and Strength 1 Dept.: KMP **Course code: PP1**	doc. Ing. Tran Huu Nam, Ph.D.	SS / 5 ECTS	Bachelor level
Annotation			
Fatigue as a phenomenon in the material. Parameters influencing fatigue behaviour of machine parts. Stress concentration at notches under static loading. Contact mechanics. Stress concentration at notches under dynamical loading. Load spectra under variable - amplitude loading. Determination of safe factor for different types of loading. Safe life fatigue. Life cycle of machine parts. Basic of crack mechanics.			
Prerequisites: Basic knowledge of the subjects STA and M1B			

Fatigue of Structures and Materials Dept.: KMP **Course code: DPZ**	prof. Ing. Iva Petrikova, Ph.D.	SS / 5 ECTS	Master level
Annotation			
Fatigue as a phenomenon in the material. Parameters influencing fatigue behaviour of machine parts. Stress concentration at notches under static loading. Contact mechanics. Stress concentration at notches under dynamical loading. Load spectra under variable - amplitude loading. Determination of safe factor for different types of loading. Safe life fatigue. Life cycle of machine parts. Basic of crack mechanics.			
Prerequisites: Basic knowledge of the subjects PP1, PP2 and NMI.			

Design of Technological Processes Dept.: KOM	doc. Ing. Stepanka Dvorackova, Ph.D.,	SS / 4 ECTS	Master level

Course code: PTPA **Minimum 2 students**			
Annotation			
During the interdisciplinary subject students will familiarize with basic principles and tools of production control during casting, welding, metal forming (pressing), plastics, machining and assembly. The starting point is the theoretical foundations of the design of technology for individual structure of the area, project analysis, calculations taking into account the capacity requirements of safety, hygiene and ergo perspectives.			
Prerequisites: Connection to subjects of the field.			

Assembly and Metrology Dept.: KOM **Course code: MOM-B** **Minimum 2 students**	doc. Ing. Stepanka Dvorackova, Ph.D., Ing. Artur Knap	SS / 4 ECTS	Bachelor level
Annotation			
Learning outcomes of the course unit The aim of the course is to get acquainted with the problems of engineering metrology and assembly technologies.			
Prerequisites: none			

Robot Vision Dept.: KSR **Course code: ROV** **Minimum 2 students**	doc. Ing. Vlastimil Hotar, Ph.D.	SS / 4 ECTS	Master level
Annotation			
The subject gives an overview of principles and possibilities of technology scene visualisation (machine vision) and its application on production lines and robotized workplaces (robot vision). It deals with the basic means of obtaining image data, physical principles of image acquisition, post-processing, analysis, interpretation and evaluation of image data. Overview of chips types, industrial cameras and lighting, lenses, data transfer types, and interface.			
Prerequisites: none			

Technology of Automatic Glass Production Dept.: KSR **Course code: TVS** **Minimum 2 students**	doc. Ing. Vlastimil Hotar, Ph.D.	SS / 4 ECTS	Master level
Annotation			
The subject presents characteristics of glass materials, defines a difference between glass and glass melt and analyses their properties. The theory of glass melting, glass melting furnace, and theory of forming and annealing is given. Basic technological processes of automated glass production and processing are shown, including an overview of principles. Importance of treatment and processing of glass with new usable properties. The aim is to acquaint students with the basics of modern and automatic glass technology with an emphasis on used equipment and machines.			
Prerequisites: none			

Technical Diagnostics Dept.: KVM **Course code: TD**	doc. Dr. Ing. Elias Tomeh	SS / 4 ECTS	Bachelor level Master level

Annotation
The course focuses on the diagnosis of non-assembled machines. Diagnosis is mainly based on the measurement and vibration analysis of machines and equipment. Students will learn the vibration spectra, vibration cepstrum, vibration severity, determine the causes of excessive vibration, excitation frequencies, machines taking over, operating deflection shapes of oscillations, experimental modal analysis and termodiagnosis without disassembly. The subject contains the basics of noise measurement, noise reduction and detection of acoustic material properties such as acoustic absorption and transmission attenuation.
Prerequisites: Mechanics III (Dynamics), Machine Parts and Mechanisms, Mechanical vibrations.

Machine Parts and Mechanisms I Dept.: KST **Course code: CSI**	prof. Ing. Lubomir Pesik, CSc. Ing. Radka Jirova, Ph.D.	SS / 5 ECTS	Bachelor level
Annotation			
Basic design principles, static and dynamic loads, fatigue and durability of machine parts. Threaded joints, screws, and bolts. Keys, splines and spline bushings, pressed and welded joints. Ball and roller, radial and axial bearings, slide bearings and their housing. Gear trains, spur, helical, bevel gears. Belt drives with flat, V-type and synchronous belts. Chain drives.			
Prerequisites: Technical Mechanics, Elasticity and Strength (Entrance test) and Technical Drawing. Passing an entrance test on the basics of mechanics (statics, kinematics, dynamics) and elasticity and strength (critical section of the part, stress types, limit stresses and limit deformations).			

Experimental Methods Dept.: KST **Course code: EXM**	Ing. Ales Lufinka, Ph.D. Ing. Martin Mazac, Ph.D.	SS / 4 ECTS	Master level
Annotation			
The course is focused on knowledge improvement in the area of industrial products testing and experimental work: safety, correlation, overall parameters and experiment setup, remarks on main elements. Most common sensors: physical principle, design, their advantages and disadvantages, calibration rules. Amplifiers for measurement, theoretical function principles, selection and connection with respect to the sensor design.			
Prerequisites: Students should acquire and deepen their knowledge in the field testing of machinery and experimental activities: security, bond, option tot.. parameters and setting the overall configuration of the experiment, broken down into individual segments and their significance. The most commonly used sensors: types, physical principles, design, their advantages and disadvantages, the principle of calibration, measuring amplifier. They should acquire knowledge of the theoretical foundations of features and integration with respect to the sensor design.			

Project Management Dept.: KST **Course code: RIP**	doc. Ing. Petr Lepsik, Ph.D. Ing. Vladimír Sojka, Ph.D.	SS / 4 ECTS	Master level
Annotation			
The courses are focused on bases principles and methods of project management. The students will applicate the theory of project management in solving of bases examples, which will be separate to simple steps of management of planning, preparation and realization. The subject will include a special program for project management.			
Prerequisites: none			

Design Methodology Dept.: KTS **Course code: MKO** **Minimum 2 students**	Ing. Simon Kovar, Ph.D.	SS / 4 ECTS	Master level
Annotation			
General principles and laws of the design process in the designing of technical objects and technological units. Methods of technical creative work. Life cycle of a technical object. Methodical approach to machine design, evaluation of variants and selection of the most suitable solution, principles of designing mass-produced and single-purpose machines. Methods to increase creative potential, brainstorming, value analysis, heuristic procedures, teamwork. Principles and methodology of manufacturability. Quality, safety and health and nature protection. Unification and normalization. Principles of creating 2D and 3D documentation. Industrial and legal protection.			
Prerequisites: Machine Parts and Mechanisms II. Design Exercise			

Project I. Dept.: KTS **Course code: PR1*M**	Ing. Simon Kovar, Ph.D.	SS / 3 ECTS	Master level
Annotation			
The aim of the project is to acknowledge design skills by solving specific design tasks in the field of single-purpose and textile machines and machines for production of nanofibres. The design is supported by analyses, syntheses and experiments.			
Prerequisites: Machine Parts and Mechanisms.			

Simulation of Polymer Processing Dept.: KSP **Course code: SPP**	Ing. Pavel Brdlik, Ph.D.	SS / 5 ECTS	Master level
Annotation			
The aim of course is getting knowledge in field of computer simulation of polymer processing. The content of course is: 1. The fundamentals of numerical computation methods. The overview of CAE analyses. 2. The simulation of injection molding process with software CADMOULD. The fundamentals and possibilities of used software. 3. The evolution of results and export possibilities of simulation software CADMOULD. 4. The flow analysis of injection molding process made with software CADMOULD. 5. The cooling process analysis of injection molding process made with software CADMOULD. 6. The deformation analysis of injection molding process made with software CADMOULD. 7. The simulation of special injection molding technologies made with software CADMOULD. 8. The special modules and advanced functions of software CADMOULD. 9. The simulation of injection molding process with software SIGMASOFT. The fundamentals and possibilities of used software. 10. The design of inflow, cooling, ejection systems and another mold parts in software SIGMASOFT. 11. The technology possibilities of injection molding adjustments of software SIGMASOFT. 12. The evaluation of results and export possibilities of software SIGMASOFT. 13. The simulation of blow molding process with software B-SIM. Extrusion and injection blow molding processes. 14. The simulation of thermoforming process with software T-SIM.			
Prerequisites: Knowledge of the plastic processing technologies.			

Notes:

- Bachelor/Diploma Thesis will be solved individually, please contact Mrs. Marcela Valkova – marcela.valkova@tul.cz .

- When choosing the course please pay attention to the conditional courses, i.e. the courses that should be passed before attending the new one. Many of our courses offered to Erasmus+ incoming students are for the students of higher grade!

- The course description of all above mentioned courses including information about the conditional course and the form of course completion can be found at the following web page after putting the course abbreviation:
https://stag.tul.cz/portal/studium/prohlizeni.html?pc_pagenavigationalstate=AAAAAgAGMjIzMTc3EwEAAAABAApzdGF0ZUNsYXNzAAAAAQA2Y3ouemN1LnN0YWcucG9ydGxIdHMxNjgucHJvaGxpemVuaS5zdGF0ZXMuUHJlZG1ldFN0YXRlAAYyMzAwMTQTAQAAAAEACnN0YXRlQ2xhc3MAAAABADZjei56Y3Uuc3RhZy5wb3J0bGV0czE2OC5wcm9obGl6ZW5pLnN0YXRlcy5QcmVkbWV0U3RhdGUAAAAA&pc_lang=en

- List of Departments at FME:
KMT = Department of Material Science
KSA = Department of Manufacturing Systems and Automation
KEZ = Department of Power Engineering Equipment
KMP = Department of Applied Mechanics
KOM = Department of Machining and Assembly
KSR = Department of Glass Producing Machines and Robotics
KVM = Department of Vehicles and Engines
KST = Department of Design of Machine Parts and Mechanisms
KTS = Department of Textile Machine Design
KSP = Department of Engineering Technology