Faculty of Mechanical Engineering TUL – Student Grant Competition – 2016-2018

Number	Project title	Principal investigator	Period	Project subsidy CZK
21001	Research and development of control structures of pneumatic, hydraulic and electrical components	Ing. Radek Votrubec, Ph.D.	2014-2016	(513 000) 160 000
The research is divided into three topics. The first is the development of innovative control algorithms of actuators of vibration isolation systems. The second thematic area is design of control system of rotary pneumatic motor. The third topic is research of the controller of precise positioning device and electric drives.				
21070	Development of the system of devices for nanofibers yarns production and their optimalization for ophthalmological implants	Ing. Andrii Shynkarenko	2015-2016	(250 000) 250 000
The aim of the project in year 2016 is to develop collecting and twisting mechanism, which will be added to the existing rotating collector for parallel yarns developing. Collector was developed in year 2015 in this project. Afterwards collecting and twisting ability will be tested.				
21071	Development and prototype production of compact DLP 3D printer	Ing. Iaroslav Kovalenko	2015-2017	(365 000) 580 000
The main aim of the individual student project is to develop a prototype of the 3D printer which produces high precision models using photopolymers. Step by step all layers are cured by projecting entire section of the part. This device will be used mostly for printing equipment for dental medicine.				
21120	Research on advanced composites materials, polymeric materials, development and simulation of mechanical and mechatronic systems	Ing. David Cirkl, Ph.D.	2016-2018	1 002 000
Multidisciplinary project deals with research on mechanical properties of composites, polymeric, magnetorheological and biologic materials. It deals also with development of the seat with adjustable pressure distribution between seating person and the seat.				
21121	Advanced Analysis Utilization the for the Research of the Special Material Types Application Possibilities in the Industrial Production	Ing. Bc. Jiří Sobotka, Ph.D. Ing. Ondřej Řídký Ing. David Koreček	2016-2018	822 000
Project is focused on the utilization of the advanced deformation, stress, structural and temperature analysis with aim to find suitable application possibilities of the special material types which are used mainly in the automotive, aircraft and energy industry. It deals mainly with the high-strength materials, stainless materials and materials with the low specific weight. Identification and definition of the utility properties for these materials with the specific properties makes possible their more effective implementation into industrial production. Supposed results of the research will be possible to use bot in the wide innovation spectrum of the current production processes and also for the mathematical modelling of the technological processes in the pre-production phases.				
21122	Research of physical, thermal and technological parameters for the application of production technologies	Ing. Jiří Machuta, Ph.D. Ing. Bc. Jiří Sobotka, Ph.D.	2016-2018	1 541 000
This project deals with the research of the procedural quantities influence of forming, plastic processing, welding and casting technological processes on the manufactured product final quality. Analysis of the procedural quantities time behavior enables creation of mathematical models and simulation calculations for research, development and process innovation. Results from simulations are verified by the experimental measurement.				
21123	Study and evaluation of the material's structure and properties	Ing. Adam Hotař, Ph.D.	2016-2018	1 237 000

The project will be deald with problem of the development of new materials in two main areas: 1) The development and evaluation of structures of non-metallic materials. 2) The study of structures and evaluation of properties of metallic materials and thin films.				
21124	Experimental and numerical investigation in applied fluid mechanics and energy devices	doc. Ing. Václav Dvořák, Ph.D. Ing. Jan Kracík	2016-2018	1 261 000
The theme of the project is: Research of heat energy accumulation in storages and phase change materials, heat and mass transfer in the heat exchangers, changes in the humid air, the research of flow in ejectors, synthetic jets, flow around objects, interaction between the fluid and the solid body, cavitation peening of materials.				
21125	Innovation of products and equipment i engineering practice	Ing. Rudolf Martonka, Ph.D.	2016-2018	1 112 000
The project will be dealt with product innovation, market research, planning, innovation, custom design, strength calculations of machine nodes and components, optimization and strength calculations of machine parts, using the FEM and the creation and production drawings. These include research and development work of students equipments.				
21126	Improving the quality of machining and assembly processes	Ing. Miloslav Ledvina	2016-2018	582 000
Research of the influence of the technological processing conditions on the properties of the machined components, evaluation of the process media and durability of the cutting tools. Further will be research the influence of machining and assembly processes to the quality of each components.				
21127	Modern methods of development and testing of vehicles and their parts	Ing. Pavel Brabec, Ph.D.	2016-2018	1 348 000
The project will focus on the design and configuration of new assemblies, parts and systems in the development of vehicles and internal combustion engines. Part of the results will be created with the support of simulation software. Verification of real properties of the proposed units, components and systems will be carried out in.				
21128	Research and development in the field of glass-producing machines, industrial and service robotics	Ing. Vlastimil Hotař, Ph.D.	2016-2018	683 000
Project is focused on construction and optimization of chosen constructional nodes in glass industry. It deals with research, development and optimization of the construction, effectors and peripheries of industrial robots and chosen parts of service robots. It is also engaged in application and development of image acquisition and analysis.				
21129	Research of the structures and the procesess of textile and single-purpose machines	Ing. Šimon Kovář, Ph.D. Ing. Michal Strnad Ing. Jiří Komárek	2016-2018	900 000
The object of the project is research and optimization of new and existing structures of textile and single-purpose machines using mechatronic principles and elements. Another object of the research will be analysis and optimization of selected textile processes and their implementation.				
21130	Research and development in the field of 3D technology, manufacturing systems and automation	Ing. Radomír Mendřický, Ph.D.	2016-2018	1 226 000
This team's project is engaged in research and development in the field of 3D digital technology, manufacturing systems and automation. It focuses on the management and optimization of manufacturing systems, use of 3D digitalization in the process of product inspection, on the innovation and application of processes for parts production using additive manufacturing (3D printing), for the design of production equipment and their parts.				

21131	Research and development of devices for production of nanofibrous materials using AC-elektrospinning process	Ing. Ondřej Baťka	2016-2018	1 050 000
This individual project deals with the research and development of devices for production of nanofibrous materials using the unique electrospinning technology, whrere an alternating current is applied (AC-electrospinning). The work will be focused on the analysis of physical processes within this highly-productive means of electrospinning technology. It also covers design activities of particular systems used in this technology and their experimental verification.				
21132	Innovation of technical systems structures with the use of composite materials	Ing. Petr Lepšík, Ph.D.	2016-2018	792 000
During the project will be carried out research on the effect of winding parameters of composite materials on the mechanical properties of structures of varying complexity. The research findings will be published and made into comprehensive methodology.				
21135	Experimental and numerical research of real fluid	Ing. Jan Novosád	2016-2018	792 000
The project is focused on: Experimental and numerical research of flow in desulphurization processes. Experimental and numerical research of supersonic flow. shock waves and shear and boundary layers of compressible flow. Experimental research of synthetic jets.				
21180	Research of renewable and biodegradable "green" composites based on cellulose nanocrystals	Ing. Martin Borůvka	2017-2018	476 000
The project is focused on a complex research of preparation, modification, processing and evaluation of biocomposites filled with cellulose nanocrystals. The project outcomes will help identify the specific properties and processing possibilities of these renewable and sustainable materials for their efficient implementation in a wide range of modern industrial applications (biomedical engineering, automotive, etc.).				
21133	New approaches in transparent material acquisition	Ing. Ondřej Matúšek	2016	226 000
The aim of the project is to describe possibilities of robot vision used in difficult application. General problematic of application of robot vision is discussed. The work deals in detail with acquisition of transparent materials. New approaches, such as laser application are considered in the main section.				
21134	Research of mechanical properties of selected living tissue and materials used in medicine	Ing. Marek Kovář	2016	297 000
The project is focused on research and development of materials used in medicine and customized surgery protocol for selected application. Namely development of a FEM model for reconstructive surgery and development of an artificial skin cover. The father aim is collaboration between FME TUL, FTE TUL and FHS TUL in biomechanics.				
21136	Low Temperature Combustion in a single cylinder research engine	Ing. Luboš Dittrich	2016	252 000
The experimental project targets the operation of a spark ingition engine in HCCI (Homogeneous charge compression ignition) mode, and transitions into and out of HCCI. HCCI has a high efficiency - low emissions potential, but extremely difficult engine control and transitions remain to be resolved.				
21179	Prediction of Springback of Drawn Stampings by using the Advanced FEM Computational Models	Ing. David Koreček	2017	287 000
The project is focused on the definition of the advanced FEM (Finite Element Method) mathematical models at calculation the drawing technology and the subsequent springback of sheets with specific utility properties. Special emphasis will be placed on the developing a methodology for selecting and implementing suitable experimental tests to obtain the necessary input parameters defining the FEM models. Besides conventional alloys based on Fe will be further tested also aluminum alloy and titan alloy.				

21182	The cavitation phenomenon and its erosion potential	Ing. Jan Hujer	2017	180 000
Project takes aim at the cavitation phenomenon and its erosion potential. Cavitation effects impact a material and cause the cavitation erosion. The erosion potential will be investigated, the analysis of the erosion potential will be mostly based on measurements of impacts by a PVDF sensor.				
21183	Development of the device for polymer solution dosing for nanofiber yarn production	Ing. Andrii Shynkarenko	2017	250 000
The aim of the project is development of the device for the precise dosing of polymers. At the same time, the temperature of the polymer will be controlled. It is a complicated problem for the currently used solvents. This device is the last step in creation of the system of devices for production of nanofiber yarns. However, it is possible to use it in many other experiments. Problems of polymer solution heating directly during spinning has not been solved yet and thus the spinnability of some polymers is limited.				
21184	Construction and development of a device for dynamic cell cultivation – Bioreactor	Ing. Michal Moučka, Ph.D.	2017	250 000
Nanofibrous and microfibrous materials are suitable for tissue engineering, where they serves as a replacement of tissues (scaffolds). These scaffolds are tested just by a static culture methods that are insufficient. For optimum cultivation methods is necessary to add a dynamic and cyclical cultivation. For this reason it is necessary to construct and use a bioreactor, which will provide the appropriate conditions for these cultivation.				
21223	Automation of the production line of multi-layer nanofibrous tubular structures	Ing. Andrii Shynkarenko	2018	190 000
The project is closely follows up on already successful implemented SGS projects 21070 and 21183, in which the production of parallel nanofibres, their collection and creation of yarns were solved. The purpose of the new project is to connect the already developed devices to one unit to achieve a higher degree of automation. This last step is necessary to achieve significantly greater accuracy, homogeneity and easier control of an already complicated process. The main focus of the project will be testing machine and determining optimal technological conditions for different polymeric materials. The tests will be conducted in collaboration with Clemson University (USA), which has a patent for equipment for the production of parallel nanofibers. Parts of the production equipment were presented in 2017 at the Science Fair in Prague, at the International Engineering Fair in Brno and others, where they attracted great attention. The device is also used to produce specific nanofibrous yarns for glaucoma implants that are unique to this technology.				
21224	Stereolithography-based 3D printing of ceramic and composite materials	Ing. Iaroslav Kovalenko	2018	160 000
Individual student project deals with testing of the modern stereolithographic materials on a 3D printer. Tests will be held on the prototype of a DLP printer designed in the previous years. Composite materials created by mixing of additives with photopolymer solutions will be used during research as a printing material. It is planned to use glass, aluminum and other materials as additives for mixing. The main aim of the project is the synthesis of photopolymer-based mixtures that may be successfully used in 3D printing. Created mixtures will be used in printing of models on the DLP 3D printer. These models will consequently be investigated using mechanical tests. Also recommended parameters for printing and shrinkage after sintering will be determined during the project.				
21225	Research of application of cavity inserts produced by additive manufacturing used for polymer injection mould design	Ing. Martina Češková	2018-(2019)	228 000 (241 000)
The project is focused on a complex research of injection mould cavity inserts design and manufactory using additive manufacturing for prototyping and small-scale production and the evaluation of the impact on properties of injection moulded parts.				
21226	Experimental, numerical and mathematical study on ejector refrigeration	Ing. Vu Van Nguyen	2018-(2019)	252 000 (150 000)

The project aims for a study on impacts of using Hydrofluoroolefins (HFOs) for ejector refrigeration technology (ERT). We employ experimental, mathematical works and numerical simulations to achieve the goals. The goals are a detail refrigerant assessment of HFOs and a design of the ejector refrigeration system for local climate conditions in Czechia.				
21227	An interaction of fluid with solid structure	Ing. Tomáš Kořínek	2018-(2019)	237 000 (178 000)
This project deals with an interaction of fluid with a solid structur. The research is based from numerical simulations and experiment. A new approach for turbulence modelling, Partially-Averaged Navier-Stokes will be tested on numerical simulations. Experiment deals with adsorption of CO2 on activated carbon. numerical simulations with PANS approach.				
21016	Management SGC	DFS	2016-2018	465 000
FME			2016-2018	18 683 000