

ANNUAL REPORT 2017



**Technical University of Košice
Faculty of Mechanical Engineering**



ANNUAL REPORT 2017

Editors: Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.

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PREFACE

The Faculty of Mechanical Engineering at the Technical University of Košice celebrated in the year 2017 the 65th anniversary of its foundation. This Faculty, previously called the Faculty of Heavy Engineering, was one of the first three faculties existing at the very beginning of the present Technical University of Košice. Establishment of the Faculty was stimulated thanks to developing industrialisation process in Slovakia, namely in the area of engineering and heavy industry. The Faculty of Mechanical Engineering made a proposal to award the highest honour of the Technical University of Košice – the honorary doctorate Doctor Honoris Causa on the occasion of the 65th anniversary of the Technical University of Košice to prof. Ing. Petr Knepp, DrSc. from the Faculty of Biomedical Engineering at the Czech Technical University in Prague and to prof. RNDr. Miroslav Doupovec, CSc., Vice-rector of the Brno University of Technology.

It is necessary, on the occasion of the 65th anniversary of the preceding Technical College in Košice, i.e. the present Technical University of Košice and in this way also on the occasion of the same jubilee of the Faculty of Mechanical Engineering, to express a cordial thanking to those who were engaging in a successful development and in a present-day distinguished domestic and foreign position of this Faculty. Nowadays, it is a reputable scientific-educational institution at home and also abroad.

Thanks to the well-experienced and highly-qualified pedagogic staff as well as thanks to the modern laboratories, top apparatuses and actual hardware-software equipment the Faculty is able to fulfil the long-term intentions. Graduates of the Faculty's study branches are successfully employed not only in the region of Košice, but also within the European and worldwide labour market.

The repeated discussions and meetings among the representatives of the "Slovak Investment and Trade Development Agency" and the Japan company Minebea,



which were performed in the framework of the Faculty of Mechanical Engineering, resulted in building of a plant especially focused on the area of automotive, aircraft and ship industry, which is situated in Košice. The basic stimulus for a decision made by the given company to place the new plant just in Košice, was the infrastructure and the research-development base of the Faculty. There will be invested during the next years more than 60 million Euros, together with creation of about 1100 new working positions in Košice, whereby this will be not only a standard production plant, but it will be also established a specialized common workplace intended for performing of the research and development activities with 100 employees.

Among the most important achievements of the Faculty belongs the Award of the International Engineering Fair in Nitra, a successful participation with an

experimental vehicle at the international competition Shell Eco-marathon Europe in London, as well as the international accreditation of the study programme *mechanical engineering*. Various prizes awarded to the doctoral, diploma and graduate works underlines importance and attention paid to education, which is the main activity of the Faculty. A considerable interdisciplinary character of the Faculty is evident thanks to the scientific outputs from the area of biomedical engineering, top research team etc. A distinguished position of the Faculty at home and abroad also confirm the highest scientific honours awarded to several employees of the Faculty by the most reputable worldwide scientific institutions, as well as the awarded state-level domestic and foreign medals, the relevant departmental or city awards, together with publications of the Faculty's employees in the prestigious worldwide professional journals.

The Faculty established a new Prototype and Innovation Centre (PaIC) as

a direct reaction to the "Research and Innovation Strategy for Smart Specialization of the Slovak Republic" (RIS3) in order to create a closer integration with the industrial practice. Such new university scientific parks and research centres are able to make the Slovak science more attractive for the young researchers.

However, the most important is contribution of the Faculty in education of excellent technical intelligence, namely in the amount of 20 000 graduates what represents a meaningful human source, which is necessary for a future development of our region.

In Košice, on January 16, 2018

Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.

Dean of the Faculty of Mechanical Engineering,
Technical University of Košice

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FOREIGN RELATIONS AND
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PhD.
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DEGREE**



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PhD.
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Ing. Mária KENDEROVÁ, PhD.
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REPRESENTING THE
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FACULTY**

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Ing. Ján Kostka

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prof. Ing. Hana Pačaiová, PhD. – KBaKP

prof. Ing. Dušan Šimšík, PhD. – KARaKR

doc. Ing. Ján Viňáš, PhD. – KSTaM

Students:

Ing. Radko Popovič

Bc. Miroslav Telepčák

Bc. Jozef Kostka

Martin Petruška

Sára Janigová

Barbara Bačová

EDUCATION

Accreditation for:

Bachelor level

- 1) Automotive Production
- 2) Quality and Security
- 3) Management of Technical and Environmental Risks in Mechanical Engineering
- 4) Mechatronics
- 5) Computer Aided Mechanical Engineering Production
- 6) Industrial Engineering
- 7) Prosthetics and Orthotics
- 8) Business Management and Economy
- 9) Mechanical Engineering
- 10) Technology of Environment Protection
- 11) Technology, Management and Innovation in Machinery Production

Master (Engineer) level

- 1) Applied Mechanics
- 2) Automation and Control of Machines and Processes
- 3) Automotive Production
- 4) Safety of Technical Systems
- 5) Biomedical Engineering
- 6) Digital Engineering
- 7) Transport Machines and Logistics
- 8) Power Supply Machines and Equipment
- 9) Production Quality Engineering
- 10) Management of Technical and Environmental Risks in Engineering
- 11) Measuring
- 12) Mechatronics
- 13) Computer Aided Support of Engineering Production
- 14) Industrial Engineering
- 15) Business Management and Economy
- 16) Robotics
- 17) Mechanical Engineering
- 18) Engineering Technologies
- 19) Processing of Plastics
- 20) Technology of Environmental Protection
- 21) Welding, Joining and Surface Treatments
- 22) Production Machines and Machinery

Doctoral study

- 1) Applied Mechanics
- 2) Automation and Control
- 3) Safety of Technical Systems
- 4) Biomedical Engineering
- 5) Parts of Machines and Mechanisms
- 6) Transport Machines and Equipments
- 7) Power Supply Machines and Equipments
- 8) Mechatronics
- 9) Measuring
- 10) Industrial Engineering
- 11) Engineering Technologies and Materials
- 12) Technology of Environmental Protection
- 13) Production Machines

Numbers of Students

STUDY LEVEL	FULL - TIME STUDENTS	EXTERNAL STUDENTS	TOGETHER
BACHELOR	709	0	709
ENGINEER	389	0	389
DOCTORAL	43	42	85
			1183

Habilitations and Inaugurations

Habilitations

Ing. Ivan Virgala, PhD.

Thesis: Numerical and experimental modeling of kinematically redundant mechanisms
Lecture: Analysis and modeling of movement of manipulators with serial kinematic structure

Ing. Peter Sivák, PhD.

Thesis: Limiting states, failure, intensification and rectification of structures
Lecture: Methods and means of analysis of boundary states and failure of structural elements

Ing. Jaromír Markovič, PhD.

Thesis: Legal metrology in the context of interdisciplinarity of measurement activities
Lecture: The role of Slovak Legal Metrology in the Metrological Infrastructure of the Slovak Republic

Ing. Natália Jasminská, PhD.

Thesis: Cooling metal hydride reservoirs when absorbing hydrogen into alloy $\text{La}_{0,85}\text{Ce}_{0,15}\text{Ni}_5$
Lecture: Hydrogen production from alternative sources and its accumulation

Ing. Marián Lázár, PhD.

Thesis: High temperature asbestos-containing waste and its recovery
Lecture: Innovative methods of high-temperature waste treatment

Inauguration

doc. Ing. Ján Slota, PhD.

Lecture: Prediction of the formability of thin sheet metal moldings using numerical simulation

Distinguished Awards

Prize for science and technology 2017

Prize for science and technology 2017 in the category Lifetime merit in the field of science and technology, Dr. Martina Lubyová, Minister of Education, Science, Research and Sports of the SR, was awarded Dr.h.c. prof. Ing. Jozef Živčák, PhD.



Mechanical faculty favorites at TECHFOR 2017 on 24. MSV in NITRA

The winner of the Techfora at the 24th International Engineering Fair in Nitra for 2017 is: Prototype of the Peltier cell-based metal hydride storage temperature management device

The prototype of the device serves to precisely control the temperature of the metal hydride reservoirs in which heat is generated and absorbed by the hydrogen storage process. To change and stabilize the storage tank temperature with the $\text{La}_{0,85}\text{Ce}_{0,15}\text{Ni}_5$ alloy composition, four Peltier cells are used to enable the jump from the heating mode to the cooling mode. The device's algorithm analyzes the curve and curve of the regression curve of the measured temperature and, based on the data, determines the heat capacity and heat loss of the container, allowing it to more accurately control the desired temperature. The device simultaneously utilizes the heat accumulation capacity of the copper heat exchanger, which increases the efficiency of the device when the Peltier cells are switched on alternately.







Award of the Automotive Industry Association of the Slovak Republic

Award of the Automotive Industry Association of the Slovak Republic concerning the best diploma work in the year 2017, namely the 3rd place for tutorial of the diploma theses awarded to doc. Ing. Michal Fabian, PhD.



Certificate – Mechanical Engineering



2nd place in the competition of best works at the international scientific conference "Technique of environmental protection" TOP 2017, in the category "Environmental technologies"



Medal at the 50th Anniversary of the Faculty of Engineering in Green Gore - prof. Ing. Peter Trenuňa, PhD.



First place at the EBEC Košice 2017 competition

Faculty of Mechanical Engineering at the EBEC Košice 2017 competition, which took place on March 17, 2017 at the premises of VW Slovakia in Bratislava. With my team, we have solved a case study on "Tool Localization for Real-time Assembling Vehicles". In this competition we were placed in 1st place, thanks to which we were 18-21.4.2017 represented TUKE at the EBEC Central competition in Budapest. Team members: Jozef Trojan (internship doctor), Dávid Bábás, Lukáš Fröhlich, Marek Mizerák (1.Ing-PI student)



INSTITUTE OF AUTOMATION, MECHATRONICS AND ROBOTICS



- Department of Applied Mathematics and Informatics
- Department of Mechatronics
- Department of Automation, Control and Human Machine Interaction
- Department of Robotics

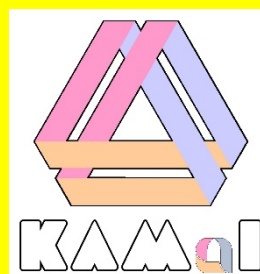


Department of Applied Mathematics and Informatics



Contact

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Staff

- | | |
|----------------------|---|
| • Professors: | 1 |
| • Assoc. Professors: | 1 |
| • Assist. Professors | 6 |
| • Researchers: | 0 |
| • PhD. Students: | 0 |

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2016
03/2017	Seminar on Graph Theory, GC University Lahore, Pakistan (prof. RNDr. Martin Bača, CSc., doc. RNDr. Andrea Feňovčíková, PhD.)
04/2017	17th Conference of Košice Mathematicians, Herľany, Slovakia (prof. RNDr. Martin Bača, doc. RNDr. Andrea Feňovčíková, RNDr. Zuzana Kimáková, PhD.)
06/2017	23rd International Conference Applied Physics of Condensed Matter, Štrbské Pleso, Slovakia (RNDr. Denisa Olekšáková, PhD.)
06/2017	The European Conference Physics of Magnetism 2017, Poznan, Poland (RNDr. Denisa Olekšáková, PhD.)
06/2017	International Colloquium „Automatizácia a robotika v 21. storočí“, Herľany, Slovakia (Mgr. Gabriela Ižaríková, PhD.)
07/2017	International Conference on Statistical Physics, Corfu, Greece (RNDr. Lucia Gálisová, PhD.)
07/2017	International Conference on Strongly Correlated Electron Systems, Prague, Czech Republic (RNDr. Lucia Gálisová, PhD.)
07/2017	28 th Internatioanl Workshop on Combinatorial Algorithms, Newcastle, Australia (prof. RNDr. Martin Bača, CSc.)
07/2017	Workshop on Graph Labeling, Singaraja-Bali, Indonesia (prof. RNDr. Martin Bača, CSc.)
08/2017	1st International Research Workshop on Network Topology, Makasar, Indonesia (prof. RNDr. Martin Bača, CSc.)
08/2017	International Conference on Graph Theory and Information Security, Jakarta - Depok, Indonesia (prof. RNDr. Martin Bača, CSc.)
08/2017	The 8 th International Conference on Research and Education in Mathematics 2017, Bandung, Indonesia (prof. RNDr. Martin Bača, CSc.)
09/2017	26th Workshop on Cycles and Colourings, Nový Smokovec, Slovakia (prof. RNDr. Martin Bača, CSc., doc. RNDr. Andrea Feňovčíková, PhD.)

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

Bachelor study

- | | |
|--|--------------------------------------|
| ✓ Basics in Constructive and Computer Geometry | ✓ Mathematics III. |
| ✓ Fundamentals of College Mathematics | ✓ Mathematics IV. |
| ✓ Mathematical Calculations Using MAPLE | ✓ Numerical Methods |
| ✓ Mathematical Software | ✓ Repetitorium in Mathematics |
| ✓ Mathematics I. | ✓ Selected Chapters from Mathematics |
| ✓ Mathematics II. | ✓ Seminary in Mathematics |
| | ✓ Statistical Software |

Master study

- ✓ Applied Mathematics
- ✓ Applied Statistics in Measuring
- ✓ Engineering Statistics
- ✓ Mathematical Methods in Automatization
- ✓ Mathematical Modelling
- ✓ Mathematics
- ✓ Mathematics I
- ✓ Statistical Methods

PhD. study

- ✓ Applied Mathematics
- ✓ Selected Chapters from Mathematics
- ✓ Mathematical Methods in Environmentalism

RESEARCH AT THE DEPARTMENT

Area of research:

- ✓ Application of mathematical methods in mechanics.
- ✓ Labelings and colourings of graphs.
- ✓ Metric dimension of graphs.
- ✓ Investigation of the soft magnetic materials and the simulation of magnetic processes by the mathematical models.
- ✓ The theoretical study of lattice Hamiltonians of the spin systems for zero and non-zero temperatures.
- ✓ Exactly soluble spin and spin-electron low-dimensional systems.
- ✓ Statistical processing control.
- ✓ Statistical methods in environment.

Research characteristics:

The research of the department is oriented to the application of mathematical methods and statistical methods in the different areas, for example environment, mechanics, physics of materials and theoretical physics. The main fields of the mathematical disciplines at the department are graph theory and mathematical calculations in theoretical physics.

Areas of expertises:

- ✓ Applied Statistics
- ✓ Condensed Matter Physics
- ✓ Discrete Mathematics
- ✓ Mathematical Modelling
- ✓ Theoretical and Statistical Physics

PROJECTS OF THE DEPARTMENT

NATIONAL PROJECTS

Title of the project	Magnetization and relaxation processes in magnetic particles and composites
Type of the project	Grant project VEGA
Number of the project	1/0377/16
Principal investigator	prof. RNDr. Peter Kollár, CSc.
Time period of the project	2016 - 2019
Annotation of the project	The project is oriented on experimental investigation of the structure and magnetic properties of magnetic particles with the size of several nanometers to several hundred micrometers. The particles (with amorphous, nanocrystalline, or polycrystalline structure) are based on ferromagnetic metals and alloys, and are covered with an inorganic or organic layer, and after technological treatments become precursors for the preparation of composites. The research is focused on investigation the magnetization and relaxation processes in ferromagnetic particles under different physical conditions as ferromagnetic phase content, temperature, amplitude and frequency of the magnetic field. Expected results will help to expand the application potential of this class of advanced materials for a variety of medical and technological applications
Title of the project	The study of the influence of ferromagnet and insulator parameters on the magnetic properties of composite materials for electrical technology
Type of the project	Grant project VEGA
Number of the project	1/0330/15
Principal investigator	doc. RNDr. Ján Fúzer, PhD.

Time period of the project	2015 – 2018
Annotation of the project	The project is focused on experimental research structure and magnetic properties of advanced soft magnetic composites. Ferromagnetic powder based on iron and nickel of various sizes will be prepared by mechanical milling. Electrically insulating layers will be prepared by chemical processes. The resulting bulk material will be prepared by compaction. Research will focus on the explanation of the influence of magnetic structure of composite and ferromagnetic interactions on the hysteresis loops under different physical conditions and on a spectrum of complex permeability. The intention is to establish a relation between the magnetic parameters and ferromagnetic particles sizes and the thickness of the insulating layer and to prepare a composite material with very good magnetic properties. Project outputs will be in the form of scientific publications and presentations at scientific conferences, and it is also counted with their application in the educational process at all levels of university education.
Title of the project	Magnetoelectric and magnetocaloric effect in exactly solvable lattice-statistical models
Type of the project	Grant project VEGA
Number of the project	1/0043/16
Principal investigator	doc. RNDr. Jozef Strečka, PhD.
Time period of the project	2016 - 2019
Annotation of the project	Magnetoelectric and magnetocaloric effects will be examined in detail with the help of exactly solvable lattice-statistical models including Ising spin systems, Ising-Heisenberg spin systems and coupled spin-electron systems, which consist of localized Ising spins and delocalized electrons. The primary goal of the project is to explore an influence of external electric field on basic magnetic properties and an influence of external magnetic field on basic thermodynamic properties of the studied lattice-statistical models. A response of magnetic system on a change of external electric and magnetic fields will be investigated mainly in a vicinity of phase transitions (including quantum ones), where particularly interesting behaviour can be expected. The rigorous theoretical results will contribute to a deeper understanding of both studied cooperative phenomena, what enables to propose a subsequent optimization of technologically important properties of multifunctional materials and magnetic refrigerants.
Title of the project	Development of a new research methods for simulation, assessment, evaluation and quantification of advanced methods of production
Type of the project	Grant project VEGA
Number of the project	1/0708/16
Principal investigator	doc. Ing. Peter Trebuňa, PhD.
Time period of the project	2016 - 2019
Annotation of the project	The proposed project aims to the application of methods of experimental verification of models and simulation as well as the development of new methods of examination and analysis of in-plant processes, the use of new diagnostic methods of the evaluation of advanced production methods. The principled objective of the scientific project is to increase the competitiveness, which requires further substantial increase in the educational level of creative research staff, development of production and in general also graduates of all levels of study in engineering departments and preventing occurrence of adverse situations during the running and the existence of engineering companies. The above objectives would contribute to avoid unexpected situations in the production sector even before the moment of their creation. This is the main objective of the

proposed project and to that it should contribute the results of basic research of the proposed project which are oriented to production sector.

Title of the project **Transfer of knowledge from laboratory experiments and mathematical models in the creation of a knowledge based system for assessing the quality environmentally friendly conveyor belts**

Type of the project Grant project VEGA
Number of the project 1/0577/17
Principal investigator prof. Ing. Daniela Marasová, CSc.
Time period of the project 2017 - 2020

Annotation of the project The long-time effort of researchers in the field of conveyor belts is to improve their manufacture qualities any by this way the quality, too. The main aim of the project is implementation of the present theoretical knowledge, results of experimental research and computer methods for purpose of their quality increase. The main part of the project is the basic research oriented to the getting of complex knowledge about manufacturing qualities of untraditional closed conveyor belts by experimental research on the basis of the present standards (testing of mechanical, physical and special properties), structural and microstructural analysis, mathematical and computer methods with the aim to achieve their sustainable quality with new technical standards. The output of the project will creation of the knowledge systems which integrated knowledge from rubber technologies, results of laboratory and simulation experiments, and also mathematical models.

Title of the project **The research of nanocomposite hard coatings to improve the functional properties of engineering parts**

Type of the project Grant project VEGA
Number of the project 1/0432/17
Principal investigator doc. Ing. Daniel Kottfer, PhD.
Time period of the project 2017 - 2020

Annotation of the project The main aim of project is determination and understanding of the basic relationships amongs conditions preparations of hard, nanocrystalline layers on the WC/C, CrC/C a WCrC/C basis with and without added chemical elements (Si, N₂, Al, Y) and their mechanical and tribological properties. Layers will by prepared using PECVD and EBPVD techniques and their combination on steel substrates. which are used for automotion components. The deposition temperature must not exceed 350°C. The project solution should be the optimizing of preparing conditions of the technology for engineering production focused on coating of functional surfaces. The accent of research activities will be on preparation of thin coatings deposited on above mentioned substrates and on laboratory evaluation of properties of developed coatings. The important part of project will be mathematical description of results, which will by focused on optimizing of deposition parameters with respect to the maximum hardness and minimum COF.

Title of the project **Transfer of information from the physical environmental factors in the process of lifelong learning**

Type of the project Grant project KEGA
Number of the project 039TUKÉ-4/2015
Principal investigator prof. Ing. Ervin Lumnitzer, PhD.
Time period of the project 2015 – 2017

Annotation of the project The area of physical factors of environment is important in terms of risks in the working environment and comfort in the environment becomes more problematic. Care work environment and demands on its evaluation are

more complicated. Methods for measuring and objectification of physical factors are complicated. Instrumentation and software is constantly evolving. A separate area of impact assessment processes is physical factors on human health. There is now a wealth of information in this field, constantly creating further information. The project deals with the transfer of information between universities and universities and practice, enabling faster and more efficient use of this information. The result is increasing of education level for university student, expert and other interested person in the field of quality of life environment.

Title of the project **Implementation of innovative instruments for increasing the quality of higher education in the 5.2.52 Industrial Engineering field of study**

Type of the project Grant project KEGA
Number of the project 030TUKÉ-4/2017
Principal investigator prof. Ing. Peter Trebuňa, PhD.
Time period of the project 2017 – 2019

Annotation of the project The main objective of this project is to increase the attractiveness of study field 5.2.52 Industrial Engineering for current students as well as for industrial practice, seeing that subjects of study field in industrial engineering are needed in company practice. Acquired knowledge is an asset entry of graduates into the real production process. Graduates will get a knowledge and skills in the application of different methodologies and working procedures applied in practice. Corpus of study program is currently relatively unchanged since 2004 by accredited programs of study Faculty of Mechanical Engineering of the Technical University in Kosice. In spite of this, the interest of applicants is increasing. The increasing of attractiveness can be achieved by conceptual changes, respectively by innovative approach to the individual parts in the second and third degree of study through the establishment of subjects useful for current industry practice.

Title of the project **Education and Training Center of Innovation Development and Implementation of business processes and systems**

Type of the project Grant project KEGA
Number of the project 029TUKÉ-4/2016
Principal investigator prof. Ing. Jozef Kováč, CSc.
Time period of the project 2016 – 2018

Annotation of the project Project is focused on implementation of educational and training center of innovative development and implementation of business processes and systems in terms of the Department of Industrial Engineering and management, in the field of SJF 5.2.52 Industrial Engineering, degree program in Industrial engineering. The aim of the project is to promote not only the acquisition of knowledge, innovative thinking but also practical (experiential) basic skills of students of graduate study and external candidates from practice. Training activities focused on the design, optimization and implementation of business processes and systems across the value chain, in real or modelling laboratory and workshop environment is an important development trend of educational processes. The aim of the solution is also expanding the existing theoretical and practical training through the use of new methods.

Type of the project Grant project APVV
Number of the project APVV-0097-12
Principal investigator RNDr. Pavol Farkašovský, DrSc.
Time period of the project 2013 – 2017

Annotation of the project The project is devoted to the theoretical study of collective phenomena in coupled electron and spin systems. The complex coupled electron and

spin systems will be examined by sophisticated numerical methods with the goal to contribute to the understanding of physical mechanisms leading to the coexistence of quantum states with different order parameters, e.g., charge/spin ordering and superconductivity, ferromagnetic and ferroelectric state, metallic and insulating states. Contrary to this, simpler coupled electron and spin systems will be examined by exact analytical methods with the goal to give an extrapolation of unconventional quantum states manifested as fractional magnetization plateaus in magnetization processes, the origin of enhanced magnetocaloric effect and the thermodynamic behaviour near the quantum critical points.

Title of the project **Design of the structure and the functional properties of soft magnetic 3-d transition metals based composites**

Type of the project Grant project APVV
Number of the project APVV-15-0115
Principal investigator prof. RNDr. Peter Kollár, CSc.
Time period of the project 2016 - 2019

Annotation of the project The project focuses on structure and functional properties design of 3-d transition metals based soft magnetic composite materials, in which will be carried out the experimental research of functional properties of advanced materials with heterogeneous structure consisting of isolated ferromagnetic particles. Magnetic micro- and nano-composite systems will be prepared using advanced powder metallurgy method and current chemical processes. The research will be focused on explanation of the interface influence on the electric, magnetic and mechanical properties investigated magnetic composite materials. Expected results extend the potential for application of advanced soft magnetic suitable for use in a medium frequencies, where ferrites are currently used.

Title of the project **Structural and chromatic graph characteristic**

Type of the project Grant project APVV
Number of the project APVV-15-0116
Principal investigator doc. RNDr. Roman Soták, PhD.
Time period of the project 2016 - 2020

Annotation of the project The project is focused on research in two areas of discrete mathematics that influence each other – the chromatic and structural graph theory. The attention will be focused on the study of various chromatic invariants (their exact values and estimates) related to the classical and generalized graphing colouring, respectively, to study of local (mainly in terms of configurations of graph elements of bounded degrees), and the global graph structure both in general as well as for graphs of specific properties (such as planar graphs and their analogues).

Title of the project **Development and research of methods for optimizing of acoustic characteristics and acoustic of emitting noise devices**

Type of the project Grant project APVV
Number of the project APVV-15-00327
Principal investigator Dr.h.c. mult. prof. Ing. Miroslav Badida, PhD.
Time period of the project 2016 - 2020

Annotation of the project The object of the project is the Development and research of methodologies for optimizing of acoustic characteristics and acoustic quality of emitting noise devices. The emphasis is given to comparison of devices suitable for the needs of noise visualization and the determination of their application possibilities for the identification of noise sources of selected groups of household appliances. There shall be performed a comparison of selected visualization methods and the appropriateness of

their application for localization and identification of noise sources. The focus will be on design and development of methodology for identification of noise source, research and development of methodology for determining the of acoustic material properties applicable for the purposes of reducing noise, creating a database of materials and their acoustic properties, design and development methodology for establishing of psychoacoustic parameters (roughness, sharpness, volume, color audio/sound, ...). The benefit will be the development and verification of optimization methodology of acoustic properties of household appliances. The content of the project is based on needs of the Directives no. 86/594/EEC on airborne noise emitted by household appliances.

Title of the project	Exotic quantum states of low-dimensional spin and electron systems
Type of the project	Grant project APVV
Number of the project	APVV-16-0186
Principal investigator	doc. RNDr. Jozef Strečka, PhD.
Time period of the project	2017 - 2021
Annotation of the project	The project is devoted to theoretical study of low-dimensional quantum spin and electron systems, which will be examined by the combination of advanced analytical and numerical methods including among other matters exact mapping transformations, transfer-matrix method, strong-coupling approach, classical and quantum Monte Carlo simulations, exact diagonalization and density-matrix renormalization group method. The obtained theoretical outcomes will contribute to a deeper understanding of exotic quantum states of spin and electron systems such as being for instance different kinds of quantum spin liquids as well as quantum states with a subtle long-range order of topological character or with a character of valence-bond solid. The project will significantly contribute to a clarification of unconventional magnetic behavior of selected low-dimensional magnetic materials and thus, it will have significant impact on a current state-of-the-art in the field of condensed matter physics and material science. On the other hand, a detailed investigation of quantum entanglement will establish borders of applicability of the studied spin and electron systems for the sake of quantum computation and quantum information processing. Another important outcome of the project is to clarify nontrivial symmetries in tensor states of the strongly correlated spin and electron systems affected by either position dependent interactions or changes in lattice geometries, which induce phase transitions of many types.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUTIONS

Employees and students	Country
Martin Bača, prof. RNDr., CSc.	Pakistan (05.03.2017–01.04.2017)
Andrea Feňovčíková, doc. RNDr., PhD.	Pakistan (05.03.2017–01.04.2017)
Martin Bača, prof. RNDr., CSc.	Australia (14.07.2017-23.07.2017)
Martin Bača, prof. RNDr., CSc.	Indonesia (23.07.2017- 13.08.2017)

VISITS OF STAFF MEMBERS FROM FOREIGN INSTITUTIONS

Employees and students	Country
Susana Clara López Masip	Departament de Matemàtiques, Universitat Politècnica de Catalunya, Barcelona, Spain (14.01.2017-13.02.2017)

Akito Oshima
Wido Saputro
Ali Owais
Muhammad Irfan
Bety Hayat Susanti

Zata Yumni Awanis

University of Tokyo, Tokyo, Japan (02.02.2017-01.03.2017)
 Institut Teknologi Bandung, Bandung, Indonesia ()
 GC University Lahore, Pakistan (29.05.2017-18.08.2017)
 GC University Lahore, Pakistan (29.05.2017-18.08.2017)
 Institut Teknologi Bandung, Indonesia (02.10.2017-02.12.2017)
 Institut Teknologi Bandung, Indonesia (20.10.2017-15.01.2018)

MEMBERSHIP IN SLOVAK PROFESSIONAL ORGANISATIONS

Union of Slovak Mathematicians and Physicists

Mirian Andrejiová, RNDr., PhD.
 Martin Bača, prof. RNDr., CSc.
 Andrea Feňovčíková, doc. RNDr., PhD.
 Gabriela Ižaríková, Mgr., PhD.
 Zuzana Kimáková, RNDr., PhD.
 Marcela Lascsáková, Mgr., PhD.
 Denisa Olekšáková, RNDr., PhD.

Slovak Physical Society

Denisa Olekšáková, RNDr., PhD.

Slovak Mathematical Society

Martin Bača, prof. RNDr., CSc.

PUBLICATIONS

Journals

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Spôsob prístupu: <http://www.mdpi.com/2075-4701/7/8/318>
- [6] ASHRAF, Faraha - BAČA, Martin - LASCSÁKOVÁ, Marcela - FEŇOVČÍKOVÁ, Andrea: **On H-irregularity strength of graphs**, In: Discussiones Mathematicae Graph Theory. Vol. 37, no. 4 (2017), p. 1067-1078. - ISSN 1234-3099
- [7] MARASOVÁ, Daniela - AMBRIŠKO, Ľubomír - ANDREJIOVÁ, Miriam - GRINČOVÁ, Anna: **Examination of the process of damaging the top covering layer of a conveyor belt applying the FEM**, In: Measurement. Vol. 112 (2017), p. 47-52. - ISSN 0263-2241
- [8] GÁLISOVÁ, Lucia: **Magnetization plateau as a result of the uniform and gradual electron doping in a coupled spin-electron double-tetrahedral chain**, In: Physical Review E. Vol. 96, no. 5 (2017), p. 052110-1-052110-16. - ISSN 2470-0045
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- [13] ANDREJIOVÁ, Miriam: **Solving the elementary linear programming problem in R**, In: Interdisciplinarity in Theory and Practice. Vol. 5, no. 13 (2017), p. 1-4. - ISSN 2344-2409
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- [16] PIŇOSOVÁ, Miriama - ANDREJIOVÁ, Miriam: **Prípadová štúdia hodnotenia hluku a vibrácií v pracovnom prostredí**, In: Fyzikálne faktory prostredia. Roč. 7, č. 2 (2017), s. 100-107. - ISSN 1338-3922
- [17] MARASOVÁ, Daniela - ANDREJIOVÁ, Miriam - GRINČOVÁ, Anna: **Applying the heuristic to the risk assessment within the automotive industry supply chain**, In: Open Engineering. Vol. 7, no. 1 (2017), p. 43-49. - ISSN 2391-5439
- [18] OVAIS, Ali - UMAR, Muhammad Awais - BAČA, Martin - FEŇOVČÍKOVÁ, Andrea: **Fans are cycle-antimagic**, In: Australasian Journal of Combinatorics. Vol. 68 no. 1 (2017), p. 94-105. - ISSN 2202-3518
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Conferences

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Department of Mechatronics



Contact

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Staff

- Professors: 2
- Assoc. Professors: 2
- Assist. Professors: 1
- Researchers: 2
- PhD. Students: 0

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2017
04/2017	Aventics Road Show

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Master's degree:

- Mechatronics

Number of the students

(till 30. 10. 2017) on the study programs guaranteed by the department:

first year of bachelor study:

- 23 internal form of study

second year of bachelor study:

- 10 internal form of study

third year of bachelor study:

- 9 internal form of study

first year of engineer study:

- 18 internal form of study

second year of engineer study:

- 23 internal form of study

PhD. degree:

- 0 PhD. students in the internal form of study
- 1 PhD. students in the external form of study

Number of the graduates (2016/2017)

on the study programs guaranteed by the department:

- 23 students in the internal form of engineering study

GRADUATE PROFILE

BACHELOR'S PROGRAMS (Bc.)

Mechatronics

Study field is focused on preparing of specialist in area of mechanical - electrical engineering with knowledge of basics from area of informatics, automation, diagnostic etc. It is focused on machines, devices and systems with high added value of functionality, movement and manipulation ability, which are controlled with modern automation and computer techniques, digital distributed control systems etc. Mechatronics is sensed as interdisciplinary scientific field, which deals with computer controlled electromechanical systems.

MASTER'S PROGRAMS (Ing.)

Mechatronics

Study program mechatronics focuses to training of experts in area of electro - mechanical systems with knowledge of engineering informatics and automation for solution of engineering tasks coupled with complex system design, testing, production and operation of mechatronics systems controlled via distributed computer systems. There are many tasks as design, construction and projection of machines, machine devices and systems with high functional, movement and manipulation abilities and mechanical accuracy, which have been controlled via modern automation and computer devices with application of artificial intelligence parts. Students will be able to analyse, design, construct large engineering solutions included mechatronic systems and they will be able to do research with high creativity and self - activity.

PhD. PROGRAMS (PhD.)

Mechatronics

Students know scientific method of the research and development of the mechatronics products. Study focuses into solution of the scientific engineering problems in areas of the mechatronics, electronics, electrical engineering, mechanics and mechanical engineering, informatics and automatic control to the level of the artificial intelligence. The main assumption of the successful study is student ability of abstract thinking, their interest and ability to apply knowledge of these fields in solutions of engineering problems. Students have to know modern analytic and numerical methods and method of math modelling. Students will learn to characterize and to sense physic phenomena and experimental knowledge about these phenomena. Next, they will learn to find adequate models and new applications in specific disciplines, in science, in research and practice. Students will obtain theoretic knowledge and practical experience with the scientific work, they will be trained for self - employed scientific work in areas which cooperates with electrical engineering, mechanical engineering, informatics, automation and control, measurement engineering and sensing engineering.

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

Mechatronics (Bachelor study)

- ✓ Informatics
- ✓ Mechatronics Systems

Mechanical engineering (Bachelor study)

- ✓ Informatics
- ✓ Basic of mechatronics

Management of technical and environmental risks in engineering (Bachelor study)

- ✓ Informatics

Automotive Production (Bachelor study)

- ✓ Informatics

Industrial engineering (Bachelor study)

- ✓ Informatics

Safety and Quality of Production (Bachelor study)

- ✓ Informatics

Technology, management and innovation of engineering production (Bachelor study)

- ✓ Informatics

Applied mechanics (Master study)

- ✓ Theory of Dynamic Systems

Mechanical engineering (Master study)

- ✓ Mechatronics

Automation and control of machines and processes (Master study)

- ✓ Mechatronic Systems
- ✓ Microprocessor Technology

Biomedical engineering (Master study)

- ✓ Mechatronics for Biomedical Engineering

The measurement (Master study)

- ✓ Control of Engineering Systems
- ✓ Logical systems
- ✓ Microprocessor Technology

Mechatronics (Master study)

- ✓ Diplom Project
- ✓ Control of Engineering Systems
- ✓ Electromechanical Systems
- ✓ Fast preparation of prototypes of mechatronic systems
- ✓ Logical control systems
- ✓ Mechatronics I.
- ✓ Theory of dynamics systems
- ✓ Modeling and simulation of mechatronic systems
- ✓ Microprocessor Technology
- ✓ Programming of Application
- ✓ Sensors and converters
- ✓ Term Project
- ✓ Mechanics of robots
- ✓ Optimization of mechatronics systems
- ✓ Mechatronic system design
- ✓ Embedded systems of mechatronic systems

GRADUATE THESES**MASTER'S THESES:**

Pavol Turák	Design of a physical didactical model imitationing of ride a snakeboard
Jakub Cocul'a	Design and Implementation of a Home Automation Systems
Branislav Grejták	Design of control for the system using for the determination of residual stresses by RingCore method
Michal Brnčal	Controller designed by use of Matlab/Simulink for simulation models
Peter Toporcer	Design and control of unstable balancing vehlice
Jaroslav Bakši	Control of Two-link 2-DOF Robot Manipulator with variable load
Igor Dovala	Functional model of eght-wheeled undercarriage for locomotion on rough terrain
Ľuboš Jurčišín	Model of hovercraft with differetial controlling of blower
Lukáš Leštach	Design of mechatronic system for inner inspection of chimney

RESEARCH AT THE DEPARTMENT**Area of research:**

- ✓ Development of computer methods and algorithms for numerical simulation and optimisation of systems.
- ✓ Methods of experimental and numerical modelling of mechatronic systems
- ✓ Design and realisation of mechatronic systems, realisation of automatic controlled systems, measurement, data acquisition and their evaluation.
- ✓ Numerical modelling of mechatronic systems.
- ✓ Research of modules for intelligent robotic systems.

- ✓ Complex modular robotic system of mid category with higher intelligence.

PROJECTS OF THE DEPARTMENT

Title of the project	Research of synthetic and biological inspired locomotion of mechatronic systems in rugged terrain
Type of the project	VEGA
Number of the project	VEGA 1/0872/16
Principal investigator	prof. Ing. Michal Kelemen, PhD.
Time period of the project	2016 - 2019
Annotation of the project	The project deals with mechatronic systems, which makes synthetic locomotion or biologically inspired locomotion. Locomotion is aim oriented motion in specific environment with any purpose. Goal of the project is to research synthetic locomotion principles (has no biological example) or biologically inspired locomotion (snake-like locomotion, spider locomotion). Design and realization of these systems include synergic combination mechanics and electronic structures, actuators, sensors and embedded systems with integrated control algorithms. Project includes also analysis of locomotion modes of mechatronic systems in rugged terrain, also mechatronic system concept, also hardware solution, also computer model of locomotion and design of locomotion strategy of solved mechatronic system. Important part of the project is functional model of mechatronic system and its experimental testing of the properties from the viewpoint of locomotion in rugged terrain.

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

IEEE Institute of Electrical and Electronics Engineers

Alexander Gmitterko, prof. Ing., CSc.

PUBLICATIONS

Journals:

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Department of Automation, Control and Human Machine Interactions



Contact

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042 00 Košice, SR
Phone no.: +421 55 602 2654



Staff

- Professor: 1
- Assoc. Professors: 3
- Assist. Professors: 0
- Researchers: 0
- PhD. students: 3 internal, 1 external

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2017
2/2017	Int. Conference ARTEP2017, Stará Lesná, Slovakia. Co-organising of the conference.
6/2017	Final examinations of Master students in study programme "Automation and Control of Machines and Processes"

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMMES

Bachelor's degree:

No study programme at bachelor level

PhD. degree:

- **Automation and Control (AC)**

Master's degree:

- **Automation and Control of Machines and Processes (ACMP)**

Number of the students (till 30. 10. 2017)
on the study programmes guaranteed by the department:

first year of study:

- 6 internal form of study

second year of study:

- 9 internal form of study

Number of the graduates (2016/2017)

on the study programmes guaranteed by the department:

- 7 students in the internal form of engineering study

GRADUATE PROFILE

MASTER'S PROGRAMME (Ing.)

Automation and Control of Machines and Processes

Graduates of this study programme have good background in the theory of automation and control including artificial intelligence algorithms. They are prepared to design automated control and information systems independently, implement and operate them. Theoretical knowledge and practical skills allow them to work in industry, ICT field, design of products/services, and in research too. Graduates have experience with CAD systems, design and simulation tools for FESTO automation, automation of products or services using mobile technologies, wireless sensor networks, programming and implementing PLC or other tools of automatic control.

PhD. PROGRAMME (PhD.)

Automation and control

Postgraduates obtain wider theoretical knowledge in the field of informatics, automatic control, communication and artificial intelligence. They get skills in work with PLM systems, modelling and simulation systems, wireless sensors networks design, ambient intelligence, tele - monitoring and control, fundamentals in experimental work and data analysis. Postgraduates are able to work in research and developmental institutions, in management positions in the field of sophisticated automated production technologies and as staff at universities.

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

Automation and Control of Machines and Processes

- ✓ Wireless monitoring and control
- ✓ Computer integrated manufacturing systems
- ✓ Diploma thesis
- ✓ Electrical engineering and automation
- ✓ Identification, modelling and simulation of systems
- ✓ ICT for intelligent applications
- ✓ Information and control systems
- ✓ Complex methods and tools of automation of processes, products and services
- ✓ Communication interfaces
- ✓ Logic control
- ✓ Methods of technical creativity and project management
- ✓ Settings of automatic controllers
- ✓ NC tools and programming
- ✓ Programming languages and tools
- ✓ Components of automatic control systems I.
- ✓ Components of automatic control systems II.
- ✓ Process Control
- ✓ Semester project
- ✓ Sensor systems
- ✓ Servomechanism
- ✓ Theory of automatic control I.
- ✓ Theory of automatic control II.
- ✓ Practice in company

Automation and Control

- ✓ Wireless measuring systems and sensor networks
- ✓ Information and database systems
- ✓ Computer integrated manufacturing systems
- ✓ Monitoring, management and communication interfaces
- ✓ Design of automated systems
- ✓ Designing smart environments
- ✓ Process Control
- ✓ Robotics a mechatronics
- ✓ Decision processes in complex systems
- ✓ Artificial intelligence

List of subjects guaranteed by the department for another study programmes at the Mechanical Engineering Faculty

- ✓ Automotive electronics
- ✓ Automation a control
- ✓ Advanced driver-assistance systems
- ✓ History of technology
- ✓ Electrical engineering and electronics
- ✓ Computer integrated manufacturing systems
- ✓ Communication interfaces
- ✓ Measurement converters and data buses
- ✓ Optimisation in automation
- ✓ Computer aided measurement and monitoring
- ✓ Industrial control systems
- ✓ Industrial buses and interfaces
- ✓ Automation control means

- ✓ Automotive control units
- ✓ Automatic control systems
- ✓ Automatic control theory
- ✓ Artificial intelligence and neural nets
- ✓ The basics of automotive electronics
- ✓ The basics of automation

DEFENDED GRADUATE THESES

MASTER'S THESES:

Automation and Control of Machines and Processes

BALÁZS, Peter	Design of workplace for partial automation of gluing machines and ceilings for the production of paper products
GOMOLA, Andrej	Design of automated workstation using Process Simulate
KORBOVÁ, Lucia	Body sensor system for automatic evaluation of rehabilitated person physiological parameters
LUCÍK, Michal	Management process visualization of assembly line module FMS 500 via the TIA Portal
ROHÁČ, Marián	Creating a laboratory exercise using technology IO-Link and PLC, including the process visualization
TAKÁČ, Ján	Design of automated device for processing and transport of bulk material controlled by PLC
TOMEČEK, Michal	Design of application for visualisation of sewage pumping station for dispatcher using Control Web

PhD. THESES:

Automation and Control

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RESEARCH AT THE DEPARTMENT

Area of research:

Automation and Control

- ✓ Automation and control in industry and services.
- ✓ Application of artificial intelligence methods for the identification, modelling, simulation and control of non - linear systems and biometrics.
- ✓ Design and modelling of man - machine communication interface.
- ✓ Wireless sensors networks. Tele – monitoring and control.

Research characteristics:

Automation and Control

Department performs scientific research, particularly in these areas: automation and control in industry as well as human fields, the artificial intelligence methods usage for identification, modelling, simulation and control of nonlinear systems and biometrics, modelling and development of human-machine interfaces. Departmental research team has been involved in several international projects in the field of ICT, Assistive technology, Rehabilitation engineering, Human Motion Analysis, Social services for elderly based on ICT, Ambient intelligence, Sensors' networks, Tele-monitoring and Home automation.

Areas of expertises:

Automation and Control

- ✓ automation and control in industry
- ✓ wireless sensor networks and actuators
- ✓ automated products and services in human fields
- ✓ human motion analysis
- ✓ ambient intelligence and domestic automation
- ✓ artificial intelligence methods applications for identification, modelling, simulation and control of nonlinear systems and biometrics
- ✓ modelling and development of human - machine interfaces
- ✓ body area networks

PROJECTS OF THE DEPARTMENT

NATIONAL PROJECTS

Title of the project	Innovation of teaching courses with a focus on automation in response to the demands of industry and services
Type of the project	Grant project KEGA
Project number	054TUKE-4/2016
Principal investigator	doc. Ing. Alena Galajdová, PhD
Time period of the project	1.1.2016 -31.12.2018
Annotation of the project	The project aims to prepare book and e-Learning materials with practical tasks in laboratory for improving the quality of teaching in the field of automation and for stronger interconnection between teaching and practice for students at the Faculty of Mechanical Engineering TU Košice especially in engineering study program "Automation and control of machines and processes", but also in other study programs at Faculty and at doctoral study "Automation and Control". The part of the project realisation is the completion of a laboratory for intelligent environments and laboratory of automation. The innovation of study will help to meet the needs of practice in the field of industrial automation and in the area of services, where we can see increasing implementation of automation. Practical applications in laboratories will be based on the implementation of wireless technology into industrial automation as well as in to building automation and home automation solutions, user communication interfaces, as well as computer simulation as an effective tool for design of technical systems.

VISITS OF STAFF MEMBERS TO ABROAD

Employees and students	Country
Šimšík, Dušan, prof. Ing., PhD.	EIT Digital, Brussels, BE; SUNY Polytechnic Institute, Utica, state NewYork, USA; National Institutes of Health, Washington D.C. – Bethesda, USA; WHO, Geneva, Suisse; ČVUT Praha, CZ; ZUYD Heerlen, Netherland; Hungexpo Budapest and EC - ICT Proposers Day.
Galajdová, Alena, doc., Ing., PhD.	SUNY Polytechnic Institute, Utica, state NewYork, USA; National Institutes of Health, Washington D.C. – Bethesda, USA;; ČVUT Praha, CZ; Hungexpo Budapest and EC - ICT

Líška, Ondrej, doc., Ing., CSc.

Proposers Day,
VŠB Ostrava, ČVUT Praha, University Zlín, CZ

Šeminský, Jaroslav, doc. Ing. PhD.

ČVUT Praha, MICROSYS Ostrava, CZ

VISITS FROM ABROAD

Employees

Vítečková, Miluše, prof. Ing., CSc.

Country

Czech Republic

Janáčková, Dagmar, prof. Ing., CSc.

Czech Republic

MEMBERSHIP IN SLOVAK PROFESSIONAL ORGANISATIONS

Dušan Šimšík, prof. Ing., PhD.

Member of SBMI committee - (Society for Biomedical Engineering and Medical Informatics)

Member of SASI (Slovak Association of Mechanical Engineers)

Member of SSAKaI (The Association of Slovak Scientific and Technological Societies)

Member of SLS (Slovak Society of Medicine – professional society for physiatry, balneology and rehabilitation treatment)

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

Dušan Šimšík, prof. Ing., PhD.

Member of Int. committee IMEKO TC 17 – Measurement in robotics

Member and National coordinator of AAATE - Association for the Advancement of Assistive Technology in Europe

Vice-chairman of ICTA Global – International Commission on Technology and Accessibility, Rehabilitation International (RI); member of RI Executive Commission

National Contact of EASTIN – European Assistive Technology Information Network

Member of International Society on Gerontechnology, Associate Editor of Gerontechnology Journal

Alena Galajdová, doc. Ing., PhD.

Member of AAATE - Association for the Advancement of Assistive Technology in Europe; ICTA Europe – International Commission on Technology and Accessibility, Subcommission of Rehabilitation International (RI); Member of EASTIN – European Assistive Technology Information Network;

PUBLICATIONS

Textbooks:

- [1] ŠIMŠÍK Dušan, et al.: **Identifikácia, modelovanie a simulácia systémov**. Základné pojmy a metódy. 1. vyd. - Košice: Strojnícka fakulta TU - 2017. - 184 s. - ISBN 978-80-553-3178-2

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- [3] ŠEMINSKÝ, Jaroslav: **Modelovací rámec RAMI 4.0 pre modelovanie podnikových a výrobných operácií**. In: Roč. 21, č. 12 (2017), s. 100-101. ISSN 1335-2938

Journals

- [1] JÁNOŠ, Rudolf - et al.: **Conceptual design of a leg-wheel chassis for rescue operations**. In: International Journal of Advanced Robotic Systems. Vol. 14, no. 6 (2017), p. 1-9. ISSN 1729-8814
- [2] ONOFREJOVÁ, Daniela - ŠIMŠÍK, Dušan: **Výskumné aktivity zamerané na budovanie platformy pre priemysel 4.0**. In: ATP Journal. Č. 4 (2017), s. 36-38. -

- [4] VIŠŇOVSKÝ, Martin - et al.: **Creating industrial network with profinet communication for education purposes**. In: Acta Mechanica Slovaca. Roč. 21, č. 4 (2017), s. 66-72. - ISSN 1335-2393

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- [5] RÁKAY, Róbert - et al.: **Vytvorenie laboratórnej úlohy prepojenia programovateľného logického automatu a Matlabu**. In: ARTEP 2017. Košice: TU, 2017 S. 46-1-46-12. ISBN 978-80-553-3075-4
- [6] VITÁKOVÁ, Vladimíra - et al.: **IO-Link v zobrazovaní procesných stavov v automatizovanej výrobe – hardvérová konfigurácia**. In: ARTEP 2017. Košice: TU, 2017 S. 48-1-48-12. ISBN 978-80-553-3075-4
- [7] VIŠŇOVSKÝ, Martin - et al.: **Softvérové riešenie pre testovanie vlastností dynamického svetelného majáka**. In: ARTEP 2017. Košice: TU, 2017 S. 47-1-47-9. ISBN 978-80-553-3075-4
- [8] ŠEMINSKÝ, Jaroslav: **Etymológia pojmu 4. priemyselná revolúcia**. In: ARTEP 2017. Košice: TU, 2017 S. 02-1-02-5. ISBN 978-80-553-3075-4
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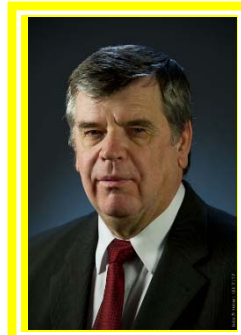
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- [12] KOVÁČ, Juraj - LIŠKA, Ondrej – MASTILÁK, Marek: **Výroba experimentálneho prototypu robotickej ruky pomocou 3D tlače**. In: ARTEP 2017. Košice: TU, 2017 S. 28-1-28-10. ISBN 978-80-553-3075-4
- [13] BARCALOVÁ Miroslava – HLAVÁČOVÁ, Jana – GALAJDOVÁ, Alena: **Hodnotenie špirálnej stabilizácie neinvazívnou metódou**. In: Vysokoškolská telesná výchova a šport, pohybová aktivita a zdravý životný štýl. Košice: TU, 2017 S. 17-22. ISBN 978-80-553-3148-5
- [14] ŠIMŠÍK, Dušan - Liška Ondrej – Šeminský, Jaroslav: **Výskumné aktivity zamerané na robotiku v kontexte rozvoja odboru automatizácie na strojníckej fakulte**. In: Automatizácia a robotika v 21. storočí. - Košice: TU, 2017 S. 9-14. ISBN 978-80-553-2820-1

Proceedings

- [1] ŠEMINSKÝ, Jaroslav – et al.: **Automatizácia a riadenie v teórii a praxi 2017 ARTEP 2017**. Zborník príspevkov z workshop odborníkov z univerzít, vysokých škôl a praxe v oblasti automatizácie a riadenia. Stará Lesná, 15.-17. február 2017. 1. vyd – Košice. TU - 2017. 350 s. [CD-ROM]. ISBN 978-80-553-3075-4.

Department of Robotics



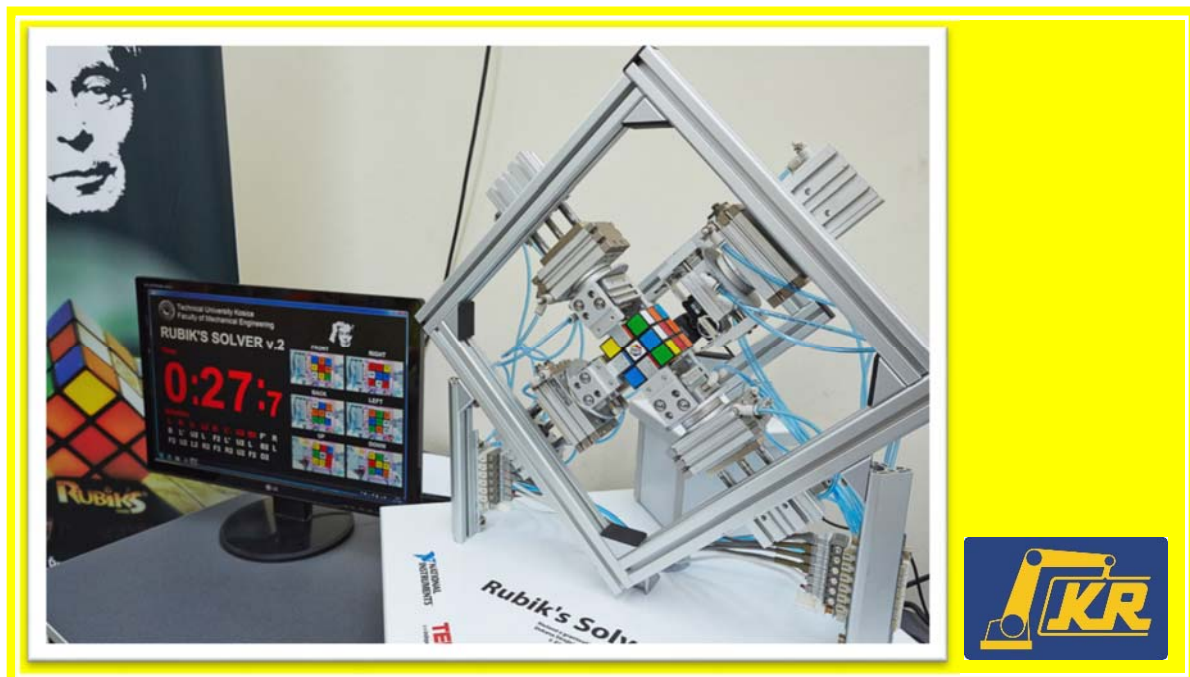
Contact

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prof., Ing., PhD.

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042 00 Košice

phone no.: +421 55 602 2193



Staff

- Professors: 1
- Assoc. Professors: 2
- Lectures: 3
- Researchers: 2
- PhD Students: 3 full-time, 3 distance

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2017
6/2017	International conference automation and robotics: Automation and Robotics in the 21st Century
9/2017	Researchers' Night 2017 Košice – presentation of robotic show
9/2017	meeting RUSOS
11/2017	EU Robotics Week, Robotic show

EDUCATION AT THE DEPARTMENT STUDY PROGRAMMES

Doctoral degree:

- ✓ Production systems
- ✓ Mechatronics

Number of the students (till 31. 12. 2017)
on the study programmes guaranteed by the
institute:

Internal students: 3

External students: 3

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

- | | |
|--------------------------------------|--|
| ✓ Automated production systems | ✓ Laboratory practice |
| ✓ Basics of fluid mechanisms | ✓ Machines and robots programming |
| ✓ Basics of informatics | ✓ Robotics |
| ✓ Diploma thesis | ✓ Robotic and handling technology for production systems |
| ✓ Diploma thesis | ✓ Robot control |
| ✓ Diploma project | ✓ Robotic systems |
| ✓ Evolution trends in robotics | ✓ Robotics systems in automobile production |
| ✓ Final work | ✓ Robotic technology |
| ✓ Final project | ✓ Semestral project |
| ✓ Fluid mechanisms | ✓ Service robots |
| ✓ History of Technique design | ✓ Service systems |
| ✓ Information systems in maintenance | |

RESEARCH AT THE DEPARTMENT

Area of research:

- ✓ Multirobotics systems profilation
- ✓ Methods and tools for design of service robots
- ✓ Modular reconfigurable robotic systems
- ✓ Development of modular principles for constructing of handling systems
- ✓ Multifunction positionable modules for production robotic technology
- ✓ Intelligent manipulation systems with unoriented 3D objects

Research characteristics:

The main fields of research of the Department of Robotics are: service, humanoid and industrial robotics, production technology and reconfigurable manufacturing systems. Research tasks in the field of robotics are oriented to address current needs such as multirobotic systems and solutions of mutual co-operation of robots, robotic systems based on modularity and reconfigurability as well as research in the field of intelligent robotics systems and intelligent manipulation systems.

The research is focused on the issues of working precision of machine tools, to evaluate the technical level of production lines, as well as the development of expert systems for dealing with diagnostic of machinery and equipment.

The Department of Robotics supports research in education in the field of manufacturing machines and robots by creating and implementing e-learning form of education using virtual laboratories connectable via the internet.

Areas of expertise:

- ✓ Multirobotic systems and robot cooperation
- ✓ Intelligent robotic systems and manipulation
- ✓ Kinematics structures
- ✓ Construction of production machines and robots
- ✓ Virtual laboratories and Virtual models
- ✓ Modular and reconfigurable robotic systems
- ✓ Intelligent manufacturing systems

PROJECTS OF THE INSTITUTE**NATIONAL PROJECTS**

Title of the project	Development of quality of life, creativity and motoric of handicapped and the elderly, with the support of robotic equipment
Type of the project	KEGA
Number of the project	059TUKÉ-4-2014
Main solutionist	Mikuláš Hajduk, prof. Ing., PhD.
Time period of the project	2014 - 2017
Annotation of the project	The objectives of the project are aimed at creating a set of material, gives an overview of the field and the possibilities of service robotics, information and communication equipment for the said specific group. The project builds further create specific solutions and guidelines to manage a mobile robot and a PC-based implementation of the X box using body movements and gestures. As part of this implementation, the project will create the presentation of the guidance material, as well as a set of logical tasks power point control with hand gestures. A set of logical tasks and tasks of the development of creativity will be created in several categories depending on age and dysfunction. As part of improving the quality of life of the project creates a methodological guide implementation of modern communication devices and sensors for wheel chairs and in door environments and operating manual of the operational guide, also gestures other methods eg. light pen or the like.

INTERNATIONAL PROJECTS

Title of the project	AuToMa – Automation, Technology transfer and Managerial practices for the growth of SMEs, a better employability and the promotion of the entrepreneurship
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Type of the project	Erasmus +
Number of the project	2017-1-IT01-KA202-005599
Main solutionist	Mikuláš Hajduk, prof. Ing., PhD.
Time period of the project	2017 - 2019
Annotation of the project	AuToMa project will effectively contribute to the development of high professional skills with specific regard to the fields of automation, innovation and technology transfer and sharing them at national and European level. AuToMa will develop an innovative and open training approach, including two specific learning paths (one technical and one managerial) and several advanced tools. AuToMa project addresses the problem of low and incongruous qualification of students and staff employed in SMEs in terms of automation systems and new technologies. It will also provide to employed, unemployed and people that need requalification more opportunities to find a job at national and EU labour markets. Other beneficiaries will be industrial organizations (at local regional, national and European levels) that work on induced activities and public organizations that want to understand how to finance or support manufacturing SMEs or entrepreneurship in general.

Title of the project	RUSOS – Robotics for teachers of secondary vocational schools
Type of the project	Erasmus +
Number of the project	2015-1-SK01-KA202-008970
Main solutionist	Mikuláš Hajduk, prof. Ing., PhD.
Time period of the project	2015 - 2017
Annotation of the project	Project is focused on educating of teachers of secondary and vocational schools in the field of robotics. The main goal of the project is to create learning materials for teachers of technical subjects at secondary vocational schools to be established at the basis and also at the latest knowledge of robotics.

Title of the project	SPOSH - Strategic Partnership for Occupational Safety and Health
Type of the project	Erasmus +
Number of the project	2015-1-PL01- KA202-016625
Main solutionist	Mikuláš Hajduk, prof. Ing., PhD.
Time period of the project	2015 - 2017
Annotation of the project	Strategic Partnership for Occupational Safety and Health – SPOSH is a three-year project starting from September, 2015 and ending in September, 2018 executed within the Erasmus+ framework, Key Action 2. The project is dedicated to the elaboration of common OSH learning tools, materials, standards and methodology which will serve SME users as a source of good practice information on the EU-OSH and help in proper OSH risk assessment.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUCIONS

Employees and students	State
Hajduk Mikuláš, prof. Ing., PhD.	Czech Republic, Portugal, Poland, Romania
Vagaš Marek, Ing., PhD.	Portugal, Poland, Romania, Bulgaria
Kováč Juraj, Ing., PhD.	Portugal

PUBLICATIONS

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INSTITUTE OF TECHNOLOGY AND MATERIALS ENGINEERING



- Department of Mechanical Engineering Technologies and Materials
- Department of Automotive Production
- Department of Computer Aided Engineering Production
- Department of Industrial Engineering and Management



Department of Manufacturing Technology and Materials



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Staff

- | | |
|----------------------|---|
| • Professors: | 3 |
| • Assoc. Professors: | 5 |
| • Assist. Professors | 1 |
| • Researchers: | 1 |
| • PhD. Students: | 5 |

Activities at the department

Date **Title of the event, activity characterizing the life at the department in 2017**

06/2017 PRO-TECH-MA 2017 International Scientific Conference
06/2017 SURFACE ENGINEERING Scientific Conference

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Bachelor's degree:

- Technology, Management and Innovation of Mechanical Engineering

PhD. degree:

- Mechanical Engineering Technology and Material

Master's degree:

- Mechanical Engineering Technology

Number of the students (till 30. 10. 2017) on the study programs guaranteed by the department:

first year of bachelor study:

- 20 internal form of study
- 9 combined form of study

second year of bachelor study:

- 11 internal form of study
- 17 combined form of study

third year of bachelor study:

- 28 internal form of study
- 22 combined form of study

first year of engineer study:

- 18 internal form of study
- 26 external form of study

second year of engineer study:

- 22 internal form of study

Number of the graduates (2016/2017)

on the study programs guaranteed by the department:

- 22 students in the internal form of engineering study (Master study)
- 24 students in the internal form of engineering study (Bachelor study)
- 18 students in the combined form of engineering study (Bachelor study)

GRADUATE PROFILE

BACHELOR'S PROGRAMS (Bc.)

Technology, Management and Innovation of Mechanical Engineering

Graduates of the Production technology program and study program Technology, management and innovation of mechanical engineering in 1st level of university degree found your applicable as manufacturing technologist, engineers of tools and equipment, workers in CAx technology service, specialist for testing, operation and maintenance, especially of the upstream sector of the automotive industry in the development of components, production management of vehicles and other related activities connected with automotive industry.

The application can also be found in the lower control service level, technical services of operations and companies and can be also the management unit's members of larger organizations.

MASTER'S PROGRAMS (Ing.)

Mechanical Engineering Technology

Graduates of master degree in program Mechanical Engineering Technology are able to systematically and complexly solve problems of preproduction, processing and after processing stage with support of CAx Technology. They have knowledge about possibilities of conventional and unconventional technique of production of semi products, complete parts, tenet of techno – sanity construction parts and products, and knowledge about methods of quality control. These abilities are integrated with knowledge of economical character, what enables to the graduate solve even problems of managing and processing of mechanical and electrotechnical productions. All of these activities are performed with the support of mathematical modeling method, method of simulation, logisticians and mathematical optimization. Graduates of master degree in field of study – Manufacturing Technology and in educational program – mechanical engineering Technology acquire attainments from common technological disciplines from this specialization, from special technology disciplines of specialization, as well as from discipline of natural sciences. Graduate simultaneously obtain accomplishments at area of informative Technology by the solving of specialization problems and practice in laboratorial work. A part of education is knowledge of foreign language and adequate knowledge from area of economy, law and next humane departments. By studying of this specialization, graduate obtain ability to specialize oneself and assumption of perpetually self educating.

Welding, joining and surface treatment

The graduates of the study program Welding, joining and surface finishing are able to systematically and comprehensively solve the problems of practice in the field of methods and technological processes of welding, joining and surface treatment. They have knowledge of conventional as well as special technologies of welding, alternative methods of joining, pretreatment of surfaces and surface finishing. They are equipped with knowledge in the field of technical materials, including progressive, their behaviour during welding and heat treatment. They can analyze the quality of joints and surfaces using appropriate control methods. In addition, they can use information technology to solve the tasks in the field and also apply knowledge and skills in laboratory work. The graduates of the study program Welding, joining and surface finishing, based on the acquired knowledge of materials, conventional as well as progressive welding and surface finishing technologies, control methods and knowledge of foreign language, can find employment in engineering companies in positions of technologist focused on welding or surface finishing, production coordinators, quality controllers, and finally after completing the education also at positions of welding engineers.

PhD. PROGRAMS (PhD.)

Mechanical Engineering Technology and Materials

The third degree of university study in field of Mechanical Engineering Technology and Materials deepens and widens theoretical knowledge from technological discipline from area of metallurgy, progressive technology of non cutting and splintery processing of metals, automation of technological processes and possibilities of their application in mechanical engineering corporations, with the ecological aspect. Graduate of doctoral study will have application at research – development departments of manufacturing corporations, top level managerial functions, managing of manufacturing departments with sophisticated production technique, institutes of Slovakia's academy of science, on technical universities and on technical high schools.

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

Power machines and equipments

- ✓ Applied Database Systems
- ✓ Applied Informatics
- ✓ Applied Informatics in Technology
- ✓ Assembly Technology and Joining
- ✓ Bachelor Theses
- ✓ Basis of Mechanical Production
- ✓ Basis of NC Machines Programming
- ✓ CA Methods in Technological Processes I.
- ✓ CA Methods in Technological Processes II.
- ✓ CA Methods in Technological Processes III.
- ✓ CAD / CAM Systems - Automation of Technical Preparation of Production
- ✓ Certification and Standardization
- ✓ Computer aided mechanical production
- ✓ Computer aided production planing - CAP
- ✓ Computer Aided Simulation
- ✓ Computer Design of Dies and Tools
- ✓ Creative Work Methodics
- ✓ Design and production of dies and tools II
- ✓ Design and Production of Tools I.
- ✓ Design and Production of Tools II.
- ✓ Design of Fixtures
- ✓ Design of Production Systems
- ✓ Design of Technological Processes
- ✓ Diploma Thesis
- ✓ Geometrical Specifications of Products
- ✓ Informatics and PC I.
- ✓ Informatics and PC II.
- ✓ Machines and Tools for Plastics Processing I.
- ✓ Machines and Tools for Plastics Processing II.
- ✓ Materials Engineering
- ✓ Materials for Automotive Production
- ✓ Materials I.
- ✓ Materials II.
- ✓ Materials Science
- ✓ Measurement and Testing
- ✓ Mechanical Technology and Materials I.
- ✓ Mechanical Technology and Materials II.
- ✓ Mechanical Technology and Materials III.
- ✓ Methods for Intelligent Production Processes
- ✓ NC Machine Programming
- ✓ New Materials
- ✓ Non - conventional Materials and Technology I.
- ✓ Non - conventional Materials and Technology II.
- ✓ Optimization of Technical Preparation of Production
- ✓ Planning and Design of Technical Preparation of Production
- ✓ Planning and Design of Technological Processes
- ✓ Planning and Evaluation of Experiments
- ✓ Precision Manufacturing and NanoTechnology
- ✓ Processing of Technological Information
- ✓ Product innovations
- ✓ Production Quality
- ✓ Progressive and non - conventional Technology
- ✓ Progressive materials and their processing
- ✓ Simulation of Technological Processes
- ✓ SMART and Intelligent Materials
- ✓ Special Materials
- ✓ Surface Treatments
- ✓ Systems of Quality Management
- ✓ Technical Creativity
- ✓ Technology of Automatized Manufacturing
- ✓ Technology I.
- ✓ Technology II.
- ✓ Technology III.
- ✓ Theory and Technology of Processes of Machining, Mechanical Working and Surface Finish
- ✓ Theory and Technology of Processes of Welding, Casting and Powder Metallurgy
- ✓ Theory of Conventional Technology
- ✓ Theory of Forming, Tools and Jigs

- ✓ Theory of Innovative Technology
- ✓ Theory of Machine Cutting, Tools and Jigs
- ✓ Theory of Progressive Technology

GRADUATE THESES

BACHELOR'S THESES:

Vladimír Rohal'	Application of nanotechnologies in surface treatments
Tibor Boka	Special technologies of materials joining
Peter Šenvický	Methods for evaluation quality of welded joints
Lenka Janáková	Database methods and standards for evaluation of surface roughness
Peter Vaško	The Effectiveness of Ecologically Acceptable Blasting Means in Surfaces Pre-Modification Process
Dušan Pavlůvčík	The Ways of Surfaces Morphology Diagnosing Using the Modern Methods
Kristián Jaš	Proposal CNC machining using CAD / CAM system Creo Parametric
Milan Janák	Design of RC car body model in SolidWorks
Denis Čmurej	Assessment of inhomogeneity selected properties of Ti6Al4V alloy
Patrik Hedvig	Analysis of wear resistance of thermally sprayed coatings
Vladimír Bul'ko	Technologies for microelectromechanical systems production
Ján Hašul'	The application of engineering technologies in automotive industry
Marek Bundschuh	Engineering technologies for aircrafts manufacturing
Kristína Petrovčinová	Comparison of databases of sheets producers for the electrotechnical industry
Maroš Cibelenko	Overview of forming technologies of aluminum and its alloys
Róbert Hagara	Technological process of blanks production using web application
Martin Gaduš	The analysis of reducing of soluble residues of compressor NT packaging after its welding line
František Farkaš	Design of production technology for symmetrical deep drawn part
Miloš Valkučák	Innovative propose of equipment for the "Bulge" test
Denys Fetko	Current methods of joining in the production of car bodies
Štefan Pál	Production parameters affecting the roundness when sanding
Erik Janoško	Utilization of bionics in relation to the automotive industry
Róbert Moro	Utilization of micro-forming in the automotive industry
Štefan Sanislo	Trends in the use and processing of magnesium sheet metals in the automotive industry
Michal Čížmarik	Analysis of new moulding technologies Intergranular corrosion of welded chromium steels.
Jaroslav Reisinger	Milling of composite materials
Norbert Sonntag	Survey of machining technologies in automotive industry
Marcel Šolc	Time reduction of preventive maintenance in paint line
René Herbert	Advanced material and technological concepts in the area of renovation of machine parts
Vladimír Blaško	Laboratory workplace - innovative concepts in the evaluation of wear metallic and non-metallic materials

MASTER'S THESES:

Lukáš Jurko	Evaluation of quality of welded joints containing heterogeneous materials in the manufacture of rail freight wagons
Daniela Okošová	The Study of Non-Conventional Blasting Means Effect on a Respective Surface and its Morphological Characteristics
Monika Nigutová	The Setting of Selected Characteristics for Organic Coatings Applied on Wagon Units
Maroš Matalík	Surface quality assessment after material cutting by progressive technologies
Štefan Pčola	Optimization of kinematic pair of casting mould height adjustment in high pressure casting machine
Tomáš Kušnir	The configuration of the vacuum chamber for covering of internal surfaces of hollow bodies via PVD evaporation technique
Gabriel Rási	The design of the vacuum chamber for deposition of coatings onto internal tube surface by vacuum sputtering
Zoltán Segecs	The design of the vacuum chamber for covering of internal tube surfaces using CVD method
Tomáš Gabáni	The analysis of anisotropic properties of double reduced packaging sheets
Erika Rácová	The evaluation of the mechanical properties of tinplates
Katarína Kašická	3D focusing of furnace rollers of Continuous Galvanizing Line No.3 and its influence on the final quality of the galvanizing process
Dominik Daňko	Optimizing of the production of molds for orthopedic aid
Pavol Baran	Evaluation of influence of shear gaps in the quality of the cutting surface when cutting of electrical sheets
Jakub Brezina	Quality analysis of the car seat frame welding joints
Eduard Pankovčín	Optimization of hardfacing layer machining process
Tomáš Ščerbák	Characteristics of welds and weld deposits for stainless steels
Tomáš Rjaby	Monitoring of the tribological characteristics under different conditions of abrasive wear

PhD. THESES:

Juraj Koncz	The application of modern methods in the evaluation of corrosion properties of protective coatings
Peter Balog	Research of state and integrity of surface in formation of functional and protective coatings
Tomáš Vaško	Research of the usable properties welded joints on thermoplastics for gas pipelines

RESEARCH AT THE DEPARTMENT

The research activities focus on:

- ✓ Research into new modern steels in relation to requirements concerning their formability.
- ✓ Research into formability conditions and their influence on the quality and final properties of drawn parts.
- ✓ Verification of the application of progressive Technology in joining of metal materials for automotive industry.
- ✓ The optimization of machining parameters in the production of tools for thin steels and plastics production.
- ✓ Research into tribological aspects of thin coatings applied on machining tools, forming tools and implants.
- ✓ Innovation procedures in the technology of machining, evaluation of workability of construction materials and cutting properties of new tool materials, wear resistance coatings on the tools, tool wearing and energy intensity during machining.

- ✓ Development of new procedures and methods for production of samples and prototypes using various methods considering specific orientation of product design: conventional machines, rapid prototyping, rapid tooling.

Research characteristics:

Scientific and research activities of the department are diversified according to specializations of the individual department sections. The current personnel structure of the department and its technological equipment allow for comprehensive solutions of material, technological, and designing tasks (in terms of products, tools and fixtures), including modelling, simulations and optimization of process planning and products, their experimental research, laboratory and semi - operational verification of the outcomes. The department offers the solutions in the area of metal and plastic forming, joining of materials, surface treatment of materials, machining of metal and non - metal materials, innovations of production and rapid prototyping.

PROJECTS OF THE DEPARTMENT

NATIONAL PROJECTS

Title of the project	Increasing the quality of cut-outs and effectiveness of cutting electric sheets
Type of the project	Grant project APVV
Number of the project	APVV-14-0834
Principal investigator	prof. Ing. Emil Spišák, CSc.
Time period of the project	2015 - 2018

Annotation of the project

Under the global trend of energy saving and environmental protection has become a very important reduction in electricity consumption. Electric motors are a key part of a range of electrical equipment for industrial and home use, and therefore it is important to reduce the level of energy losses in them. The assumed project results will allow processing of electrical steel sheet in Slovakia more effectively, mainly for electrical industry, in production segment of electric motors for automotive and consumer industry. They will allow more effective production of stator and rotor packs as well as transformers and allow to reduce the costs of their production. The main benefit is expected in the area of efficiency of cutting the cut-outs for motor packs with partial or complete elimination of annealing process following the minimization of energy losses due to cutting process as well as higher lifetime of these tools.

Title of the project	The utilization of innovative technology for repair functional surfaces of mold casting dies for castings in automotive industry
Type of the project	Grant project APVV
Number of the project	APVV-16-0359
Principal investigator	prof. Ing. Janette Brezinová, PhD.
Time period of the project	2017-2020

Annotation of the project

The project aims at increasing the service life of shaped parts of molds and cores for high pressure die casting (HPDC) of aluminum alloys for the automotive industry. Increasing the service life of casting moulds and dies is achieved using innovative technologies of restoration their functional shape surfaces. For this renovation purpose will be used hard surfacing of functional surfaces of tools in combination with PVD and PE-CVD coatings made of new advanced nanomaterials based on TiAlN, CrAlN and TiB. There will be experimentally verified the effectiveness of

local heat exposure of renovated as well as original surface of shaped casting mould to laser as a method of surface pretreatment before deposition thin coatings using PVD or PE CVD technology. The application potential of the project lies in reducing the cost of maintenance moulds and dies, in saving of material resources and also in increasing the productivity and reliability of the process of aluminum castings production.

Principal investigator **Tribosimulations on realistic models of joint replacements made of DLC coated Ti-6Al-4V alloy**
Time period of the project Grant project VEGA
Annotation of the project 1/0117/15

Principal investigator prof. Ing. Eva Zdravecká, CSc.
Time period of the project 2015 - 2018
Annotation of the project Diamond-like carbon (DLC) due to its unique properties is good candidate for a wide range of tribological applications. Under dry friction conditions, using lubricant and in the presence of water DLC has a very low friction coefficient and good self-lubricity. Its use in bio-mechanical tribosystems such as artificial joint replacements, however, requires a thorough understanding of the wear mechanisms that would allow preventing unwanted failures. The project is therefore focused on the study of the DLC - substrate tribosystem properties. An important project part will be the correlation analysis between the friction, hardness, adhesion and wear resistance in a dry or lubricated friction, with the presence of water and at elevated temperature, such simulating human body conditions. DLC will be prepared by CVD and PVD techniques on flat and shaped Ti6Al4V alloys. The influence of the method and parameters on the properties of tribosystem will be evaluated and optimized processes will be designed.

Title of the project **Application of high-strength materials for exterior car body parts**
Type of the project Grant project VEGA
Number of the project 1/0441/17
Principal investigator prof. Ing. Emil Spišák, CSc.
Time period of the project 2017 - 2019
Annotation of the project The project deals with the application of high-strength materials for the production of exterior car body parts, the research of the properties of high strength materials in context of their application for exterior parts. Specification of springback prediction of car body drawn-parts from high-strength materials experimentally and with using the numerical simulations. Analyses of dependence of springback on the amount of the plastic deformation, which allow the corrections of shapes and sizes of forming tools for the production of exterior body parts.

Title of the project **Study of the properties of newly constituted layers and coatings in tribological systems**
Type of the project Grant project VEGA
Number of the project 1/0424/17
Principal investigator prof. Ing. Janette Brezinová, PhD.
Time period of the project 2017 - 2019
Annotation of the project The project is focusing on the study of the properties of newly constituted layers and coatings intended for the renovation of functional surfaces exposed in hard tribological conditions. Research will focus on the

possibility of using surfacing methods FCAW as well as tubular wire in multicomponent gas protective atmospheres FCAW-S with application of innovated types of filler materials with the aim to innovate renovation process by eliminating the energy consuming heat treatment. The project is focusing also on research of formation and properties of cermet coating applied using HVOF and HVOF technology. These high-efficiency coatings containing sintered carbides and metal powder will be tested in corrosive conditions and in conditions of abrasive, erosive and adhesive wear. Renovation layers will be evaluated in conditions of high temperature cyclic fatigue. Part of the experimental work will focus on optimization of surface pre-treatment processes in relation to the adhesion of subsequently applied coatings.

Title of the project	Innovative learning approaches in the composite component's design and production area.
Type of the project	Grant project KEGA
Number of the project	059TUKE-4/2016
Principal investigator	prof. Ing. Janette Brezinová, PhD.
Time period of the project	2016 - 2018
Annotation of the project	The present project aims to develop the innovative methods of teaching in the area of the design and manufacture of composite components. The goal of the project is by using the modern teaching methods of "learning-by-doing" and blended learning to connect theoretical knowledge base of students with practical experience in the design of the original conception of experimental ultralight city vehicle. For the needs of combined methods of teaching at the Engineering Faculty of the Technical University in Košice there will be created e-learning courses and electronic tests in the platform of Moodle software. E-learning texts using Moodle will form the basis of the combined approach of education in engineering technologies and materials engineering. The practical outcome of the project will be an innovative small urban electric car built on the basis of VW e-up! with the car body made of the composite materials. For the needs of the project there will be developed research – teaching facility and in area of methodology training for the needs of social practice there will be progressively realized education of students from theoretical knowledge to the implementation of the prototype. The output of the project will also the university textbook focused on composite materials, organizing the workshops and conferences on the topic of the use of composite materials in the automotive industry.
Title of the project	The research of nanocomposite hard coatings to improve the functional properties of engineering parts.
Type of the project	Grant project VEGA
Number of the project	1/0432/17
Principal investigator	doc. Ing. Daniel Kottfer, PhD.
Time period of the project	2014 - 2016
Annotation of the project	The main aim of project is determination and understanding of the basic relationships amongs conditions preparations of hard, nanocrystalline layers on the WC/C, CrC/C a WCrC/C basis with and without added chemical elements (Si, N ₂ , Al, Y) and their mechanical and tribological properties. Layers will by prepared using PECVD and EBPVD techniques and their combination on steel substrates. which are used for automotion components. The deposition temperature must not exceed 350 °C. The project solution should be the optimizing of preparing conditions of the technology for engineering production focused on coating of functional surfaces. The accent of research activities will be on preparation of thin

coatings deposited on above mentioned substrates and on laboratory evaluation of properties of developed coatings. The important part of project will be mathematical description of results, which will be focused on optimizing of deposition parameters with respect to the maximum hardness and minimum COF.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUTIONS

Employees and students	Country
Spišák Emil, prof. Ing., CSc.	Lviv Polytechnic National University, Lviv, Ukraine University of Technology Lublin, Lublin, Poland Rzeszow University of Technology, Rzeszow, Poland
Majerníková Janka, doc. Ing., PhD.	Rzeszow University of Technology, Rzeszow, Poland
Guzanová Anna, doc., Ing., PhD.	Czech Technical University in Prague, Czech Republic Ternopil Ivan Pul'uj National Technical University, Ukraine
Draganovská Dagmar, doc. Ing., PhD.	Czech Technical University in Prague, Czech Republic Ternopil Ivan Pul'uj National Technical University, Ukraine
Brezinová Janette, prof. Ing., PhD.	Czech Technical University in Prague, Czech Republic Ternopil Ivan Pul'uj National Technical University, Ukraine
Vrabel' Marek, Ing., PhD.	Óbuda University, Budapest, Hungary Cracow University of Technology, Poland Vienna University of Technology, Austria St. Cyril and Methodius University, Macedonia University of Novi Sad, Serbia University of Miskolc, Miskolc, Hungary Otto von Guericke University, Magdeburg, Germany
Kottfer Daniel, doc. Ing., PhD.	Cracow University of Technology, Poland

VISITS OF STAFF MEMBERS FROM FOREIGN INSTITUTIONS

Employees and students	Country
Mucha Jacek	Rzeszow University of Technology, Poland
Arkadiusz Belcarz	Lublin University of Technology, Lublin, Poland
Jachowicz Tomasz	Lublin University of Technology, Lublin, Poland
Klepka Tomasz	Lublin University of Technology, Lublin, Poland
Michalak Magdalena	Lublin University of Technology, Lublin, Poland
Tor-Swiatek Aneta	Lublin University of Technology, Lublin, Poland
Garbacz Tomasz	Lublin University of Technology, Lublin, Poland
Kurowski Pawel	Lublin University of Technology, Lublin, Poland
Lobejko Piotr	Lublin University of Technology, Lublin, Poland

Kurzep Szymon

Lublin University of Technology, Lublin, Poland

Wójtowics Ilona

Lublin University of Technology, Lublin, Poland

Drzymala Radoslaw

Lublin University of Technology, Lublin, Poland

Biaduń Paulina

Lublin University of Technology, Lublin, Poland

Szpakowska Monika

Lublin University of Technology, Lublin, Poland

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

International Deep - Drawing Research Group

Emil Spišák, prof. Ing., CSc.

Journal Tribologia (PL)

Eva Zdravecká, prof. Ing., CSc.

Advances in Science and Technology Research Journal

Emil Spišák, prof. Ing., CSc.

Association of Corrosion Engineers

Janette Brezinová, prof. Ing. PhD.

MEMBERSHIP IN SLOVAK PROFESSIONAL ORGANISATIONS

Slovak Metal Science Society

Janette Brezinová, prof. Ing., PhD.

Ján Viňáš, doc. Ing., PhD.

Anna Guzanová, doc. Ing., PhD.

Slovak Welding Society

Ján Viňáš, doc. Ing., PhD.

Slovak Society for Surface Treatment

Dagmar Draganovská, doc. Ing., PhD.

Slovak Association of Mechanical Engineers

Emil Spišák, prof. Ing., CSc.

Slovak Association for Tribology and Tribotechnology

Eva Zdravecká, prof. Ing., CSc.

PUBLICATIONS

Books

- [1] BREZINOVÁ, Janette - VIŇÁŠ, Ján - MARUSCHAK, Pavlo O. - GUZANOVÁ, Anna - DRAGANOVSKÁ, Dagmar - VRABEL', Marek: **Sustainable renovation within metallurgical production.** - 1. vyd - Lüdenscheid : RAM - Verlag - 2017. - 215 p.. - ISBN 978-3-942303-58-3

- [2] KOTTFER, Daniel: **Funkčné povlaky na vnútorných valcových plochách.** 1. vyd - Košice : TU, SJF - 2017. - 96 s.. - ISBN 978-80-553-3175-1.

- [3] TKÁČOVÁ, Jana: **Vybrané konvenčné a nekonvenčné strojárské technológie.** 1. vyd - Košice : TU - 2017. - 183 s.. - ISBN 978-80-553-3114-0.

Journals

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- [2] GUZANOVÁ, Anna - IŽARÍKOVÁ, Gabriela - BREZINOVÁ, Janette - ŽIVČÁK, Jozef - DRAGANOVSKÁ, Dagmar - HUDÁK, Radovan: **Influence of build orientation, heat treatment, and laser power on the hardness of Ti6Al4V manufactured using the DMLS process**. Metals. Vol. 7, no. 8 (2017), p. 1-17. - ISSN 2075-4701.
- [3] ZDRAVECKÁ, Eva - SLOTA, Ján - SOLFRONK, Pavel - KOLNEROVÁ, Michaela: **Evaluation of the effect of different plasma-nitriding parameters on the properties**. Journal of Materials Engineering and Performance. Vol. 26, no. 7 (2017), p. 3588-3596. - ISSN 1059-9495.
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- [5] LANDOVÁ, Mariana - BREZINOVÁ, Janette: **Effect of tribological conditions for properties thermal spraying**. Production Engineering Archives. Vol. 14 (2017), p. 37-39. - ISSN 2353-5156.
- [6] EVIN, Emil - TKÁČOVÁ, Jana - LENGYEL, Zoltán - VIDAŠIČ, Alexander: **Design of modernization of control valves for the counter-bending forces regulation in finishing mill**. Journal of Achievements in Materials and Manufacturing Engineering. Vol. 80, no. 2 (2017), p. 56-64. - ISSN 1734-8412.
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- [10] MAJERNÍKOVÁ, Janka - SPIŠÁK, Emil - MULIDRÁN, Peter: **Thin steel sheets – Most widely used material in packaging industry**. The International Journal of Engineering and Science. Vol. 6, no. 12 (2017), p. 56-61. - ISSN 2319-1813.
- [11] SLEZIAK, Tomáš - SPIŠÁK, Emil - MAJERNÍKOVÁ, Janka - MULIDRÁN, Peter - GREŠ, Miroslav: **Using of Coating in Shearing Processes**. The International Journal of Engineering and Science. Vol. 6, no. 12 (2017), p. 55-63. - ISSN 2319-1813.
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Department of Automotive Production



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Staff

- | | |
|----------------------|------------|
| • Professors: | 2 |
| • Assoc. Professors: | 1 |
| • Assist. Professors | 4 |
| • Researchers: | |
| • PhD. Students: | 1 external |

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Bachelor's degree:

- Automotive Production

Master's degree:

- Automobile Production
- Plastics Processing

Number of the students

in academic year 2016/2017:

Bachelor's study:

first year of study:

- 95 internal form of study Automotive Production

second year of study:

- 37 students in the internal form of bachelor study Automotive Production

third year of study:

- 45 students in the internal form of bachelor study Automotive Production

Master's study:

first year of study:

- 28 internal form of study Automotive Production
- 8 internal form of study Plastics Processing

second year of study:

- 19 internal form of study Automotive Production
- 17 internal form of study Plastics Processing

PhD. degree:

- 1 PhD. student is in the external form of study

in academic year 2017/2018:

Bachelor's study:

first year of study:

- 46 internal form of study Automotive Production

second year of study:

- 69 internal form of study Automotive Production

third year of study:

- 41 internal form of study Automotive Production

Master's study:

first year of study:

- 18 internal form of study Automotive Production

second year of study:

- 28 internal form of study Automotive Production
- 8 internal form of study Plastics Processing

Number of the graduates (2016/2017)

on the study programs guaranteed by the department:

- **19** students in the internal form of engineering study Automotive Production
- **17** students in the internal form of engineering study Plastic Processing
- **39** students in the in the internal form of bachelor study Automotive Production

GRADUATE PROFILE

BACHELOR'S PROGRAMS (Bc.)

Automotive Production

Graduate is able to design and project production processes and production sequence of components, assemblies and testing of automotive aggregates and automobiles. He is able to cooperate with innovation propositions of automotive components and work on rationalizing projects. Is also able to cooperate on manufacturing places planning, and insuring their managing with the intention of productivity, quality, environmental and safety characteristics.

Graduate is able to organize material and information flows in the supply networks of automotive industry. He has control over techniques of informative technologies applications in the production preparation, planning, production management and testing.

He has control over techniques of laboratory works and experiments of project managing. Graduate can apply in the sphere of technological preparation, production planning, projection of automotive components and aggregates, testing and in the service favours. He can apply in the sphere of services connected with automotive industry, in service and consultant companies and also as small entrepreneur.

MASTER'S PROGRAMS (Ing.)

Automotive Production

Educational program Automotive Production is intended for preparation of engineers with focus on mechanical engineering for production new products, designing of production processes and managing automobile manufacturing and their components. Graduate has knowledge and ability of using them to the technologies of manufacturing components, assembling aggregates and their testing, production technique and structure of manufacturing workplace, logistician and organization of supply chains of automotive industry. Content of study program is realized through education in such way, that theoretical, research, special and applied knowledge throughout innovation trends of automotive production were to be provided. Graduate have knowledge onto production of new and innovated products primarily technology of computer aided design and engineering, virtual reality, production of prototypes and theirs testing. They have knowledge about methods of slip and agile production and about implementation of high tech. A part of graduate profile is also knowledge of foreign language and adequate attainments from economies, management, environmental direction and safeness of systems. Graduation have additional accomplishment on basis of which, they are able to work in team with other professions participated on securing of production (marketing, service trades, logistics, etc.). Graduate have application in wide spectrum of professions of automotive production, at researchers and developments centers of automotive producers and supplier's of aggregate and components, in the units of preparation of production just how designers of production processes and systems. Graduate works in positions of production engineers able to insure quality and effectiveness of production and its continual innovation.

Plastics Processing

Study program "Plastic Processing" is implemented within the field of study "Production Technologies", in line with the actual trends of development plastics based component base. Graduate obtains complete second-level degree in plastics processing. Graduate will gain following skills: applying of the acquired theoretical knowledge about the composition, structure and performance of plastics in their processing by the design of the product, ability to not only solve the current problems in the application of plastics in various applications but specifically will also guarantee their technological processing with a guarantee of reliability especially mechanical as well as other specific characteristics in real assemblies. Gained skills of graduate provide him a deep knowledge of manufacturing technologies for plastics processing and enable to manage teams of workers in this area alone lead even large projects and take responsibility for complex solutions. Graduate will gain experience with hypothesis formulation, experimental design, testing hypotheses and data analysing. He will be able of creative and systematic

analysis approach and synthesis technology systems and processes, on the other hand, access to analysis and synthesis derived from mathematical and physical description of the individual functional blocks of these systems, subsequently verified by experiments on real objects capable of analysing the mechanical properties of the system in terms of management principles its movement to the creation of the system hardware and software control system.

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

Bachelor degree:

Innovations of Processes and Products
Delivery Systems in Automobile Production
Technologies of Automobile Production
Design of Tools, Fixtures and Machines in Mechanical Engineering
Projection of automotive workstations and workshops
Testing in Automobile Production
Fundamentals of Engineering Materials
Design of Tools, Fixtures and Machines in Mechanical Engineering
Design of tools, fixtures and machines for mechanical manufacturing
Design of Fixtures

Laboratory project
Production Design
Small business II
Automotive Operation and Maintenance
Innovations in Automotive Manufacturing
Testing of automobile and components
Research and Development Management
Strategic Planning
Automobile Design
Automotive Manufacturing Management
Design of Automotive Production
Innovations in Automotive Manufacturing
Technology of Automotive Production
CA Methods in Technological Processes I.
CA Methods in Technological Processes II.
Diploma Project
The Design of Plastic Mouldings (CAD)
Computer Design of Dies and Tools
Semestral project
Machines and tools for plastics processing I
Machines and tools for plastics processing II

Master degree:

Automotive Manufacturing Management
CAx Technologies in Preparation and Management of Production
Small business I
Technical Creativity
Automotive Supply Chain Management

GRADUATE THESES

BACHELOR THESES:

Automotive Production

Astaloš Marek	Overview of surface defects of automotive plastic parts
Balla Miroslav	Proposal for a vehicle steering Shell Eco Marathon 2017
Béreš Matúš	Design of the stand for modelling a frontal impact of the vehicle
Debnárik Michal	Innovative solutions for maintenance and services in the field of automobile production
Drábik Jozef	The use of thermoplastics in automotive construction
Duchnovská Jana	Design of vehicle body Shell Eco Marathon 2017
Dzvonik Ján	Methods and tools for managing innovation
Džurňák Ladislav	Design of stand for the fatigue tests
Forrai Maroš	Analysis of materials used for car body components
Fotta Benedikt	Design and construction of chassis bracing

Fuchs Pavol	The innovativeness of the Slovak Republic
Gaduš Martin	The analysis of reducing of soluble residues of compressor NT packaging after its welding line
Hanečák Ľubomír	Stress and deformation analysis of beam with holes by using experimental methods of mechanics
Horizral Jakub	Analysis of gearboxes fitted to passenger cars
Hornák Martin	Analysis of product family assembly process in LEANLAB laboratory
Jačisko Denis	Proposal of mobile module workstation for manual assembly
Janák Milan	Design of RC car body model in SolidWorks
Karkus Rómeo-Oliver	Design of intelligent gripper
Kázmér Tomáš	Application of product family 3D models in the assembly design process
Kovács Bálint	Impact of Industry 4.0 on Enterprises
Kupec František	Computer aided of car design process
Lučivjanský Martin	Design of a prototype of the automotive component using 3D printing
Maleš Peter	Small wheel motorcycle with electric drive
Mezei Ján	Rationalization of work processes in automotive industry
Mikolaj Pavol	Ergonomic analysis of workplace in the area of automotive components
Moro Róbert	Utilization of micro-forming in the automotive industry
Paluv Peter	Optimization of production processes in terms of lean production
Pelle Szilárd	Impact of the industrial revolution on development of the automotive industry
Rapáč Samuel Krištof	Analysis of composite materials machining for the automotive industry
Sailer Henrich	Usage of photovoltaic systems in passenger cars
Sirý Šimon	Technology of connecting body panels for the car body production
Stromp Richard	Innovation technological tooling purpose cars
Tarasseková Michaela	Bioplastics, their processing and utilization in the automotive industry
Timanik Vladislav	CAD model of chosen component creation
Turzák Tomáš	Workplace design in the environment of the selected software application
Vojtila Ľuboš	Analytical study of machining methods for automotive components production
Zimmermann Lukáš	Analysis of the lifetime of vehicle autobodies
Zimnikoval Martin	Application of CAD modelling in changing the design of automotive component
Žihlavič Matúš	Product and production design laboratory for industry 4.0

MASTER'S THESES:

Automotive Production

Barto Michal	Analysis of technical and economic efficiency of electric vehicles operation.
Ceheľský Marek	Creating a digital model of production facility in the context of Digital Manufacturing
Duračka Ľuboš	Proposal sports pedal box

Fusek Marián	Proposal of assistance system for laboratory LEANLAB
Halčín Viktor	Application of work analysis techniques to increase workplace productivity
Jancura Pavol	Head rest adjustable mechanism design build into small installation spaces.
Kožuško Dominik	Production of monocoque component from composite materials
Mišenčík Tomáš	Design of aid tool to facilitate embarkation to automobile for people with reduced mobility
Mitro Ladislav	Rapid duplication of components with use of ultralight composites
Mížák Rudolf	Design and production of split molds for composite parts
Nalevanko Maroš	Analysis and modification of riveting workstation
Pello Marko	The application of composite parts for the motorcycle body
Růža Juraj	The application of composite materials in the construction of experimental vehicles
Sabo Matúš	Principles analysis of the concept of intelligent manufacturing in automobile industry
Skalský Marek	Surface treatment of composite body on experimental vehicles
Tkáč Jozef	Design of stand for modelling of bend loading of thin-walled autobody components
Vahalec Ján	Design of technical solutions exhaustion of device in the automobile industry
Zvolánek Maroš	Evaluation of manual assembly workstation parameters
Župčan Viktor	Assembly workstation design in automotive industry

Plastics processing

Auer Jakub	Influence of injection molding technological parameters on shrinkage of PA matrix composite
Bazyláková Lucia	The water absorption of the thermoplastic composites
Danko Michal	Design of technology of production of plastic parts for scale model cars
Demčáková Adriana	Testing of plastics for exterior passenger cars at the Institute of Technology and Management
Hanyus Dominik	Production of relief maps - design technology
Kalapáč Peter	Plastic recycling as a possibility of waste decreasing
Kalís Ján	Analysis of critical parameters for the stabilization of the molding process, plastics
Kmecová Miroslava	Influence of the amount of regrind on the properties of engineering plastics
Koczurová Perla	Wear of automotive components from thermoplastics
Mráz Jozef	Proposal technology of plastic stopper on a bottle
Repčáková Martina	Inject metal parts with plastic - design technology
Rímsky Daniel	Design of technology Glass Packaging Materials - Parizon
Straka Lukáš	Proposal producing plastic components for the automobile
Štovčík Tomáš	Design Production collection container for used oil car
Tkáčová Dominika	Analysis of mechanical resistance of welded PVC foils after degradation
Vozarský Rastislav	Influence of environment on the properties change of coated sheets
Žipaj Pavol	Optimization of the mold typing standards at injection molds at LPH Vranov n / Topľou Ltd.

PhD. THESES:**Marek Výrostek**

Study of tribological properties of contact surfaces coated dies

RESEARCH AT THE DEPARTMENT**The research activities focus on:**

- ✓ Techniques for the development of automotive components (reverse and simultaneous engineering,
- ✓ DFX methods - design for manufacturing, assembly, disassembly,
- ✓ Innovations in design and control of automobile production (methodology of innovative projects, the implementation of lean manufacturing and agile manufacturing, supply network management)
- ✓ Components and manufacturing processes for automotive production based on advanced materials, application of ultra-light materials.
- ✓ Support of ultra-light car component innovations aimed at reducing of car weight and emissions.
- ✓ Concept design of ultralight vehicles and vehicles using alternative energy sources.
- ✓ Prediction of safety characteristics for ultra-light and thin-walled automotive components

PROJECTS OF THE DEPARTMENT**NATIONAL PROJECTS**

Title of the project	Supporting innovations of autobody components from the steel sheet blanks oriented to the safety, the ecology and the car weight reduction
	SIASEW
Type of the project	Grant project APVV
Number of the project	APVV – 0273 – 12
Principal investigator	prof. Ing. Emil Evin, CSc.
Time period of the project	2013 – 2017
Annotation of the project	The key aim of the project is supporting the activity of designers and product engineers in the phase of production preparation of automobile components from tailored blanks, focused on the abatement of emissions in production and car traffic by decreasing the weight of particular components of car body. The ambition of project is the implementation of scientific knowledge obtained from numerical and experimental methods to the proposals of modified standard procedure of validation of the virtual methods. The numerical methods in combination with the experimental methods present very strong tool for supporting the activity of designers and product engineers and allow reacting more effectively to the changes in the technological process, allow decreasing the experimental works, which lead to increasing quality, reliability and competitiveness of the firms that are producing components of automobiles from tailored blanks. The accuracy and reliability of prediction of simulation results depends on the accuracy of material model, accuracy and completeness of material data.

On the base of results of experimental and virtual tests, prediction models of index of functionality, formability and weldability will be proposed. A model of multi-criteria optimization of working properties of the components, which will lead to the increasing of competence of engineers in process of innovation, proposal and production of new components of car bodies, will be proposed.

Title of the project	Laser welding parameters influence on the structure and properties of welded joints of advanced steels for the automotive industry
Type of the project	Grant project VEGA
Number of the project	VEGA 2/0113/16
Principal investigator	prof. Ing. Emil Evin, CSc.
Time period of the project	2016 – 2018
Annotation of the project	The project is focused on prediction of laser welded joint behaviour at different strain rates. Mentioned simulated the real crash tests by creating new and cost-efficient test methods available in the laboratory. The strength and deformation properties of high-strength steel sheets, laser welded tailored blanks and composites will be investigated by tensile, 3-point bending and cyclic bending tests. The measured characteristics of these materials will be compared with the characteristics of progressive materials such as aluminium alloys and composites. The thermodynamic calculations will be performed before welding in order to predict phase composition of polycomponent welds depending on welding conditions (power, welding rate and focus position). To reach the objectives the method of design of experiment, experimental tests and numerical simulations based on finite elements method will be used.

Title of the project	Research of the active surface preparation for advanced tooling produced by CNC form milling
Type of the project	Grant project VEGA
Number of the project	1/0360/15
Principal investigator	prof. Ing. František Greškovič, CSc.
Time period of the project	2015 - 2017
Annotation of the project	Project is aimed on the active surfaces preparation for the forming tools which determine shaping of the raw product into final product. Active surface preparation is associated with elements of tools being used in sheet forming and plastic moulding wherein active surfaces with minimum deviation in surface texture of two directions are needed. Active surfaces in tooling being nowadays produced in 3 or 5 axis milling and they include form or relief shaped parts. Objective of active surface preparation is to reduce finishing operations in tool-making. Preparation of active surfaces includes procedures, combining and programming of the tool path overlapping in 3 axis milling. A part of the project is analysis and programming of the variable engagement of

milling cutters in 3 axis milling as well as influence of the effective diameters in milling. Expected result is methodology and verifying of procedures of preparing active surfaces to reduce friction in sheet forming and improve flow of plastics in moulding.

Title of the project	Conference about Industry 4.0 in the automotive industry
Type of the project	Visegrad fund
Number of the project	21640389
Principal investigator	Budapest University of Technology and Economics (Hungary) as the main partner, - Tomas Bata University in Zlín (Czech Republic), - University of Green Mountain (Poland), - Technical University of Košice (Slovak Republic). - prof. Ing. Emil Evin, CSc.
Time period of the project	2017
Annotation of the project	The automotive industry has great importance for the Central European region. At present, the automotive industry is increasingly determined by the trend referred as INDUSTRY 4.0. In addition, this trend is a challenge for the automotive industry, and it is also a challenge faced by universities. INDUSTRY 4.0 is itself a very complex topic of education and therefore cooperation between universities is inevitable. The main goal of the project is to gather and share knowledge and experience about current praxis in INDUSTRY 4.0. Another goal is development of education module for Industry 4.0 for the participating universities, so that new graduates can start their career in the automotive industry with experience in Industry 4.0.

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Department of Computer Aided Engineering Production



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Staff

- | | |
|----------------------|---|
| • Professors: | 2 |
| • Assoc. Professors: | 3 |
| • Assist. Professors | 1 |
| • PhD. Students: | 3 |

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2017
04/2017	Certification 10 students Ing. PPSV : CSWA - Solidworks
5/2017	Seminar for students – Possibilities of chaining analyzes with the transfer of results from simulation of forming to welding simulation -Pavel Hurnik
10/2017	Seminar for students – Importance of simulation when developing a new product-Ing. Miroslav Kollár (SimulPlast s.r.o.)
11/2017	Seminar for students – Preparation and application of diamond coatings – Ing. Marian Vojsa, PhD.

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Bachelor's degree:

- **Computer Aided Manufacturing Technology**

PhD. degree:

- **Mechanical Engineering Technologies and Materials**

Master's degree:

- **Computer Aided Manufacturing Technology**

Number of the students (till 30.10. 2016)
on the study programs guaranteed by the department:

- first year of bachelor study: 33
- second year of bachelor study: 30
- first year of engineer study: 24
- second year of engineer study: 26

Number of the graduates (2016/2017)
on the study programs guaranteed by the department:

- 27 students in the form of engineering study

GRADUATE PROFILE

BACHELOR'S PROGRAMS (Bc.)

Computer Aided Manufacturing Technology

Graduate of bachelor student program Computer Aided Manufacturing Technology is able to solve problems related with introducing and running of production – technological systems. Graduates have knowledge about production technologies (machining, forming, welding, surface treatment, assembly, transporting and logistics, materials, machines tools, facilities of operational and interoperable manipulation and transport, control of production processes). Mentioned special accomplishments have expanded of knowledge from computing techniques, CA systems and CA technologies used by the preparation and production management. Graduates have additional accomplishments on the basis of which they are able to communicate with others professions and elements participated on ensuring of production (management, construction, supplying, etc.)

Graduates have ability to assert the implementation and controlling of production – technological systems just how technologist. They have knowledge necessary to ensuring intelligent operation and solving non - standard situation which comes into being by working. They also have sufficient knowledge to projecting integrated parts of production progress.

MASTER'S PROGRAMS (Ing.)

Computer Aided Manufacturing Technology

Graduate of educational program acquire knowledge connected with development of production technologies as well as knowledge needs to use new engineering materials in the mechanical engineering production. In this program, accent is put on connection of management and production technology in the modern structure of industry as well as encompassment of informative bindings at production systems. Graduate are able to work with PC techniques and her applications in the area of CAD/CAM/CAE with production planning (CAPP), in modeling, simulating and optimizing of technological processes, in creation of technologically oriented databases, in managements of engineers information etc. Acquired attainments enable graduates wide range of application in technological specializations of manufacturing, in area of using computing techniques, in the automation of engineering activities at production. Graduates are characterized by adaptability and flexibility towards condition changing in area of production practice.

PhD. PROGRAMS (PhD.)

Mechanical Engineering Technologies and Materials

The third degree of university study in field of Mechanical Engineering Technologies and Materials deepens and widens theoretical knowledge from technological discipline from area of metallurgy, progressive technology of non-cutting and splintery processing of metals, automation of technological processes and possibilities of their application in mechanical engineering corporations, with the ecological aspect. Graduate of doctoral study will have application at research – development departments of manufacturing corporations, top level managerial functions, managing of manufacturing departments with sophisticated production technique, institutes of Slovakia's academy of science, on technical universities and on technical high schools.

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

- | | |
|--|--|
| ✓ Application of CAx in Technology | ✓ Engineering Processes Automatization |
| ✓ Bachelor Project | ✓ Laboratory Project |
| ✓ CA Methods | ✓ Measurement and Testing |
| ✓ CA Technologies | ✓ NC Machines Programming |
| ✓ CAD in Manufacturing Technology | ✓ Precise Manufacturing and Nano Technologies |
| ✓ CAD/CAM Systems – Automatization of the Technical Preparation of Manufacturing Process | ✓ Precision and Manufacturing Process Evaluation |
| ✓ CAM Programming in Technical Processes | ✓ Progressive Technologies Theory |
| ✓ Computer Aided Methods in Manufacturing Production | ✓ Semestral Project |
| ✓ Diploma Project | ✓ Technological Information Processing |
| ✓ Diploma Thesis | ✓ Process Monitoring |
| | ✓ Theory of Machining, Tools and Jigs |

GRADUATE THESES

BACHELOR'S THESES:**MASTER'S THESES:**

Baľo Róbert	CNC technologies for production stamping tools
Csala Vojtech	Deep drawn process optimization by using FEA stamping simulation
Durkáč Viktor	CA systems at 3D reliefs production based on 2D schemes
Filakovský Richard	Analysis joining technologies for components manufactured by a method FFF
Fröhlich Lukáš	CAD model of electromotocycle parts for urban transport
Gajdoš Lukáš	Numerical simulation of deep drawing when produce pressings made of thick steel sheets
Gnip Dávid	The analysis of influence of mechanical joining parameters on the quality of joints
Halász Norbert	Design of production process for 5-axis milling of complex part
Halász Štefan	The utilizing of CAE systems for optimization of punch dimension for mechanical joining
Hul'vejová Tatiana	Influence analysis of selected processing parameters on tribological properties of products made by FFF technology
Imrich Ján	NC codes verification when generated by CAM systems
Kachman Bohuš	Influence of welding parameters on the weld nugget size in high-strength materials
Kušnír Tomáš	Design of a vacuum chamber arrangement for the surface treatment of hollow body surfaces by PVD
Leško Maroš	Possibility of joining of combinations of ferrous and nonferrous metals
Mních Dominik	CAD proposal of screw knife feeder for single-purpose machine
Norko Roman	Rapid tooling when produce pre-production forming tools
Ragan Lukáš	Comparison the production of prototypes by conventional and additive technology
Rjaby Tomáš	Monitoring of the tribological characteristics under different conditions of abrasive wear
Rozek Peter	Design and load simulation of the BMX bike
Slavkovský Martin	Design of forming tool by special moduls of CAD/CAM systems
Sobotka Michal	Design of fixtures for plastic part pruction on CNC machine
Straňák Ľubomír	Influence of drawing radius on forming limits of drawn parts from Al alloy
Szoták Daniel	Numerical simulation and experimental verification of Nakazima test on Al alloy
Šariský Jozef	Desing of carrying-traction battery 8Nx8T for single-rope aerial tramway
Štrbková Lenka	CAD/CAM system when designing part production
Tešínský Ján	CAD proposal of industrial screw spindle

RESEARCH AT THE DEPARTMENT**The research activities focus on:**

- ✓ Research into new modern steels in relation to requirements concerning their formability.
- ✓ Research into formability conditions and their influence on the quality and final properties of drawn parts.
- ✓ Verification of the application of progressive technologies in joining of metal materials for automotive industry.

- ✓ The optimization of machining parameters in the production of tools for thin steels and plastics production.
- ✓ Innovation procedures in the technology of machining, evaluation of workability of construction materials and cutting properties of new tool materials, wear resistance coatings on the tools, tool wear and energy intensity during machining.
- ✓ Development of new procedures and methods for production of samples and prototypes using various methods considering specific orientation of product design: conventional machines, rapid prototyping, rapid tooling.

Research characteristics:

Scientific and research activities of the department are diversified according to specializations of the individual department sections. The current personnel structure of the department and its technological equipment allow for comprehensive solutions of material, technological, and designing tasks (in terms of products, tools and fixtures), including modeling, simulations and optimization of process planning and products, their experimental research, laboratory and semi - operational verification of the outcomes. The department offers the solutions in the area of metal and plastic forming, joining of materials, surface treatment of materials, machining of metal and non - metal materials, innovations of production and rapid prototyping.

PROJECTS OF THE DEPARTMENT

Title of the project	Integration of Nanometrological Proces into Quality Assessment for Small Diameter of End Mill Cutters
Type of the project	Grant Project APVV
Number of the project	APVV SK_AT_2015-0020
Principal investigator	prof. Ing. Ildikó Maňková, CSc.
Time period of the project	2016-2017
Annotation of the project	The proposed project is aimed at the mutual use of human resources, laboratory equipment, and special equipment for research, development and application of nanometrological process for management, control and quality assessment of small diameters end mill cutters. The research activities of the project are focused on use of micro- and nanometrological procedures for assessment of cutting tool edge and surface microgeometry when micromilling and high speed milling. The project research activities will focus on definition of appropriate measurement procedures and assessment of cutting tool edge from the micro-geometry point of view as edge radii, tool edge sharpness and roughness and their variability during milling process. The experimental study will focused on the mechanism of machined surface formation, changes at active parts of tool edge due to gradual tool wear, identification of inaccuracy of machined surfaces as well as influence of cutting parameters on accuracy and quality of machined surface. Integration of nanometrology into quality assessment for small diameters end milling tools is assumed to be key contribution of project solution. Publishing of scientific results in leading journals worldwide, elaboration of master and PhD theses are expected to be the added value in the project.
Title of the project	Research on Process Dependent Interface when Milling With Small Diameter of End Mill Cutters
Type of the project	Grant Project VEGA
Number of the project	VEGA 1/0434/15
Principal investigator	prof. Ing. Ildikó Maňková, CSc.
Time period of the project	2015-2018
Annotation of the project	Scientific goals of the project are oriented to the investigation of

project accompanying phenomena (tool wear, force, temperature, surface quality) when milling difficult to cut materials (titanium alloy and steels for forming tool) employing cutters with small diameters 1 mm and 2 mm. Research is focused on the process dependent interface between micro-milling and high-speed milling. Project is oriented to the research of cutting tool wear and its identification through monitoring of force and acoustic emission signals. Research activities examine deformation in the cutting process, size effect and ploughing with respect to the surface quality in micro-milling and high speed milling. The output of research determines technological interface of accompanying phenomena and their occurrence in both processes. Stress of project goals are given process monitoring, data processing of sensor signals and determination of direct relationship among tool wear and scanned force and acoustic emission signals in both processes.

Title of the project **Integration of artificial intelligence methods into innovative milling processes**

Type of the project Grant Project APVV

Number of the project SK-SRB-2016-0045

Principal investigator prof. Ing. Ildikó Maňková, CSc.

Time period of the project 2017-2018

Annotation of the project The proposed project is focused on the mutual use of human resources, laboratory equipment, and special equipments and software for implementation of artificial intelligence methods as well as modelling and simulation in the research on process dependent interface when micro-milling and high speed milling with small diameters end mill cutters. Research is focused to the identification of process dependent interface between micro-milling and high-speed milling and to the effect of mechanical and thermal load of cutting tool on tool wear and its identification through monitoring of force components signals. Research activities examine deformation in the cutting process, size effect and ploughing with respect to the surface quality in micro-milling and high speed milling. Project aim is to apply and verify methods of artificial intelligence – neural network, fuzzy logic and generic algorithm – for prediction of tool wear and machined surface quality using data acquired from experimental trials as well as from simulation processes. Stress of the project goals is given by integration of experimental trials, numerical modelling and artificial intelligence implementation to the innovative milling processes. Publishing of scientific results in leading journals worldwide, elaboration of master and PhD theses are expected to be the added value in the project. Another expected outcome is focused on preparation of joint international research project.

Title of the project **Research of the active surface preparation for advanced tooling by CNC free form milling**

Type of the project DAAD PPP project

Number of the project prof. Ing. Ildikó Maňková, CSc.

Principal investigator 2017/2018

Time period of the project Proposed project is of experimental art, its aim is to prepare active form surfaces for tooling, which control material forming process when sheet forming and moulding of plastics. Active form surfaces for tooling are to prepare when 3 axis milling. In such a process, tool path programming and advanced end ball cutters and combining of milling strategy are to apply. Progress of project considers following scientific objectives:

Annotation of the project To define, establish and verify preparation of surfaces on active form parts of tooling while aim of preparation of active form parts is to reduce needs

Title of the project Type of project Number of the project Principal investigator Time period of the project Annotation of the project	of applying additional finishing operations in tool-making. To propose and verify, programming procedures of the precision milling of the active form surfaces. To express relationship, and sequences among roughness parameters of active surfaces in two directions Advances in Machining - Innovation Procedures for Joint Education and Research, Part 2 CEEPUS Project SK-0067-11-1516 prof. Ing. Ildikó Maňková, CSc. 2006-2017
Title of the project Type of project Number of the project Principal investigator Time period of the project Annotation of the project	The Network SK 0067 had started its activities since September 2005. All partners included to the network (Technical University of Kosice (TUK), Faculty of Mechanical Engineering, Institute of Technology and materials , Vienna University of Technology (TUW), Institut für Fertigungstechnik, Department for Interchangeable Manufacturing and Industrial Metrology, Tomas Bata University in Zlín (TBUZ), Faculty of Technology in Zlín, University of Miskolc (UM), Faculty of Mechanical Engineering, Institute of Production Technology, Cracow University of Technology (CUT), Faculty of Mechanical Engineering, Production Engineering Institute, Obuda University Budapest (OBU), Banki Donat Faculty of Mechanical Engineering and Safety, Institute of Material Science and Manufacturing Technology, University " Sv. Kiril i Metodij"-Skopje, (UKMS) Faculty of Mechanical Engineering, University of Novi Sad (UNS) Faculty of Technical Science, Institute of Production Engineering) have confirmed yearly their willingness to cooperate and all have endeavoured to fulfil objectives stated in project with larger or smaller success. Universities included in this project have long term cooperation each to other on various levels (education, research, personal contact). Competency based education within CNC programming KEGA Project 070TUK-4/2017 prof. Ing. Ildikó Maňková, CSc. 2017 Main feature of the proposed project is integration of the teaching/education with Industrial surroundings of the CNC technology and that can be referred to as modern concept of the Teaching Factory. Such a project combines the progress of the e-learning with presentation forms of teaching to gain practice skills and programming capability. In order to combine capabilities in teaching with that of programming, the definition of industrial need is expected when developing curricula of combined training for CNC technology. In order to carry out implementation of the principles/fundamentals of CNC technology into courses and curricula, know-how of two universities from abroad will be used in solving of this project. Proposed project is assumed to reduce training costs in education of the advanced programming. The certification of the courses/curricula for integrated teaching in CNC technology is also assumed in order to facilitate trained persons at the labour market. Development of the on-line server approaches the concept of integrated teaching for students and practitioners, therefore, project results become an important tool of knowledge based economics.
Title of the project Type of project Number of the project Principal investigator Time period of the project Annotation of the project	Innovation of educational process in education of CAD/CAM/CAE systems using computational cluster GRID KEGA Project 065 TUK-4/2017 doc. Ing. Ľuboš Kaščák, PhD. 2017 The aim of the project is the implementation of the learning system using

project	multimedia for improving the process of teaching subjects in computer aided engineering technologies. The practical outcome of the project will be the creation of adaptive educational web portal for 1st and 2nd degree of college study in daily as well as in external form . The portal will include multimedia textbooks for CAD/CAM/CAE systems including hypertext and video combination of components modelling procedures, creation of assemblies and simulation of machining, forming, welding and injection molding. The portal will also include the tasks and tests for self-assessment students, educational materials for the diagnosis of students' knowledge. As part of the project will be establishment of classroom for teaching CAD/CAM/CAE systems. For complex numerical calculations, the parallel or distributed computing based on GRID technology using supercomputers will be used. The output of the project will be extendable multimedia textbooks, able to be adjusted according to the current software version of CAD / CAM / CAE systems.
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VISITS OF STAFF MEMBERS TO FOREIGN INSTITUTIONS

Employees and students	Country
Ildikó Maňková, prof., Ing., CSc.	Vienna University of Technology, Vienna, Austria Obuda University, Budapest, Hungary Cracow University of Technology, Cracow, Poland Otto von Guericke University Magdeburg Tomas Bata University in Zlín, Czech republic
Ján Slota, doc. Ing., PhD.	Politechnika Swietokrzyska, Kielce, Poland
Ľuboš Kaščák, doc., Ing., PhD.	Politechnika Rzeszowska, Rzeszów, Poland Politechnika Lubelska, Lublin, Poland
Ivan Gajdoš, Ing., PhD.	Politechnika Swietokrzyska, Kielce, Poland
Mária Franková, Ing.	Cracow University of Technology, Cracow, Poland Tomas Bata University in Zlín, Czech republic
Marek Šiser, Ing.	Brno University of Technology, Czech republic
René Kubík, Ing.	Brno University of Technology, Czech republic

VISITS OF STAFF MEMBERS FROM FOREIGN INSTITUTIONS

Employees and students	Country
prof. Numan Durakbasa	Vienna University of Technology, Vienna, Austria
prof. DrSc. Kundrák János	University Miskolc, Miskolc, Hungary
Ing. Jitka Baďurová, CSc.	Tomáš Baťa University, Zlín, Czech Republic
doc. Dr. Ing. Vladimír Pata	Tomáš Baťa University, Zlín, Czech Republic
Doc. Dr. – Ing. Mikó Balázs	Obuda University, Budapest, Hungary
Doc. Dr.- Ing. Agota Dregelyi-Kiss	Obuda University, Budapest, Hungary
Dr. Ing. Richard Hovath	Obuda University, Budapest, Hungary
prof. Dr. Pavel Kovac	University of Novi Sad, Novi Sad, Serbia
prof. Marin Gostirmovic	University of Novi Sad, Novi Sad, Serbia
Dr. Boris Savkovic	University of Novi Sad, Novi Sad, Serbia
MSc. Dragan Rodic	University of Novi Sad, Novi Sad, Serbia
Dr. Otko Tadeuzs	Cracow University of Technology, Cracow, Poland

prof. Wojciech Zebala	Cracow University of Technology, Cracow, Poland
Ksenia Rumian	Cracow University of Technology, Cracow, Poland
Magdalena Machno	Cracow University of Technology, Cracow, Poland
Jozsef Nyers	Cracow University of Technology, Cracow, Poland
Dr.-Ing. Thomas Emmer	Otto von Guericke University, Magdeburg, Germany
Dr.-Ing Florian Welzel	Otto von Guericke University, Magdeburg, Germany
Tung Manh Dan	Otto von Guericke University, Magdeburg, Germany
M. Sc. Fabian Laufer	Otto von Guericke University, Magdeburg, Germany
Dmytro Borysenko, M.Sc.	Otto von Guericke University, Magdeburg, Germany

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

International Deep - Drawing Research Group

Ján Slota, doc. Ing., PhD.

Society of Plastic Engineers

Ivan Gajdoš, Ing., PhD.

Institute of Research Engineers and Doctors

Ivan Gajdoš, Ing., PhD.

PUBLICATIONS

Textbooks

polyethylene modified with natural fillers. In: Advances in Science and Technology Research Journal. Vol. 11, no. 4 (2017), p. 35-40. - ISSN 2299-8624

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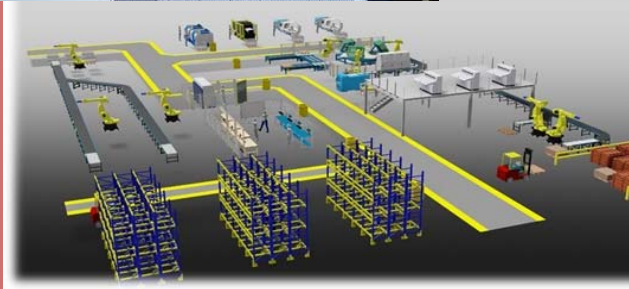
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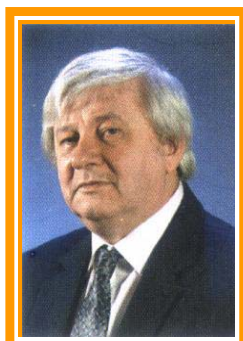


INSTITUTE OF MANAGEMENT, INDUSTRIAL AND DIGITAL ENGINEERING





Institute of Management, Industrial and Digital Engineering



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Staff

- Professors: 3
- Assoc. Professors: 3
- Lectures: 3
- Researchers: 1
- PhD Students: 2

Activities at the institute

Date	Title of the event, activity characterizing the life at the Institute in 2017
07/2017	Journal Transfer inovácií 34/2017, 35/2017
12/2017	20th International Scientific Conference Trends and Innovative Approaches in Business Processes, Košice © 2017

EDUCATION AT THE INSTITUTE

STUDY PROGRAMMES

Bachelor's degree:
Industrial Engineering (IE)

Bachelor's degree:
Enterprise Management and Economics (EMaE)

Master's degree:
Industrial Engineering

Doctoral degree:
Industrial Engineering

Number of the students (2017/2018)
on the study programmes guaranteed by the department:

Bachelor's degree:
– 9 internal form of study IE
– 10 internal form of study EMaE

Master's degree:
– 21 internal form of study
– 1 combined form of study

Doctoral degree:
– 2 internal form of study
– 7 external form of study

Number of the graduates (2016/2017)
on the study programmes guaranteed by the department:

Bachelor's degree:
– 0 internal form of study
– 0 combined form of study

Master's degree:
– 10 internal form of study
– 9 external form of study

Doctoral degree:
– 0 internal form of study
– 0 external form of study

GRADUATE PROFILE

BACHELOR PROGRAMMES (Bc.)

Industrial Engineering

The Bachelor of Industrial Engineering programme objective is to help students apply technical, technological, economical and mathematical principles to the design, improvement, and installation of integrated systems comprised of people, material, information, and energy.

Enterprise Management and Economics

The Bachelor of Enterprise Management and Economics programme objective is to gain knowledge in the field of technical and natural science disciplines of management and economics, manufacturing and information technology and business process management.

MASTER PROGRAMMES (MSc., ENG.)

Industrial Engineering

The graduate gains complete university education focused on planning, designing, implementing and managing production systems and also creativity development in engineering projects or processes. The student has deep knowledge of natural sciences, technical, technological disciplines and humanities with expertise in industrial engineering, company management, production management, business economics, theoretical knowledge of operation and system analysis, logistics, personal management, investment, finance, innovation, information management, etc. The graduate is ready, either to continue his/her study in postgraduate degree and develop his/her research career in industrial management, or to enter job market immediately. He/she will successfully perform as a middle or top manager in organisations within various sectors of industry, requiring the synergy of managerial, economical, technical and soft skills and knowledge.

Enterprise Management and Economics – new accredited study program

Graduates of the study program Enterprise Management and Economics obtain full secondary education in the field of Industrial Engineering, will have a deepened knowledge of business management and economics, designing, improving and optimizing business processes, will be able to use modern computer and software resources. Graduates also acquire knowledge in the field of management and industrial engineering, which will enable him / her to manage business projects independently, can analyze, design and apply more complex technical, technological, economic and management solutions and conduct research with a high degree of creativity and autonomy. Students find application in scientific, research, development, projection and production organizations to solve problems of management and economy of the enterprise and of industrial engineering, and they will be ready to study according to the study program of doctoral (third degree) study in the study program Industrial Engineering.

Digital Engineering – new accredited study program

Graduates of the study program Digital Engineering obtain full secondary education in the field of Industrial Engineering, acquires knowledge in the field of digital and industrial engineering, which will enable him/her to manage business projects independently. They also gain competencies to design, implement complex business processes and systems with digital and virtual technologies and systems throughout their value chain, to work on projects of complex engineering processes, systems and plants of the future (to implement Industry 4.0 principles in practice). Students will be able to analyze design, technological, management and other processes in machine-building with the possibility of application to individual branches of engineering; specify, design, implement and maintain comprehensive integrated solutions involving engineering for different applications. They will be capable of managing the processes of technology changes in terms of technology development, adaptation and implementation of progressive engineering activities; working on projects that include problem identification, analysis, design and implementation of extensive engineering processes and systems solutions, along with testing and appropriate documentation, with the application of the individual quality aspects; working efficiently as an individual, as a member and as a team leader; keeping in touch with developments in their discipline with continuous self-education.

DOCTORAL PROGRAMMES (PhD.)

Industrial Engineering

The graduate gains complex university education in Industrial Engineering. He/she has mastered research and development methods of gaining knowledge independently. He/she will be able to develop creative methods in the field of the Industrial Engineering. The graduate will be successful in

the top managerial positions in various types of organisations, consulting companies and universities, in both research and teaching careers.

LIST OF SUBJECTS GUARANTEED BY THE INSTITUTE

Industrial Engineering

- ✓ Basics of Digital and Virtual Technologies
- ✓ Basis of Industrial Engineering
- ✓ Business Strategies
- ✓ Business Controlling
- ✓ Business Economics
- ✓ Business Information System
- ✓ Business Processes and Systems
- ✓ Business Strategy of Small and Middle Sized Enterprises
- ✓ Creation and Management of Innovation Processes
- ✓ Crisis Business Management
- ✓ Database Systems
- ✓ Design and Operation of Production Systems
- ✓ Design of Businesses
- ✓ Design of Production Processes
- ✓ Designing the Engineering Production
- ✓ Digitalization and Virtualization of Production
- ✓ Diploma Work
- ✓ Economic Tools of Business Management
- ✓ Engineering Economics
- ✓ Enterprise Information and Communication Systems
- ✓ Ergonomics, Analysis and Work Measurement
- ✓ Final Bachelor Work
- ✓ General Economics
- ✓ Human Resources Management
- ✓ Industrial Professional Experience
- ✓ Introduction to Management
- ✓ Introduction to Rationalization of Work
- ✓ Laboratory Training
- ✓ Logistics Systems
- ✓ Management of Enterprises
- ✓ Management of Investment Business Development
- ✓ Marketing
- ✓ Modelling and Simulation of Logistic Processes
- ✓ Production Automation
- ✓ Production-practical Experience
- ✓ Production Preparation
- ✓ Project Management
- ✓ Products and Technology Innovation
- ✓ Semestral Project
- ✓ Team Work

Enterprise Management and Economics

- ✓ Controlling Fundamentals
- ✓ Business Fundamentals
- ✓ Design of Engineering Production
- ✓ Enterprise Economics
- ✓ General Economics
- ✓ Human Resources Management
- ✓ Final Bachelor Work
- ✓ Fundamentals Of Digital And Virtual Technologies
- ✓ Informatization And Communication Enterprise Systems
- ✓ Informatization And Digitization Of Enterprises
- ✓ Introduction to Industrial Engineering
- ✓ Knowledge Intensive Services
- ✓ Labor Productivity
- ✓ Logistics Systems
- ✓ Management of Enterprises
- ✓ Management Marketing
- ✓ Management Skills
- ✓ Marketing
- ✓ Production Management
- ✓ Semestral Project
- ✓ System of Economic Information

- ✓ Business Competitiveness
- ✓ Introduction to Management

GRADUATE THESES

BACHELOR'S THESES:

Industrial Engineering

Čarnogurský Zdeno	Coordination of production operations planning in the production of selected products
Dzvonik Ján	Methods and tools for managing innovation
Fuchs Pavol	Innovation capability of the Slovak Republic
Grega Viliam	Innovative managerial methods and techniques in the production management
Kovács Bálint	Impact of Industry 4.0 on Enterprises
Maleš Peter	Three-wheeled utility electric motorcycle
Mezei Ján	Rationalization of work processes in automotive industry
Rakyta Oliver	Increasing of production efficiency in an engineering company
Stromp Richard	Innovation of technological superstructures of special purpose vehicles
Szilard Pelle	Impact of the industrial revolution on development of the automotive industry
Šuk Jaroslav	Utilization of software tool Plant Simulation in the optimization process of order completing
Tillisch Herbert	Measuring the financial performance of an industrial enterprise

Above mentioned Bachelor Students were supervised by the Institute of Management, Industrial and Digital Engineering, and successfully graduated the study programe at Automotive Production and Technology and Innovations of Engineering Production.

MASTERS THESES:

Industrial Engineering

Alexovič Tomáš	Reducing the cost of the production line due to spare parts consumption
Čenger Lukáš	Purpose superstructures of bicycles with electric drive
Dobranský Matej	Creating a simulation model of the material flow of the paint shop in Kia Motors Slovakia, s.r.o. in TX Plant Simulation
Keďuch Dávid	Physical modeling of the prototype center using 3D printing
Mičáková Michaela	Design and management of mechanical engineering buildings
Mičuda Tomáš	Design of prototype workshop variants using CAD systems
Trojan Jozef	Utilization of the possibilities of process digitization in the company's production process
Vavreková Lucia	Controlling costs of an industrial enterprise
Onderčín Michal	Innovative Start-up of Start-up Entrepreneurs
Sviatko Martin	New Approaches to Measuring Business Process Efficiency
Breznániková	Opportunities to increase the competitiveness of a business company

Henrieta

Dudičová Mária Application of the Tecnomatix Jack software tool for optimizing ergonomic solutions

Fraňo Martin Increasing production efficiency at Cutting workplace

Kvašná Veronika Using the Tecnomatix Jack software module in enterprise logistics

Maťaš Miroslav Tools to increase the competitiveness of the water company

Nudzík Peter Innovative business solutions using industry knowledge 4.0

Podracký Michal Application of additive technologies in prototype production of selected product types

Šulák Marek Using the Plant Simulation module in the selected company

Tkáčik Ladislav Capacitive increase in roof window production for the BMW brand (using Lean Theory)

PhD THESES:

Industrial Engineering

RESEARCH AT THE INSTITUTE

Area of research

- Integrated designing of production systems on the physical and virtual modelling base.
- Methods and techniques of experimental modeling of in-plant manufacturing and non-manufacturing processes

PROJECTS OF THE INSTITUTE

Title of the project	New project technologies for the creation and implementation of future factories
Type of the project	VEGA
Number of the project	1/0853/16
Main solutionist	Dr.h.c. mult. prof. Ing. Jozef Mihok, PhD.
Time period of the project	2016-2018
Annotation of the project	The project is focused on research, development and implementation of new projects technologies for the creation and implementation of future factories. For the future factories is characteristic extreme flexibility in adapting to changing market requirements. Within this context are actual ideas, challenges and demands for change in strategy development, innovation and design of new business concepts, production factories, production processes, systems, and the role of human factors in these systems, etc. Reference approaches are particular approaches presented in strategies Industrie 4.0, Cyber-Physische Systeme and Smart Fabrics. Decentralized, flexible, modular and autonomous, sophisticated and automated production systems are necessary to integrate into a well cooperative network of factories and enterprises with significant support of the new management principles. In connection with expected future changes, the project deals with research and development of innovative

methods, processes, techniques and systems.

Title of the project	Controlling innovation of the industrial companies for the sustaining and improving their competitiveness
Type of the project	VEGA
Number of the project	1/0741/16
Main solutionist	doc. Ing. Jaroslava Kádárová, PhD.
Time period of the project	2016-2018
Annotation of the project	A prerequisite for positive structural changes and convergence of the Slovak economy are competitive and successful innovating companies. Innovations increase competitiveness of enterprises in the long term support dynamic growth of their market value. The project aims to assess the economic progress and results of the innovation processes in industrial plants and assessing the impact of innovation on competitiveness of enterprises implementing them. The methodology will be based on strategic and operational controlling methods and tools that support innovation management in the enterprises.
Title of the project	Development of a new research methods for simulation, assessment, evaluation and quantification of advanced methods of production
Type of the project	VEGA
Number of the project	1/0708/16
Main solutionist	prof. Ing. Peter Trebuňa, PhD.
Time period of the project	2016-2019
Annotation of the project	The present project aims to put the application methods of experimental testing and simulation models as well as the development of new methods of examination and analysis of internal processes, the use of new diagnostic methods for the evaluation of advanced techniques. The fundamental aim of the project is to increase the competitiveness of products and production engineering industry, which requires further substantial increase in the educational level to creative research, development and manufacturing in general and graduates of all levels of study of engineering disciplines and preventing adverse situations during the operation and the existence of engineering companies. The above objectives would contribute to averting the development of unexpected situations in the manufacturing sector even before the moment of their creation. This is the main objective of the proposed project and to contribute should the results of basic research into the proposed project-oriented manufacturing sector.
Title of the project	Educational and training workplace of innovative development and implementation of business processes and systems
Type of the project	KEGA
Number of the project	029TUKE-4/2016
Main solutionist	prof. Ing. Jozef Kováč, CSc.
Time period of the project	2016-2018
Annotation of the project	Project is focused on implementation of educational and training center of innovative development and implementation of business processes and systems in terms of the Department of Industrial Engineering and management, in the field of SJJ 5.2.52 Industrial Engineering, degree program in Industrial engineering. The aim of the project is to promote not

only the acquisition of knowledge, innovative thinking but also practical (experiential) basic skills of students of graduate study and external candidates from practice. Training activities focused on the design, optimization and implementation of business processes and systems across the value chain, in real or modelling laboratory and workshop environment is an important development trend of educational processes. The aim of the solution is also expanding the existing theoretical and practical training through the use of new methods.

Title of the project	Implementation of innovative educational approaches and tools to enhance the development of the core competencies graduate study program Industrial Engineering
Type of the project	KEGA
Number of the project	026TUKE-4/2017
Main solutionist	Dr.h.c. mult. prof. Ing. Jozef Mihok, CSc.
Time period of the project	2017-2019
Annotation of the project	On many levels it is currently being debated on the preparedness of graduates for the requirements and needs of the labour market and employers. The project aims at a higher rate to satisfy such requirements and develop key competencies of students in higher education so that graduates gain during the study not only expertise, but also other hard and soft core competencies required by employers. In forming the adjustment of education using innovative educational forms and tools will be based on an analysis of the requirements of employers, graduates, students and teachers.

Title of the project	Implementation of innovative instruments for increasing the quality of higher education in the 5.2.52 Industrial Engineering field of study
Type of the project	KEGA
Number of the project	030TUKE-4/2017
Main solutionist	prof. Ing. Peter Trebuňa, PhD.
Time period of the project	2017-2019
Annotation of the project	The main objective of this project is to increase the attractiveness of study field 5.2.52 Industrial Engineering for current students as well as for industrial practice, seeing that subjects of study field in industrial engineering are needed in company practice. Acquired knowledge is an asset entry of graduates into the real production process. Graduates will get a knowledge and skills in the application of different methodologies and working procedures applied in practice. Corpus of study program is currently relatively unchanged since 2004 by accredited programs of study Faculty of Mechanical Engineering of the Technical University in Kosice. In spite of this, the interest of applicants is increasing. The increasing of attractiveness can be achieved by conceptual changes, respectively by innovative approach to the individual parts in the second and third degree of study through the establishment of subjects useful for current industry practice.

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INSTITUTE OF DESIGN MACHINE AND PROCESS ENGINEERING



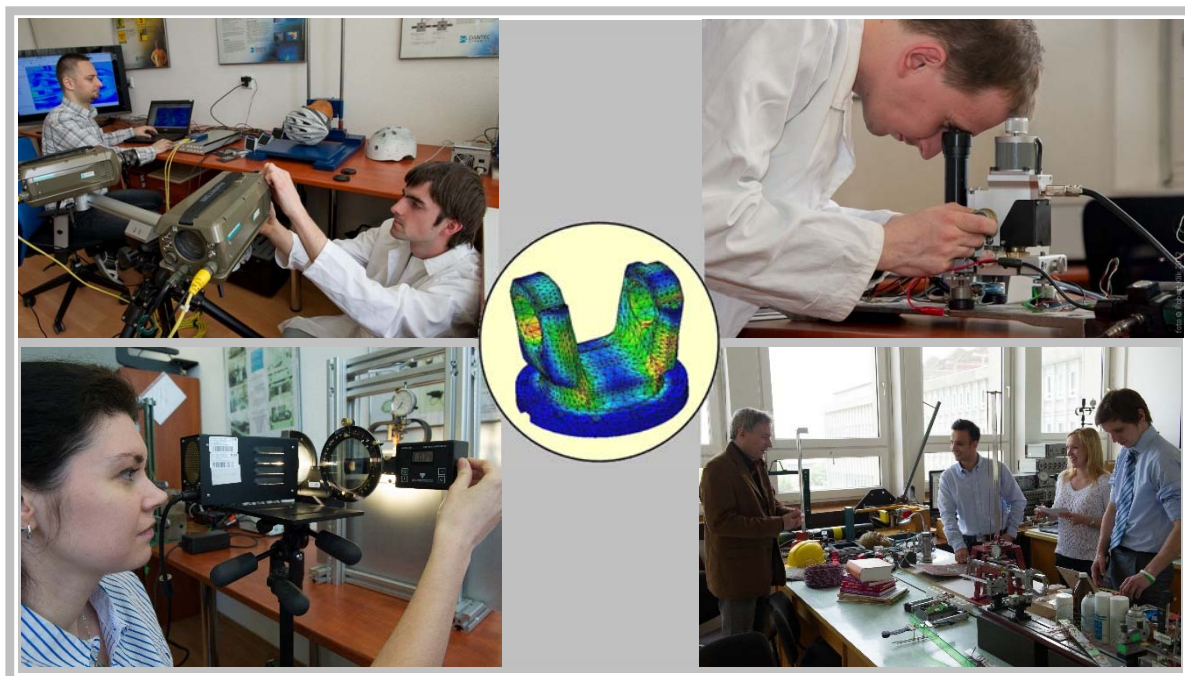
- Department of Applied Mechanics and Mechanical Engineering
- Department of Power Engineering
- Department of Construction, Automotive and Transport Engineering
- Department of Production Systems
- Department of Process and Environmental Engineering

Department of Applied Mechanics and Mechanical Engineering



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Staff

- Professors: **4**
- Assoc. professors: **5**
- Assist. professors: **2**
- Researchers:
- PhD.students: **6 internal, 2 external**

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2017
4/2017	Department's competition of student scientific and technical activities.

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Bachelor's degree:

- Mechanical Engineering

Master's degree:

- Applied Mechanics
- Mechanical Engineering

PhD. degree:

- Applied Mechanics

Number of the students

(till 31.10.2017) on the study programs guaranteed by the department:

first year of bachelor study:

– 45 internal present form of study in Slovak language

– 20 internal present form of study in English language

second year of bachelor study:

– 45 internal present form of study in Slovak language

third year of bachelor study:

– 42 internal present form of study in Slovak language

first year of engineer study:

– 18 internal present form of study in Slovak language

second year of engineer study:

– 19 internal present form of study in Slovak language

first year of PhD. study:

– 2 internal form of study

second year of PhD. study:

– 1 internal form of study

third year of PhD. study:

– 2 internal form of study

– 1 external form of study

fourth year of PhD. study:

– 1 internal form of study

five year of PhD. Study:

– 1 external form of study

Number of the graduates (2017/2018)

on the study programs guaranteed by the department:

– 42 students in the internal form of bachelor study

– 19 students in the internal form of engineering study

– 1 PhD. students in the internal form of study (defended PhD. thesis)

GRADUATE PROFILE

BACHELOR'S PROGRAMS (Bc.)

Mechanical Engineering

Students of this program will obtain knowledge from the theory of the mechanical systems and from their application in computation, constructional and technologic problems. Students will be able to design, develop, implement, expand and operate modern mechanical devices and they can cooperate with managers and specialists from other professions. Students will obtain also theoretic and methodical knowledge from the areas related to the engineering and machines, they will improve their skills in using of the CAD systems, they will introduce the economy rules, organisation and business activities in area of mechanical production. Students will obtain practical experiences, abilities and skills in area of construction and making of documents of the mechanical systems.

MASTER'S PROGRAMS (Ing.)

Mechanical Engineering

Students of this study program will be able to analyze, design, construct, and review large engineering devices and they will be able to provide research with high creativity and self - activity. Students will obtain detailed knowledge from area of the mechanical engineering, which gives them ability to manage work teams in this area. They will be able to self - employed lead of projects and takeover liability for complex solutions. Students will be able to work with using of scientific approaches, because they will have experiences with formulation of hypothesis, with design of experiment, hypothesis verification and analyzing of obtained data.

Applied Mechanics

Students of this study program will have deepened knowledge from area of solid - state mechanics and compliant body mechanics. They will be able to do dynamic and strength analysis of complicated mechanical devices, and they will be able to use modern software, in modelling and simulation process. Obtained knowledge from area of solid state and compliant bodies and environments allows them to self - employed lead of projects in area of mechanical devices development. They will be able to analyze design and construct large engineering solutions including mechanical systems and they will know to provide research with high creativity and self - activity.

PhD. PROGRAMS (PhD.)

Applied mechanics

Study in this program is focused on training of high - specialized scientist for research, development and practise in all disciplines and workplaces, where is applied scientific knowledge of mechanics. Their scientific erudition is focused mainly into these areas of mechanics: development and improvement of the analytical and numerical computing methods (finite element method, method of boundary elements, meshless methods), theory of the modelling and analysis of the mechanical systems and construction, constitution relation with impact onto linear and nonlinear behaviour of material, condition of the marginal state of the materials and bodies, mechanics of composites, smart and MEMS materials, analysis of the stress, analysis of the coupled deformation and dynamic response of selected body classes included combined bodies, inverse tasks of the mechanics and deformation of selected technologic processes, optimization and contact tasks, interaction of constructions and environment, expert systems, mechanics of the micro and nano - systems, dynamics of the vehicles and machine devices.

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

Mechanical engineering (Bachelor study)

- | | |
|--|--|
| <ul style="list-style-type: none"> ✓ Statics ✓ Elasticity and strenght I. ✓ Elasticity and strenght II. ✓ Kinematics ✓ Dynamics ✓ Computer mechanics | <ul style="list-style-type: none"> ✓ Modelling of technical objects ✓ Final work ✓ Basic engineering experiment ✓ Monitoring and data analysis in the experiment |
|--|--|

Management of technical and environmental risks in engineering (Bachelor study)

- | | |
|---|---|
| <ul style="list-style-type: none"> ✓ Elasticity and strength ✓ Mechanics I. | <ul style="list-style-type: none"> ✓ Mechanics II. |
|---|---|

Technology, management and innovation of engineering production (Bachelor study)

- | | |
|---|---|
| <ul style="list-style-type: none"> ✓ Elasticity and strength ✓ Mechanics I. | <ul style="list-style-type: none"> ✓ Mechanics II. |
|---|---|

Automotive Production (Bachelor study)

- | | |
|---|---|
| <ul style="list-style-type: none"> ✓ Elasticity and strength ✓ Mechanics I. | <ul style="list-style-type: none"> ✓ Mechanics II. |
|---|---|

Computer Aided Mechanical Engineering Production (Bachelor study)

- | | |
|---|---|
| <ul style="list-style-type: none"> ✓ Elasticity and strength ✓ Mechanics I. | <ul style="list-style-type: none"> ✓ Mechanics II. |
|---|---|

Industrial engineering (Bachelor study)

- | | |
|---|---|
| <ul style="list-style-type: none"> ✓ Elasticity and strength ✓ Mechanics I. | <ul style="list-style-type: none"> ✓ Mechanics II. |
|---|---|

Prosthetics and Orthotics (Bachelor study)

- | | |
|--|--|
| <ul style="list-style-type: none"> ✓ Statics ✓ Elasticity and strenght I. ✓ Elasticity and strenght II. | <ul style="list-style-type: none"> ✓ Kinematics ✓ Dynamics |
|--|--|

Applied mechanics (Master study)

- | | |
|--|---|
| <ul style="list-style-type: none"> ✓ Vibrations of mechanical systems ✓ Term project ✓ Diploma work ✓ Noise and vibrations ✓ Theory of the mechanics ✓ Thermal stresses ✓ Numerical methods in mechanics I. ✓ Nonlinear mechanics and continuum mechanics ✓ Kinematics and dynamics of compound dynamical systems | <ul style="list-style-type: none"> ✓ Plasticity and creep ✓ Theory of the elasticity ✓ Theory of engineering experiment ✓ Limit status of the constructions ✓ Mechanics of composite materials ✓ Numerical methods in mechanics II. ✓ Stochastic mechanics ✓ Thin-walled supporting elements ✓ Theory of mechatronical systems, modeling, design, optimalization |
|--|---|

Mechanical engineering (Master study)

- | | |
|---|---|
| <ul style="list-style-type: none"> ✓ Applied mechanics ✓ Term project ✓ Diploma work ✓ Mechanisms of machines | <ul style="list-style-type: none"> ✓ Plasticity and creep ✓ Numerical methods of mechanics ✓ Theory of engineering experiment ✓ Construction of process devices |
|---|---|

Automotive Production(Master study)

- ✓ Theory of engineering experiment

Transport systems and logistic (Master study)

- ✓ Building mechanics
- ✓ Numerical methods of mechanics

Mechatronics (Master study)

- ✓ Vibration control
- ✓ Numerical methods in mechanics I.
- ✓ Numerical methods in mechanics II.
- ✓ Theory of engineering experiment
- ✓ Mechanics of composite materials
- ✓ Computer aided design of mechatronic systems

Machine tools and equipments(Master study)

- ✓ Numerical methods of mechanics of production machines

Robotics techniques(Master study)

- ✓ Mechanics of robots
- ✓ Numerical methods of robot mechanics

Plastics Processing(Master study)

- ✓ Degradation processes and prediction of lifetime plastics
- ✓ Finite element method

Computer Aided Mechanical Engineering Production(Master study)

- ✓ Applied Mechanics in MT

Management of technical and environmental risks in engineering(Master study)

- ✓ Theory of engineering experiment

Welding, joining and surface treatment (Master study)

- ✓ Quantification of residual stresses
- ✓ Dimensioning of welded joints

Applied mechanics (PhD. study)

- ✓ Experimental methods of mechanics
- ✓ Selected topics from dynamics
- ✓ Synthesis of mechanisms
- ✓ Numerical methods of mechanics
- ✓ Continuum mechanics
- ✓ Applied elasticity and strength
- ✓ Computational mechanics
- ✓ Technical acoustics

GRADUATE THESES

BACHELOR'S THESES:

Bartók Gergely	Determination of the operation parameters on absorption hydrogen storage
Bobal' Lukáš	Didactic model of water container system with the pump controlled by microprocessor
Csótó Kristián	Modal analysis of the cantilever beam using FEM
Čajka Andrej	Using of digital image correlation for the stress analysis of crank hook
Dančičin Marek	Analysis of movement of hydraulically lifted assembly ladder
Darida Marek	Vibration analysis of mechanical systems
Dronzek Jozef	Design of equipment for testing of springs
Dubecký Martin	Design of robotic arm for drawing of user defined inputs
Fabišik Jakub	Design of the shape of gear bodies
Hovanec Andrej	FEM analysis of compressed column
Jakub Tadeáš	Structural analysis in the range of finite deformations
Jenčík Lukáš	Six-member plane mechanism of cranked press and its kinematical

Kimák Boris	analysis
Kollár Adrián	The structural design of the drive for feeder
Kopčák Marek	Analysis and comparison of technical parameters of flexible shaft couplings
Kopčan Maroš	Kinematical analysis of crank mechanism
Kulik Róbert	Experimental determination of mechanical characteristics of flexible shaft couplings
Link René	Stress analysis of spherical container
Makara Pavol	Modeling of dynamic systems in state space
Mlinarček Dušan	Using of Laplace transformation for analysis of mechatronic systems
Mríz Štefan	Conceptual Design of Service Robot for the Domestic Use
Ondruš Jozef	Modeling of dynamical system in Matlab
Paľovčík Jakub	Stability of dynamic system
Pet'ura Edgar	Design and strength analysis of supporting structure of one and two-stage transformer by program Abaqus
Pillárová Bibiána	Characteristics of linear dynamic systems
Polák Peter	Modification of driving system for belt conveyor
Poremba Daniel	Modeling and control of motion of hydraulic actuator
Potor Ján	Inverse kinematic analysis of plane and spatial robot motion
Rabatin Ján	Correlation analysis of numerical and experimental model in program NX Nastran
Ruščák Samuel	Static and dynamic analysis of statically balanced parking barriers
Sič Tomáš	Dimensioning of wagon undercarriage for high loading of wheels
Slovinský Štefan	Innovation possibilities of piston combustion engine in order to reduce fuel consumption
Szabóová Viera	Modeling of mechanical system by simulation program
Vasko Martin	Optimization of the reinforcement of cantilever structure using FEM
Veľas Tomáš	Design of device for recycling of plastics
Zeleňák Michal	Stress state in open two-member cylindrical vessel
	The test equipment car locks in climatically demanding environments

MASTER'S THESES:

Gábik Roman	Stress analysis of samples from photoelastic material under knife action using the method of reflective photoelasticity
Hvizdoš Michal	Validation of computational model of spot joint of car chassis sheets
Jacko Jakub	Creation of mathematical model of impactor of child's head and tuning of response during impact to free steel sheet on stiff frame
Kaľavský Adam	Proposal of methodology for the computation of lifespan for stochastic loading including dynamic behaviour
Kicko Michal	Structural design, strength analysis and optimization of breakdown truck body
Kipikaša Dávid	Hyperelastic material models and their applications
Koval' Juraj	Noise and vibration decreasing of ventilation system by using numerical acoustic analysis
Kučinský Martin	Optimization of selected structural members of the wing of training airplane fighter
Polónyová Zuzana	Proposal of methodology for the measurement of residual stresses by digital image correlation method
Sauer Július	Strength analysis of composite monocoque structure of Formula Student car on the basis of numerical model
Tomko Marián	Material models with isotropic and kinematic hardening and their applications
Bendíková Barbora	Analysis of geometrically nonlinear thin-walled shells
Diabelková Patrícia	Analysis of sandwich structures by the finite element method
Kmec Maroš	Design of the perforating device for punching the plastic polymer cliché needed for tampon printing
Kovács Attila	Finite element analysis of joints in steel structures
Lejko Patrik	Design and strength analysis of supporting truss of airplane structure
Roth Günter	Modification of the beam with the aim mass decreasing and preservation of strength and stiffness parameters

Sabol Eduard
Stöhr Róbert

Computation of nonstationary thermal fields by FEM
Modification of robotic collection of components of the assembly station for electronic locks of cars

RESEARCH AT THE DEPARTMENT

Area of research:

- ✓ Development of non - traditional experimental methods for mechanical and mechatronic systems
- ✓ Development of computer methods and algorithms for numerical simulation and optimization of systems
- ✓ Methods of experimental and numerical modelling of mechanical systems
- ✓ Using of experimental methods for development of methodology for identification and prediction of failures in supporting elements of mechanical systems
- ✓ Stochastic processes and limit states of mechanical systems
- ✓ Development, verification and using of modern experimental methods of mechanics
- ✓ Measurement of residual stresses by the hole-drilling and Ring-Core methods
- ✓ Modal analysis of mechanical systems
- ✓ Measurement of deformation and stress states by the methods of photoelasticity
- ✓ Fatigue analysis and determination of life-span of mechanical systems
- ✓ Research of modules for intelligent robotic systems

PROJECTS OF THE DEPARTMENT

Title of the project	Analysis of causes of mechanical systems failures by the qualification of strains and stress fields
Type of the project	VEGA
Number of the project	VEGA 1/0393/14
Principal investigator	prof. Ing. František Šimčák, CSc.
Time period of the project	2014 - 2017
Annotation of the project	Failures of machines and equipments are mostly caused by crossing of critical states that are defined by limit values of stresses and deformations in locations of critical loading. The project is oriented to development of methods for analysis of failure cases in supporting elements of mechanical systems by the quantification of strain and stress fields with the help of using experimental and numerical methods of mechanics. The suggested treatments will be used for the reliability and residual life assessment of machines and equipments.
Title of the project	Development of modern numerical and experimental methods for analysis of mechanical systems
Type of the project	VEGA
Number of the project	VEGA 1/0721/16
Principal investigator	Prof. Ing. Jozef Bocko, CSc.
Time period of the project	2016 - 2019
Annotation of the project	Increasing demand for productivity of machines and equipment and the pressure to decrease their prices necessitate to provide exact prediction of their properties and determination of their critical states. This is connected with the requirement to develop and exploit new effective numerical and experimental procedures. The project is oriented to research of properties of supporting members of structures by using modern numerical and experimental methods of mechanics. Numerical methods are common

tools in engineering practice, but these methods alone are not able to give satisfactory picture about structural state. In opposite case, it would be necessary to model not only actual loading of structure, but also whole process of their production. The project is oriented to exploration of structural behaviour of structures with respect to their critical states by comparison of numerical and experimental methods. The project is focused especially to thin-walled slender members suffering to excessive vibration.

Title of the project	Development of methodology for determination of residual stresses by modern experimental methods of mechanics
Type of the project	VEGA
Number of the project	VEGA 1/0751/16
Principal investigator	doc. Ing. Miroslav Pástor, PhD.
Time period of the project	2016 - 2019
Annotation of the project	Analysis of possibilities of creation new methodology for determination of correction coefficient for determination of residual stresses by the hole drilling and Ring-Core method. Proposal of new software product for determination of correction coefficient by using numerical modelling as well as on the basis of data gained from experimental measurements. New developed software allows not only to process data from experiments, but also their presentation in graphic form. Proposal of new methodology for evaluation of released deformations on the surface of machine parts by modern optical methods with the aim to assess residual stresses. Proposal of modular chain using of several experimental methods for determination of residual stresses.
Title of the project	Quantification of residual stresses in elements of mechanical, mechatronic and biomechanical systems
Type of the project	APVV
Number of the project	APVV15-0435
Principal investigator	Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.
Time period of the project	2016 - 2019
Annotation of the project	Project is devoted to the quantification of residual stresses that occur in the structure or its supporting member due to technology of production, assembling, joining to its environment, thermal influences or overloading. Residual stresses are superimposed to stresses that results from actual loading of structure and they can considerably influence resulting stress state. This can have significant influence to the lifespan of mechanical parts of machines and equipment, but also mechanical and biomechanical systems or various implants produced by 3D technologies. Accordingly, the knowledge of residual stresses is significant for the analysis of actual state of investigated element. Modern computer based methods of analysis allow to provide simulation of complex materials and loadings, but simulation of production and loading conditions that meets the supporting element of structure during technology process and using is practically impossible. This is the reason why the experimental methods of mechanics are necessary for providing adequate analysis of structural state. The project will be devoted to methodology of measurement of residual stresses including their quantification and application in mechanical, mechatronic and biomechanical systems.
Title of the project	Research and development of intelligent mobile robotic platforms and positioning systems with high precision for using in research, development and industry
Type of the project	Stimuli
Number of the project	Req 00169-003
Principal investigator	Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.

Time period of the project	2015 - 2018
Annotation of the project	The aim of industrial (applied) research is to solve complex robotic modules that create positioning system with extraordinary high precision of positioning (min. 5.10 ⁻⁴ mm) which will be competitive on world trades, especially experimental systems of prestigious European and world research centers. The systems in question will fulfill increased demands on stiffness, resistance against thermal loading and resistance against increase radiation. Important part of project solution will by optimization of kinematic structure as well as system of arrangement and control of the whole positioning system.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUTIONS

Employees and students	Country
doc. Ing. Peter Frankovský, PhD.	Faculty of Mechanical Engineering, University of Zielona Góra, Poland

VISITS OF STAFF MEMBERS FROM FOREIGN INSTITUTIONS

Employees and students	Country
prof. Ing. Miroslav Okrouhlík, CSc.	Institute of Thermomechanics, The Czech Academy of Sciences, Czech Republic
Dr hab. inż. Piotr Kuryło Prof. UZ	Faculty of Mechanical Engineering, University of Zielona Góra, Poland
dr inż. Dariusz Michalski	Faculty of Mechanical Engineering, University of Zielona Góra, Poland

MEMBERSHIP IN SLOVAK PROFESSIONAL ORGANISATIONS

Member of Editorial Committee of Home Journals	Association of Slovak Mechanical Engineers
František Trebuňa, Dr.h.c. mult. prof. Ing., CSc.	František Trebuňa, Dr.h.c. mult. prof. Ing., CSc.
Czech and Slovak Association for Mechanics	Slovak Association for Mechanics
František Trebuňa, Dr.h.c. mult. prof. Ing., CSc.	František Trebuňa, Dr.h.c. mult. prof. Ing., CSc., František Šimčák, prof. Ing., CSc., Jozef Bocko, prof. Ing., CSc., Ingrid Delyová, doc. Ing., PhD., Róbert Huňady, doc. Ing., PhD., Miroslav Pástor, doc. Ing., PhD

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

Member of Editorial Committee of Foreign Journals	František Trebuňa, Dr.h.c. mult. prof. Ing., CSc. New York Academy of Sciences
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František Trebuňa, Dr.h.c. mult. prof. Ing.,
CSc.

Technical Scientific Committee IMEKO
Technical Mechanics

František Trebuňa, Dr.h.c. mult. prof. Ing.,
CSc.

International Biographical Centre
Cambridge, England

František Trebuňa, Dr.h.c. mult. prof. Ing.,CSc.

PUBLICATIONS

Books:

- [1] TREBUŇA, František - PÁSTOR, Miroslav - HUŇADY, Róbert - FRANKOVSKÝ, Peter - HAGARA, Martin: **Optické metódy v mechanike** / - 1. vyd - Košice : TU - 2017. - 550 s.. - ISBN 978-80-553-3168-3.

Journals:

- [1] FRANKOVSKÝ, Peter - OSTERTAG, Oskar - OSTERTAGOVÁ, Eva - TREBUŇA, František - KOSTKA, Ján - VÝROSTEK, Marek: **Experimental analysis of stress fields of rotating structural elements by means of reflection photoelasticity** / - 2017. In: Applied Optics. Vol. 56, no. 11 (2017), p. 3064-3070. - ISSN 1559-128X
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Department of Power Engineering



Contact

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Staff

- Professors: 1
- Assoc. Professors: 3
- Assist. Professors: 2
- Researchers: 0
- PhD. Students: 1 internal, 0 external

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2017
02/2017	Tatramat – ohrievače vody, s. r. o. (Ing. Dušan Hanuščák)
05/2017	Tanta university in Egypt, Faculty of Mechanical Engineering (prof. Abd elnaby Kabeel)

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Master's degree:

- Power Machines and Equipments

PhD. degree:

- Power Machines and Machinery

Number of the students

(till 31. 12. 2017) on the study programs guaranteed by the department:

first year of study:

- 7 internal form of study
- 0 external form of study

second year of study:

- 5 internal form of study
- 0 external form of study

Number of the graduates (2016/2017)

on the study programs guaranteed by the department:

- 5 students in the internal form of master's degree
- 0 students in the external form of master's degree
- 1 PhD. students in the internal form of study (defended PhD. thesis)
- 0 PhD. student in the external form of study

GRADUATE PROFILE

MASTERS'S PROGRAM (Ing.)

Power Machines and Equipments

The alumnus of the study programme will receive 2nd stage of study's knowledge in order to perform qualified solution of problems in the wide area of power engineering; focused on the mechanical engineering, metallurgy, ecology and economic and legislation aspects. The knowledge is supported by modern information technologies; at activities related to the production, distribution, projection and operation in various companies and institutions concerning power engineering.

PhD. PROGRAM (PhD.)

Power Machines and Machinery

The study of the third stage of university study is focused on preparation of high - qualified employees of scientific research and development in the all fields of power engineering.

Doctoral study programme, as the study programme of the third stage of study, is focused on receiving knowledge based on the present state of scientific knowing in the given area. The study is reflection of

independent creative activity of a student at scientific research and his/her own contribution to scientific knowledge. Standard length of the doctoral study for internal students is 4 years; for external students 5 years.

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

- ✓ Applied Mechanics
- ✓ Audits, Certifications and Legislation in Power Engineering
- ✓ Business Ethics
- ✓ Cogeneration Systems
- ✓ Combustion Engines
- ✓ Combustion Equipments and Heat Exchangers
- ✓ Computational Support of Power Equipments Projection
- ✓ Cooling Equipments and Heat Pumps
- ✓ Design of Power Equipments I.
- ✓ Design of Power Equipments II.
- ✓ Designing of energy systems
- ✓ Diagnostic Methods in Power Engineering
- ✓ Diploma Thesis
- ✓ Electrical Power Engineering
- ✓ Energy Resources and Conversion
- ✓ Foundations of Nuclear Power Engineering
- ✓ Fuel Economy
- ✓ Gas Facilities
- ✓ Heat and Mass Transfer
- ✓ Heat Supply
- ✓ Industrial Ventilation
- ✓ Manufacturing and Professional Practice
- ✓ Materials and Technologies in Energy
- ✓ Measurement, Control and Automation of Heat Processes
- ✓ Measuring and Measurement Methods in Power Engineering
- ✓ Modelling and Simulation of Heat Processes
- ✓ Pumps, Compressors
- ✓ Selected Chapters of Heating Technology
- ✓ Semester Project
- ✓ Steam, Gas and Water Turbines
- ✓ Technical Equipments for Ventilation and Air Conditioning
- ✓ Water Economy

GRADUATE THESES

MASTER'S THESES:

- | | |
|----------------------------|---|
| Brezina Martin | Optimization of heating systems using alternative technologies in the firm Tatramat - water heaters, s.r.o. |
| Körösi Peter | The structural design of the metal hydride tank with heat exchanger. |
| Lacko René | Optimization of flow characteristics of the valve. |
| Staroňovoá Michaela | The analyse of the possibilities determining the coefficient of thermal conductivity of the powder materials. |
| Štochová Lenka | Increase the efficiency of heat and power plant using organic Rankine cycle and cogeneration unit. |

PhD. THESES:

RESEARCH AT THE DEPARTMENT

Area of research:

- ✓ Plasma technology
- ✓ Renewable energy sources
- ✓ Plasma treatment of dangerous wastes.
- ✓ Storage of excessive electric power made of alternative energy sources; in the form of hydrogen.
- ✓ Research of intensification of storage capacities of hydrogen for adsorption and absorption materials.
- ✓ Research of cooling intensity of curved heat - exchanging areas.
- ✓ Filtration of natural gas before compression in the process of natural gas transport.

- ✓ Flow and heat transfer in natural gas coolers.
- ✓ Numerical simulations of heat transfer in specific technical applications and porous materials.

Research characteristics:

The research is focused on utilization and optimization of renewable energy sources. Emphasis was on hydrogen technologies which represent ecologically clean energy. In the framework of grant projects and projects funded by the European Structural Funds, utilization of solar power using photovoltaic cells in order to produce hydrogen, which is used as interlink in the process of energy storage, is solved. The research in the area of plasma treatment of wastes is solved too. This technology enables the dangerous waste to decrease its volume by high - temperature separation of thermally decomposable waste components.

On the basis of co - operation with industrial practice, the potential for solution of current issues from practice was created. The issues focused on the transport issues of natural gas which is related to filtration, compression and cooling of gas in compressor stations.

The department has high specialised staff altogether with doctoral students in order to solve tasks like these.

Areas of expertises:

- ✓ CAD systems (Pro - Engineer, Siemens NX, ...)
- ✓ CFD systems (ANSYS_CFX)
- ✓ Dimensional analysis
- ✓ Hydrogen - processing technologies
- ✓ Plasma technology for waste treatment
- ✓ Mathematical and physical modelling of power engineering systems
- ✓ Mechanics of non - rigid materials (fluids)
- ✓ Heat and mass transfer
- ✓ Thermodynamics
- ✓ Thermogravimetry

PROJECTS OF THE DEPARTMENT

Title of the project	Research of function, activities and management of the new type of compressor driven by heat accumulated and generated inside metal hydrides.
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Type of the project	Grant VEGA
Project number	1/0752/16
Principal investigator	doc. Ing. Tomáš Brestovič , PhD.
Time period of the project	1/2016 - 12/2018
Annotation of the project	The project is aimed at research of thermal cycles of hydrogen compressors utilizing metal hydride materials, which exhibit substantial pressure gradients as a function of their temperature. To achieve the objectives is necessary basic research of storage capacities of selected series of metal hydrides respecting the operating pressure for predefined acceptable operating temperatures. A significant part of the project is creating of the functional prototype of multi-stage tandem compressor serving on compression of hydrogen. This compressor will include properly used types of alloys based on the elements La, Ce and Ni. By the suitable combination of alloy composition can be achieved an optimal equilibrium pressure of hydrogen absorption in one of tanks of tandem pair and it is also possible to increase the pressure by the heating of tank. The creation of prototype requires structural design of the device with heat pump, which serves for the transport of heat between tanks and the creation of prototype require.

Title of the project	Implementation of new technologies in the production and hydrogen
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Type of the project Project number Principal investigator Time period of the project Annotation of the project	storage field and their transformation in educational process for increasing the quality of education in the power machines and equipments branch. Grant KEGA 005TUKÉ-4/2016 Ing. Natália Jasminská, PhD. 1/2016 - 12/2018 The essence of the present scientific project represents an extension of the project 041TUKÉ-4/2013 „Hydrogen and hydrogen technologies“. The research is focused on the implementation of new technologies in the production and storage of hydrogen and the application of knowledge, in which it will be the acquired knowledge and skills applied in the context of improving the quality of the educational process in the field 5.2.6. Power Machines and Equipment through specialized training in „Laboratory of hydrogen technologies“. Complex research and development will be devoted to the production of hydrogen, storage of hydrogen and optimal operation of the hydrogen system. In the scope of the project is planned extension of the laboratory equipment, where it will be implemented experimental measurements, the result of which will be summarized in scientific-pedagogical publications (monographs, university textbooks, current content articles, patent registration). To increase the efficiency of transfer of knowledge from experimental research into the educational process is planned also implementation of information and communication technologies.
Title of the project Type of the project Project number Principal investigator Time period of the project Annotation of the project	New technologies for the processing of hazardous wastes and their implementation to educational process in the field of energy machines and equipment Grant KEGA 003TUKÉ-4/2016 prof. Ing. Mária Čarnogurská, CSc. 1/2016 - 12/2018 The essence of the scientific research project consists in demonstrating the applicability of plasma technology in two types of hazardous waste management. These are the fly and selected type of waste containing asbestos. Research about the suitability of the use of high temperature waste treatment is focused on the development and application of target knowledges, which will be applied in the preparation of innovative educational programs, used energy systems through specialized training in specialized laboratories. Comprehensive research and development will be dedicated to application referred technology in waste treatment. High temperature waste treatment with low ionized plasma allows the efficient disposal of hazardous waste, as well as material and energy recovery of products formed in this process. Verification and review of the positive and negative aspects of this new and underused technology in waste management constitute the benefit for the scientific sector, for practice, but especially given the possibility of spreading ideas in the education of a new generation of students. The project is also envisaged with the completion of the "Plasma technology" laboratory, where will carry out experiments of plasma wastes melting, the results of which will be summarized in the scientific monograph titled New techniques of hazardous waste treatment.

Title of the project	Development equipment for efficient compression and storage of hydrogen using new metal hydride alloys
Type of the project	Grant APVV
Project number	APVV-15/0202
Principal investigator	doc. Ing. Tomáš Brestovič , PhD.
Time period of the project	7/2016 - 6/2019
Annotation of the project	The project aims to development of unique prototype devices at efficient compression of hydrogen using metal hydride storage tandem in conjunction with a heat pump. The development of device closely related to the research of thermal cycles hydrogen compressor utilizing metal-hydride alloys, which have a significant pressure gradients according to their temperature. The research of capacities of storage of selected types of metal hydride alloys is necessary to achieve effective hydrogen compression. The operating pressures should be respected at predefined acceptable operating temperatures. The output of the project is the development of a functional prototype of the tandem compressor to compress the hydrogen that will be to contain suitably used types of metal hydride alloys. Prototype development requires structural design of the heat pump system, serving to transport heat between reservoirs and optimize the management with the creation of an algorithm for increase effectiveness. The application organization long-term cooperates with businesses in research of hydrogen technologies and their utilization in the automotive and energy industries. In the case of confirmation of theoretical assumptions, technology of research replaces today existing technology certainly. The researching technologies have a number of crucial advantages such as lower energy consumption, simpler and more compact design, saving on installation space, lower estimated cost, significantly lower service costs in achieving longer life and high standards of safety by avoiding contact with the moving parts of the system with compressed hydrogen. Development of hydrogen compressor has great potential for innovation needs of social and economic practice in the development and application of hydrogen technologies in the automotive industry and transport, especially in the context of Slovak European innovation strategy.

MEMBERSHIP IN SLOVAK PROFESSIONAL ORGANISATIONS

Plynár Vodár + Kúrenár (SK)

Peter Lukáč, Ing., PhD.

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

Journal of Applied Science in the Thermodynamics and Fluid Mechanics (CZ)

Mária Čarnogurská, prof. Ing., CSc.

PUBLICATIONS

Books

- [1] BRESTOVIČ, T., JASMINSKÁ, N., LÁZÁR, M.: *Metal hydride tank cooling at hydrogen absorption into the $La_{0.85}Ce_{0.15}Ni_5$ alloy*. Belgicko, EuroScientia, 2017. 138 p. ISBN 978-90-822990-8-3.
- [2] LUKÁČ, Peter: *Reducing the impact on flow measurement accuracy of ultrasonic flowmeters for gas transmission*. In: Selected problems in the transport of natural gas. Zagreb, University of Zagreb Faculty of Metallurgy, 2017, p. 26. ISBN 978-953-7082-28-4.

Textbooks

- [1] ČARNOGURSKÁ, M., DOBÁKOVÁ, R.: *Vodné hospodárstvo v energetike*. Košice TU, 2017. 103 s. ISBN 978-80-553-3145-4.
- [2] DOBÁKOVÁ, R., ČARNOGURSKÁ, M.: *Zásobovanie teplom*. Košice TU, 2017. 166 s. ISBN 978-80-553-2818-8.
- [3] LUKÁČ, P.: *Chladiace zariadenia a tepelné čerpadlá*. Košice TU, 2017. 143 s. ISBN 978-80-553-2870-6.

Journals

- [1] SAKSL, K., ĎURIŠIN, J., BALGA, D., MILKOVIČ, O., BRESTOVIČ, T., JASMINSKÁ, N., ĎURIŠIN, M., GIRMAN, V., BALKO, J., KATUNA, Y., ŠULÍKOVÁ, M., ŠŮLOVÁ, K., FEJERČÁK, M., BOLDI, J., BERTRAM, F.: *Devitrification and hydrogen storage capacity of the eutectic $Ca_{72}Mg_{28}$ metallic glass*. In: Journal of Alloys and Compounds. Vol. 725 (2017), p. 916-922. ISSN 0925-8388.
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- [16] JASMINSKÁ, N., BRESTOVIČ, T., BEDNÁROVÁ, L., LÁZÁR, M., DOBÁKOVÁ, R.: *Design of a hydrogen compressor powered by accumulated heat and generated in metal hydrides*. In: International Journal of Engineering Research and Science. Vol. 3, no. 9 (2017), p. 35-39. ISSN 2395-6992.

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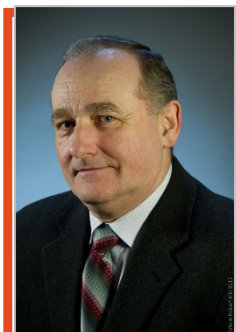
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Patents

- [1] BRESTOVIČ, T., JASMINSKÁ, N., LÁZÁR, M., ČARNOGURSKÁ, M.: *Tandemový vodíkový kompresor s metalhydridovou zliatinou a tepelným čerpadlom*, zverejnená patentová prihláška SK 84-2015 A3, Banská Bystrica: ÚPV SR 2017. 7 s.
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Department of Construction, Automotive and Transport Engineering



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Staff

- Professors: 1
- Assoc. Professors: 7
- Assist. Professors: 4
- Researchers: 2
- PhD. Students: 5 internal, 1 external

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Bachelor's degree:

PhD. degree:

- **Transport Machines and Machinery**

Master's degree:

- **Transport Engineering and Logistics**

Number of the students

(till 30. 10. 2017)

on the study program guaranteed by the department:

first year of study:

- 13 internal form of study

second year of study:

- 10 internal form of study

Number of the graduates (2016/2017)

on the study programs guaranteed by the department:

- 10 students in the internal form of engineering study
- 0 students in the external form of engineering study
- 0 PhD. students in the internal form of study (defended PhD. thesis)
- 0 PhD. students in the external form of study (defended PhD. thesis)

GRADUATE PROFILE

MASTER'S PROGRAMS (Ing.)

Transport Engineering and Logistics

The study program "Transport Engineering and Logistics" in the branch of study "Transport Machines and Machinery" is a 2 - years engineer's study after the first 3 years of previous relevant Bc. - study. In the framework of this program there are presented basic information and knowledge from the area of theoretical principles, machine design (steel supporting structure and drives) and operation of transport and handling machines. There are described all important transport machines and machinery, which are working continuously (i.e. the large - scale spectrum of conveyors) and cyclically (i.e. lifting machines – the wide range of cranes and lifts), as well as fundamental principles of material flow projection and transport logistics applications.

PhD. PROGRAMS (PhD.)

Transport Machines and Machinery

The graduate obtains wide and deep theoretical knowledge in the field of transport and handling machines and machinery. He masters scientific methods of research and development in the area of transport machines and logistics. He can find a qualified job in research and development institutes in leading positions, as well as in technical universities. His professional skills are supported by ability to articulate autonomously and to solve research tasks, together with leading of a research team.

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

- ✓ CA - Methods of Structures Design
- ✓ Logistics of Production and Technical Systems
- ✓ Drives and Transmissions I.
- ✓ Experimental Methods
- ✓ Social - Science Subject
- ✓ Building Mechanics
- ✓ Theory and Design of Earthmoving Machines
- ✓ Applied Mathematics
- ✓ Progressive Production Technologies
- ✓ Safety of Technical Systems
- ✓ Reliability of Technical Systems
- ✓ Theory and Design of Conveyers
- ✓ Drives and Transmissions II.
- ✓ Semestral Project
- ✓ Steel Structures Design I.
- ✓ Storages and Storage Management
- ✓ Projection of Flexible Production Systems
- ✓ Computer Aided Design I.
- ✓ Technical Drawing
- ✓ Computer Aided Design I. and II.
- ✓ Machine Parts and Mechanisms II.
- ✓ Machine Parts and Mechanisms III.
- ✓ Numerical Methods in Mechanics
- ✓ Theory and Design of Lifting Machines
- ✓ Operational Strength
- ✓ Year - Class Project
- ✓ Theory of Vehicles
- ✓ Maintenance, Diagnostics and Repairs of Machines
- ✓ Steel Structures Design II.
- ✓ Computer Aided Design II.
- ✓ Logistics and Material Flows
- ✓ Diploma Work
- ✓ Elements of Mechanical Engineering
- ✓ Draw up of Technical Documentation
- ✓ Machine Parts
- ✓ Parts of Machines and Mechanisms
- ✓ Machine Parts and Mechanisms III.
- ✓ Computerized Graphics
- ✓ Material Flows and Logistics
- ✓ CAD – Systems
- ✓ Technical Documentation
- ✓ Transport Systems
- ✓ Elements of Design

GRADUATE THESES

MASTER'S THESES:

Transport Engineering and Logistics

Petrušová, Anna	Analysis and construction of mechanical boot lock for passenger motor car
Lavčák, Matúš	Construction of side opening mechanism for freight wagon
Jenča, Radovan	Construction of double-girder bridge crane 12,5/5 t – 24 m
Kostelník, Jozef	Construction of double-girder bridge crane 35 t – 23 m
Ráso, Filip	Solution of inter-operation transport system for handling with injection moulds
Hrindová, Anna	Proposal of storage logistic system and construction of storage/retrieval machine
Kovács, Ladislav	Stationary jig for rotation of metal sheet coils by 90 degrees
Hudák, Šimon	Construction of bridge crane 20/5 t – 18 m specified for operation in workshop
Sekerák, Daniel	Design proposal of frontal bumper for passenger car using the CAD and optimisation of it with regard to aerodynamics
Sekerák, Ján	Design proposal of frontal bonnet for passenger car by means of the CAD-support

PhD. THESES:

Transport Machines and Machinery

Petróci Ján	Increasing the output characteristics and reliability of the one-wheeled vehicle power unit
Lumnitzer Ján	Identification of skewing arising processes for cranes and possibility of its elimination
Pušár Dušan	Research management system and components of internal combustion engines to focus on optimizing their operations and increase efficiency
Boslai Róbert	Creating parametric 3D model of the car and its treatment using selected parameters
Moravič Marek	Control of dangerous vibration of mechanical systems drives
Žulová Lucia	Controlling of dangerous vibrations and noisiness in the mechanical drive system

AWARDS OF DEPARTMENTAL EMPLOYEES

Award of the Automotive Industry Association of the Slovak Republic concerning the best diploma work in the year 2017, namely the 3rd place for tutorial of the diploma theses awarded to doc. Ing. Michal Fabian, PhD.

RESEARCH AT THE DEPARTMENT

Area of research:

Transport Engineering and Logistics

- ✓ Optimisation of material flows
- ✓ Identification and simulation of logistic relations in production control and supplying
- ✓ New concepts of more perfect handling machines and machinery with high - level reliability characteristics
- ✓ Experimental verification of dynamic properties of steel supporting structures of transport machines from the point of view of their reliability and residual durability

Machine Design and Machine Parts

- ✓ Tuning-up of torsion vibrating mechanical systems by pneumatic tuners with regard to dangerous torsion vibration
- ✓ Diagnostics of various types of mechanical systems and equipment from the point of view of torsion vibration and excited mechanical oscillations supplying
- ✓ Research, development and design of new types of elastic shaft couplings
- ✓ Optimisation of mechanical systems from the point of view dangerous torsion vibration

Research characteristics:

Up to the year 1990 there were solved at our Department various research tasks from the area of machine design and operation of the transport, building and agricultural machinery, with regard to analysis of dynamic characteristics and operational reliability, above all. The most important institutions cooperating with our Department were: Institute for Mechanics of Slovak Academy of Science, Institute for Research and Development of Engineering in Martin, Institute for Research and Development of Engineering in Zvolen, East - Slovak Metalworks in Kosice.

The important success of the Department was obtained at the International Engineering Fair in Brno in 1975 as a result of cooperation with the Institute for Research and Development of Engineering in

Zvolen, as well as the "Gold Medal Award" in 1976 repeatedly, in cooperation with the crane - building factory in Brezno.

After 1990 there are two most important areas of our research activities: durability and reliability of steel supporting structures of lifting machines; logistics and material flows.

The above - mentioned research areas are diversified into the following important topics: optimisation of material flows, identification and simulation of logistic relations in production control and supplying, new concepts of more perfect handling machines and machinery with high - level reliability characteristics, experimental verification of dynamic properties of steel supporting structures of transport machines from the point of view of their reliability and residual durability.

Cooperation with practice is focused on following topics: experimental measurement of operational loads of steel supporting structures of transport and handling machines and machinery, prediction of durability, project and realization of heavy load transportation, structural design of new components of manipulation equipment, suggestion and solution of inter - operational transport, logistic project of a Shopping - Functional Centre.

The most important cooperating partners are: US - Steel Košice, Cargo Bratislava, Transport Research Institute Žilina, Whirlpool Poprad, Wagon - works Poprad.

Areas of expertises:

Transport Machines and Logistics

- ✓ Optimisation of material flows
- ✓ Identification and simulation of logistic relations of production control and supplying
- ✓ New concepts of more perfect handling machines and machinery with high - level reliability characteristics
- ✓ Experimental verification of dynamic properties of steel supporting structures of transport machines from the point of view of their reliability and residual durability

Machine Design and Machine Parts

- ✓ Research, development and design of new types of elastic shaft couplings
- ✓ Optimisation of mechanical systems taking into consideration dangerous torsion vibrations
- ✓ Tuning-up of torsion vibrating mechanical systems by means of pneumatic tuners with emphasize on dangerous torsion vibration
- ✓ Diagnostics of various types of mechanical systems and equipment with regard to torsion vibration and excited mechanical oscillation

PROJECTS OF THE DEPARTMENT

NATIONAL PROJECTS

Title of the project	Research and development of technology for homogeneous charge self-ignition using compression in order to increase engine efficiency and to reduce vehicle emissions.
Type of the project	Grant project VEGA
Number of the project	1/0473/17
Principal investigator	doc. Ing. Michal Puškár, PhD.
Time period of the project	01/2017 - 12/2020
Annotation of the project	During the last year occurred information that one of the worldwide reputed automotive companies installed in the motorcars equipped with the diesel engine special software in order to hide the over-limit values of

the nitrogen oxides, which are monitored during the emission testing process. It is a well-known fact that the actual emission limits are very hard and there is arising a serious problem for the automobile factories how to meet the more and more demanding emission requirements. Taking into consideration the above-mentioned facts, the main goal of this project is research and development of a new technology, which will be able to keep the efficiency level of the diesel engine, together with a significant reduction of the emissions. This idea is highly topical in the given area of the science and technology. The main attention is paid to the HCCI technology (Homogeneous Charge Compression Ignition).

Title of the project **Implementation of new technologies specified for solution of questions concerning emissions of vehicles and transformation of them into the educational process in order to improve quality of education.**

Type of the project Grant project KEGA

Number of the project 041TUKE-4/2017

Principal investigator doc. Ing. Michal Puškár, PhD.

Time period of the project 01/2017 - 12/2019

Annotation of the project The main task of the research, which should be performed within the framework of the presented scientific project, consists in implementation of new technologies in order to solve the questions of motorcar emissions. Consequently, the newest technical information will be integrated into the educational process at the Faculty of Mechanical Engineering, Technical University of Košice, taking into consideration quality improvement of the study branches Power Machines, Mechanical Engineering and Transport Machines, using the specialised laboratory. During the last year occurred information that a worldwide well-known automotive concern installed in some of the motorcars, equipped with the diesel engines, special software, which was able to hide the over-limit values of the nitrogen oxides that are monitored during the emission testing process. That is to say that the actual emission limits are very hard and therefore there is arising a serious problem for the automobile factories to meet theses high demanding emission requirements. The complex research and development process will be focused on a new technology, which will be able to keep efficiency level of the diesel engine, together with a significant reduction of the emissions. The main attention is paid to the HCCI technology (Homogeneous Charge Compression Ignition). The existing laboratory will be supplemented with new devices, which enable to perform experimental measurements, whereas the obtained results will be presented in the scientific-pedagogical publications (monograph, university textbook, articles published in the CC-journals, patent application). There is also scheduled implementation of information-communication technologies in order to increase efficiency of knowledge transformation into the educational process.

Title of the project **Research of innovative methods for emission reduction of driving units used in transport vehicles and optimisation of active logistic elements in material flows in order to increase their technical level and reliability**

Type of the project	Grant project VEGA
Number of the project	1/0198/15
Principal investigator	doc. Ing. Michal Fabian, PhD.
Time period of the project	01/2015 - 12/2017
Annotation of the project	The presented scientific project is linked with solutions of our previous projects in order to keep a continuity of the scientific-research work at our workplace. The main research task in the first part of this scientific project is reduction of gaseous emissions of driving units used for transport vehicles as well as efficiency increasing of the driving unit output parameters. The second part is focused on projection of logistic systems in the material flows with specification for the active logistic elements. Another important goal of this project is development of original equipment for on-line monitoring of operational loading of the active logistic elements, namely the bridge cranes. The final result of this part will be development of an innovative system for elaboration of the loading spectrums, together with following determination of the residual durability in the selected points of the crane supporting structures.
Title of the project	Development of cognitive activities focused on innovations of educational programs in the engineering branch, building and modernisation of specialised laboratories specified for logistics and intra-operational transport
Type of the project	Grant project KEGA
Number of the project	021TUKE-4/2015
Principal investigator	doc. Ing. Martin Mantič, PhD.
Time period of the project	01/2015 - 12/2017
Annotation of the project	Nowadays there are changing rapidly requirements concerning the professional profile of university graduates. In order to meet the above-mentioned requirements it is necessary to expand an amount of knowledge as well as to realize all the required changes. Thus, it is necessary to apply a flexible educational system in this way. This system has to observe changes at the markets and it should be able to response very quickly. The base of knowledge is substantial in this surrounding because it creates processes for the demanded profile of graduate. In the framework of this complex reality there will be developed a specialised laboratory of the trans-operational transport and logistics, which offers a very good possibility to obtain practical skills and professional routine for the future graduates.
Title of the project	Research and development of combustion technology based on controlled homogenous charge compression ignition in order to reduce nitrogen oxide emissions of motor vehicles.
Type of the project	Grant project APVV
Number of the project	APVV-16-0259
Principal investigator	doc. Ing. Michal Puškár, PhD.
Time period of the project	07/2017 - 06/2020

Annotation of the project

The Research and Innovation Strategy for Intelligent Specialisation of the Slovak Republic (RIS3) is a basic global strategic document determined for supporting of the research and innovation activities in the present epoch. This document defines the research and development priorities, including the efficient exploitation of energy sources, reduction of emissions and progressive technologies. The automotive industry is a strategic branch of industry within the home and international framework. In the past year occurred information about a fact that in some of the motorcars was installed a software, which enabled to hide the over-limit values of the nitrogen oxides during the emission testing process. The automotive producers are oriented towards the essentially new technical solutions taking into consideration the more and more demanding emission requirements. The main attention is focused on the innovative technology of combustion process, i.e. the HCCI (Homogeneous Charge Compression Ignition). The HCCI technology is a combination of the gasoline engine and the diesel engine, utilizing the best characteristic feature of the both ignition systems. Combustion of the homogenous charge, which is based on the controlled compression ignition, is running all at once in the whole piston combustion area and the charge is combusted almost completely. The homogenous mixture of the fuel with the air reduces emissions, whereas the NOx emissions are almost neglectable. Application of the HCCI technology was limited up to now due to the several basic problems, for example the high values of pressures during compression and difficult control of the self-ignition process. Therefore this project is focused on the research and development of the innovations specified for solution of the abovementioned problems and on building of the HCCI-engine prototype, which will be installed in the experimental vehicle with a presentation at the competition Shell Eco-marathon.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUTIONS

Employees and students

Puškár Dušan, Ing.

Country

Czech Republic (23. 10. 2017 - 01. 12. 2017)

Ladislav - MASARYK, Michal - SLOBODA, Oskár - BLIŠŤAN, Peter: Principles of car body digitisation based on geometry extracted from views in 2D drawing documentation - 2017. In: International Journal of Vehicle Design. Vol. 74, no. 1 (2017), p. 62-79. - ISSN 0143-3369

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Books

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- [2] HOMIŠIN, Jaroslav - MEDVECKÁ-BEŇOVÁ, Silvia - VOJTKOVÁ, Jarmila: Konštrukčné riešenia uzlov v technickej praxi - 1. vyd - Košice : TU - 2017. - 70 s. - ISBN 978-80-553-2942-0.

- [2] PUŠKÁR, Michal - KOPAS, Melichar - KÁDÁROVÁ, Jaroslava: Ecological analysis related to creation of gaseous emissions within transport focused on fulfilment of the future emission standards - 2017. In: Transportation Research Part D. Vol. 57 (2017), p. 413-421. - ISSN 1361-9209.
- [3] PUŠKÁR, Michal - FABIAN, Michal - KÁDÁROVÁ, Jaroslava - BLIŠŤAN, Peter - KOPAS, Melichar: Autonomous vehicle with internal combustion drive based on the homogeneous charge compression ignition technology - 2017. In: International Journal of Advanced Robotic Systems. Vol. 14, no. 5 (2017), p. 1-8. - ISSN 1729-8814.

Journals

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- [4] GREGA, Robert - KRAJNÁK, Jozef - ŽULOVÁ, Lucia - FEDORKO, Gabriel - MOLNÁR, Vieroslav: Failure analysis of driveshaft of truck body caused by vibrations - 2017. In: Engineering Failure Analysis. Vol. 79 (2017), p. 208-215. - ISSN 1350-6307.
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Patents

- [1] KAŠŠAY, Peter: Pneumatická pružná hriadeľová spojka s hadicovým pružným elementom úžitkový vzor SK 7708 Y1- Banská Bystrica : ÚPV SR - 2017. - 4 s.
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Department of Production Systems



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- Professors: 1
- Assoc. Professors: 2
- Lectures: 1
- Researchers: 2
- PhD Students: 2 internal
2 external

Activities at the department

Date	Title of the event, activity characterizing the life at the Institute in 2015
2/2017	Participation at XI. workshops of experts from universities, universities and practices in automation and industrial informatics, Artep 2017, Jozef Svetlík, doc. Ing., PhD., KARaKR, Sjf – KMIK, FVT, TU of Košice, Stará Lesná.
3/2017	Scientific co-operation on collaborative laboratory projects, Jozef Svetlík, doc. Ing., PhD., KST a KSSaR, Fakulta strojní, TU in Liberec, Czech republic.
4/2017	Erasmus plus, Employee mobility for training, Jozef SVETLÍK, PhD., doc., Ing., Nový Sad, Serbia.
9/2017	Participation in the meeting of departments and institutes of production machines in 2017. Peter DEMEČ, prof., Ing., CSc., Jozef SVETLÍK, doc., Ing., PhD., Šamorín-Čilistov, Sjf STU Bratislava.
11/2017	Active lecture: "Participation at the EAI International Conference on Management of Manufacturing Systems (MMS 2017) – Jozef SVETLÍK, doc., Ing., PhD., Starý Smokovec.

EDUCATION AT THE DEPARTMENT STUDY PROGRAMMES

Master's degree:

- Production machinery and equipment

Number of the students

on the study programmes guaranteed by the institute:

first year of studies:

- 10 internal form of study

second year of studies:

- 14 internal form of study

PhD. degree:

- Production systems

Number of the students

on the study programmes guaranteed by the institute:

- 2 internal form of study

- 2 external form of study

GRADUATE PROFILE

MASTERS PROGRAMMES (ING.)

Production machinery and equipment

Mechanical engineer profiled for the design, application and operation of machinery and equipment for engineering (machining, forming, casting, welding, locksmith standing) and tools (food, wood processing machines) and production systems. By self-profiling (selecting subjects) as a specialist designer (the theory of production machinery, design methodology, design and construction, methods of automation, control and programming, diagnostics and experimental methods), establishment (production machines theory, theory of operation, traffic handling methodology, diagnostics and maintenance, management and programming, experimental methods), manufacturer with deep knowledge of the design (the development of talent, knowledge and skills in shaping, humanizing technology and creating a working environment). The summary of knowledge and skills include the application of CA technologies, management of engineering activities, management of operational activities, business management and personnel management.

PhD. PROGRAM (PhD.)

Production systems

Deepening understanding of the engineering study by the independent study program of elaboration and extension of theoretical approaches and methodologies in the field of engineering structural design and manufacturing robotic technology based on innovative concepts from the design of robot cells and flexible manufacturing systems-based on innovation system structures, from models of the production management systems based on optimization of operating conditions. Deepening knowledge and skills for individual activity, synthesis and optimization of the proposed facilities and systems taking into account the interrelationships and compatibility of design modules, engines, control systems and diagnostic methods with implementation of computer intelligence and relation of "man-machine-environment". Deepening the knowledge of constructing concepts and principles of technical solutions and their experimental models and their verification using virtual and real models. The scientific approach of development of dissertation topic is based on the use of modern methods of creating innovative solutions (CAI - TRIZ) supported by means of CA technologies (including virtual prototyping and dimensional calculations, product lifecycle management, modeling and simulation, ...). Specialization of knowledge oriented to the construction of machines, robots and manufacturing systems is bound to direct involvement in scientific projects of training center with a high degree of application of their own creativity.

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

- ✓ CA methods of structural design I
- ✓ CA methods of structural design II
- ✓ CA methods of structural design III
- ✓ Construction theory of modular machines
- ✓ Design of machines I
- ✓ Design of machines II
- ✓ Diploma project
- ✓ Experimental methods in the field
- ✓ Evolution trends in production systems
- ✓ Food industry machines I
- ✓ Food industry machines II
- ✓ Machine tools control techniques
- ✓ Maintenance and diagnostics
- ✓ Manufacturing and professional experience
- ✓ Methodology of machines' renewal
- ✓ Methods and means of operation of production machinery
- ✓ Modelling of technical structures I
- ✓ Modelling of technical structures II
- ✓ Modular construction of production equipments
- ✓ Production and professional training
- ✓ The methodology for projecting construction of production machines
- ✓ Machine tools building theory I
- ✓ Machine tools building theory II
- ✓ Machine tools building theory III
- ✓ Theory of machine tool construction
- ✓ Thesis seminar

GRADUATE THESES

MASTER THESES:

Production machinery and equipment

Tomáš Danko	Determination of stiffness and positioning accuracy of milling machine workspace
Alexandra Araňošová	The approach to tackling sustainability of production machinery
Mojmír Bruchánek	Numerical and experimental quantification of machining center working accuracy
Martin Daňo	Possibilities of increasing the capacity of the production line
František Demko	Proposal of hybrid effector for assembly / disassembly
Dominik Smik	The structural design of the transmission for e-bike
Veronika Eliášová	IDEA - Intelligent child seat
Peter Novotný	Study the applicability of modular systems in Production Engineering
Petra Marcinášková	Study of solution of metamorphic structures of the production machines using hybrid joints
Pavel Lehocký	The design of the universal assembly workstation ETB5
Štefan Pidanič	Computational models of lathe machine design in MS Excel
Tomáš Šimkovič	Engineering design of table three-axis milling machines
Anton Torma	Design of measuring jig for measuring the machine stiffness
Ivan Lichvar	Draft of input tray for long pipes

DOCTORAL THESES:

Production systems

Zbigniew Pilat	Human-robot communication in welding technology manufacturing cells
Jozef Putala	Approaches to solution for palletization in logistics chain
Lenka Pradová	Analysis of the problems of cooperation industrial robots in multirobotics systems
Michal Šulík	Selected patterns of formation of flexible manufacturing cells
Patricia Dudová	Methodology of design solution of exoskeleton
Alena Pešková	Design and Verification Mechanism for Optimizing the Process of
Martin Pituk	Modular serial kinematic structure control with unlimited rotation
František Ďurovský	Vision system for robot - human cooperation

RESEARCH AT THE DEPARTMENT

Area of research:

- ✓ Virtual prototyping of machining machines
- ✓ Modular reconfigurable manufacturing systems
- ✓ Auxiliary equipment production machinery
- ✓ Maintenance and diagnostics of production machines
- ✓ Methodology of recovery machines
- ✓ Machine design

Research characteristics:

The main fields of research of the Department of Production Systems are production technology, maintenance and diagnostics of production machines and reconfigurable manufacturing systems. Research tasks in the field of production technology are oriented to address current needs such as

modularity systems and solutions of manufacturing systems based on modularity and reconfigurability as well as research in the field of intelligent manufacturing systems.

The research is focused on the issues of working precision of machine tools, to evaluate the technical level of production lines, as well as the development of expert systems for dealing with diagnostic of machinery and equipment.

The Department of Manufacturing Engineering supports research in education in the field of manufacturing machines by creating and implementing e-learning form of education using virtual laboratories connectable via the internet.

Areas of expertises:

- ✓ Multimachines systems and machines cooperation
- ✓ Modular manufacturing structures
- ✓ Construction of production machines
- ✓ Virtual laboratories and Virtual models
- ✓ Intelligent manufacturing systems

PROJECTS OF THE INSTITUTE**NATIONAL PROJECTS**

Title of the project	Research and development of advanced methods for virtual prototyping of manufacturing machines
Type of the project	VEGA
Number of the project	1/0124/15
Main solutionist	Peter Demeč, prof. Ing., CSc.
Time period of the project	2015 - 2018
Annotation of the project	The research project is focused on the research and development of advanced methods for virtual prototyping of manufacturing machines. The leitmotif of the project is research the possibilities to create the complex digital virtual models of manufacturing machines that are able to describe how the mechanical structure of the machine, as well as its control and possibly the real control system, with which the construction contemplated. Research and development of new advanced methods of virtual prototyping will be realized by combining methods of analysis of structures based on FEM, modeling accuracy characteristics of the machine, simulation of control and verification of analytical solutions on specifically developed experimental prototype model three-axis machine tool based on a modular concept. The project will be part of the solution and the question of possible areas of application innovation potential of advanced methods for virtual prototyping of machines in practice.
Title of the project	Research of new measuring methods of machine condition
Type of the project	APVV
Number of the project	15-0149
Main solutionist	Tomáš Stejskal, Ing., PhD.
Time period of the project	2016 - 2020
Annotation of the project	The research focuses on new possibilities of machine state monitoring. They are more meaningful in accuracy of identification of failure state, in estimation of residual time until the failure and in earliness of revelation of the beginning of failure state. Newness comes from the elaboration of measurement methods of stiffness of machine components. Based on the results of analysis, actual state of machine or machine knot is set. CNC cutting machines and coordinate measurement machines (CMM) are the object of the measurement. Measurement is aimed at the determination of

static and dynamic stiffness in the confrontation of changes and other state parameters, such as temperature, vibrations, deformations, positioning accuracy, etc. Relationship of changes between static and dynamic stiffness is supported by elaboration of proper mathematical apparatus. Results of basic research are directed into the development of new effective diagnosis methods and devices.

Title of the project	The creating of virtual laboratories web-based technologies to support the educational process in the field of Manufacturing Technology
Type of the project	KEGA
Number of the project	039TUKE-4/2016
Main solutionist	Peter Demeč, prof. Ing., CSc.
Time period of the project	2016 – 2019
Annotation of the project	The project aims to increase the efficiency of student learning in control, measurement, diagnosis and monitoring of production machines using new and advanced methods the information and web technologies. The project solution arises a comprehensive web based system to support the educational process of experimental methods in the field of Production Technique programs containing multimedia service individual machines and laboratory equipment, multimedia database with the latest knowledge about the training issue, WEB system for online evaluation and analysis of measured data, WEB system for archiving conducted scientific experiments performed in specialized laboratories production technique in the workplace investigators and web system for online checking of students. On the research workplace will be to create the system of virtual laboratories where students will be allowed to monitor online course complicated measurements, respectively testing of control programs to real machines and participate in the evaluation and analysis of experiments outside laboratory and in time the self-study work in a virtual lab by means form repeated the experiment with the possibility of re-analysis of the measured data, respectively machined parts on CNC machines. Complete database of experiments (laboratory exercises) will be freely available on the website of the workplace for all potential candidates who will be able to make free use as teaching aids.

Title of the project	Research and development of a rotating module with unlimited rotation.
Type of the project	VEGA
Number of the project	1/0437/17
Main solutionist	Jozef Svetlík, doc. Ing., PhD..
Time period of the project	2017 – 2019
Annotation of the project	The project focuses on the issue of flexible production systems focusing on modular production systems. The project aimed at a rotating motion module with unlimited rotation. This the proposed motion module is a custom solution and its structure contributes to the development of modular robotics equipment as part of modern multiprofessional manufacturing centers. This is a new kinematic arrangement a conventional structure based on rotary modules for the construction of production machines. The main objective of the project is research and development of possibilities of replacing linear motion units in the production of rotary machines Modules with simultaneous preservation, respectively. Extending parameters compared to conventional machines. By of the proposed rotation module will be able to assemble various robotic handling arms, moving parts manufacturing machines, or to assemble machines of a special nature.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUCIONS

Employees and students

Svetlík Jozef, doc., Ing., PhD.
Svetlík Jozef, doc., Ing., PhD.

State

Czech Republic
Serbia

MEMBERSHIP IN SLOVAK PROFESSIONAL ORGANISATIONS

SASI – Slovak Association of Mechanical Engineers

Peter Demeč, prof. Ing., CSc.

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

Society for the machine tools of the Czech Republic (CZ)

Peter Demeč, prof. Ing., CSc.

PUBLICATIONS

Monograph

- [1] DEMEČ, Peter - SVETLÍK, Jozef: **Virtual prototyping of machine tools**, 1. vyd - Lüdenscheid : RAM-Verlag - 2017. - 156 p. - ISBN 978-3-942303-61-3.

Device for use in manufacturing equipment 2017.In: Acta Technica Corviniensis : Bulletin of Engineering. Vol. 10, no. 4 (2017), p. 73-75. - ISSN 2067 – 3809

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Scripts

- [1] DEMEČ, Peter: **Teória stavby výrobných strojov** 3 1. vyd - Košice : TU - 2017. - 115 s. - ISBN 978-80-553-2691-7.

- [6] VALENČÍK, Štefan: **Application of 2D motion module in open and closed mechanical structures** 2017.In: Transfer inovácií. Č. 35 (2017), s. 18-21. - ISSN 1337-7094.

Journals

- [1] OLEJÁROVÁ, Štefánia - DOBRÁNSKY, Jozef - SVETLÍK, Jozef - PITUK, Martin: **Measurements and evaluation of measurements of vibrations in steel milling process** 2017.In: Measurement. Vol. 106 (2017), p. 18-25. - ISSN 0263-2241.

- [7] VALENČÍK, Štefan: **Integration options of movement and development of concepts of 2D motion module** 2017.In: Transfer inovácií. Č. 35 (2017), s. 22-25. - ISSN 1337.

- [2] HRBČEK, Jozef - BOŽEK, Pavol - SVETLÍK, Jozef - ŠIMÁK, Vojtech - HRUBOŠ, Marián - NEMEC, Dušan - JANOTA, Aleš - BUBENÍKOVÁ, Emília: **Control system for the haptic paddle used in mobile robotics** 2017.In: International Journal of Advanced Robotic Systems. Vol. 14, no. 5 (2017), p. 1-11. - ISSN 1729-8814.

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- [3] SVETLÍK, Jozef - BUŠA, Ján - BRESTOVIČ, Tomáš - DOBRÁNSKY, Jozef - KRÁL, Ján ml.: **Film thickness estimation for the oil applied to the inner surface of slim tubes** 2017.In: Applied Sciences. Vol. 7, no. 10 (2017), p. 1-15. - ISSN 2076-3417

- [9] STEJSKAL, Tomáš: **Konvolúcia ako prirodzený princíp náhodného rozdelenia** 2017.In: Spravodaj ATD SR. Roč. 14, č. 1 (2017), s. 28-32. - ISSN 1337-8252.

- [4] PALAŠČÁKOVÁ, Dominika - ŠTOFA, Miroslav:

- [10] PALAŠČÁKOVÁ, Dominika - DEMEČ, Peter: **Virtual analysis of machine tools** 2017.In: Acta Mechanica Slovaca. Roč. 21, č. 4 (2017), s. 44-50. - ISSN 1335-2393.

- [11] PALAŠČÁKOVÁ, Dominika - BADIDA, Miroslav: **Engineering technologies and their impact on the environment** 2017. In: Scientific Letters of Academic Society of Michal Baludansky. Roč. 5, č.

- 5 (2017), s. 139-142. - ISSN 1338-9432.
- [12] ŠTOFA, Miroslav - SVETLÍK, Jozef - PITUK, Martin: **Secondary proposal of coupling mechanism rotation universal module** 2017.In: MM Science Journal. Vol. 2017, no. February (2017), p. 1663-1667. - ISSN 1803-1269.
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- [15] DRABIKOVÁ, Elena - SVETLÍK, Jozef: **Leading issues of the economic research conducted at the ECB: the inflation instance** 2017.In: Ad Alta. Vol. 7, no. 1 (2017), p. 28-30. - ISSN 1804-7890.
- [16] SVETLÍK, Jozef - DEMEČ, Peter - KRÁL', Ján ml.: **CNC milling machine precision analysis through numerical modelling** 2017.In: Advances in Science and Technology-Research Journal. Vol. 11, no. 2 (2017), p. 212-219. - ISSN 2299-8624.
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- [7] ŽILINSKÝ, Adam: **Diagnostika a modernizácia CNC frézky pre výučbové účely** 2017.In: Novus Scientia 2017. - Košice : TU, 2017 S. 210-213. - ISBN 978-80-553-3080-8.
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- [9] VALENČÍK, Štefan **The strategy of modularity and reconfigurable production machinery** / Štefan Valenčík - 2017.In: Trendy a inovatívne prístupy v podnikových procesoch. - Košice : TU, 2017 S. 1-4. - ISBN 978-80-553-2856-0.
- [10] STEJSKAL, Tomáš - ŠIDLOVSKÁ, Ľuboslava: **Aplikácia technickej tvorivosti pri riešení projektov verzus obchodná filozofia firmy** / Tomáš Stejskal, Ľuboslava Šidlovská - 2017.In: Trendy a inovatívne prístupy v podnikových procesoch. - Košice : TU, 2017 S. 1-5. - ISBN 978-80-553-2856-0.
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Conference Proceedings

- [1] STEJSKAL, Tomáš - ŠTOFA, Miroslav - SVETLÍK, Jozef - PITUK, Martin - ŽILINSKÝ, Adam: **Production Aspects affecting the final precision machining of advanced materials** 2017.In: Key Engineering Materials : Manufacturing Technologies : Materials, Operation and Applications volume 756. - Switzerland : TTP, 2017 P. 155-161. - ISBN 978-3-0357-1196-7 - ISSN 1013-9826.
- [2] VALENČÍK, Štefan - KABDI, Kani: **Starting points of production system construction and development** 2017.In: Aktuálne problémy transporta i energetiky: Puti ich innovacionno rešenija. - Astana : Euroazijsky nacionalnij univerzitet, 2017 P. 246-251. - ISBN 978-9965-31-840-5.
- [3] VALENČÍK, Štefan - KABDI, Kani: **Production system profiling principles** 2017.In: Aktuálne problémy transporta i energetiky: Puti ich innovacionno rešenija. - Astana : Euroazijsky

Patents

- [1] PALAŠČÁKOVÁ, Dominika - SVETLÍK, Jozef - DOBRÁNSKY, Jozef: **Inteligentná detská autosedačka**, zverejnená patentová prihláška SK 105-2015 A3/ Dominika Palaščáková, Jozef Svetlík, Jozef Dobránsky - Banská Bystrica : ÚPV SR - 2017. - 8 s.

Technical Reports

- [1] SVETLÍK, Jozef: **Reinigungsmaschinen: Cleaning machines** 2017.In: Manus 2017 : Wettbewerb für spannende Kunststoff-Gleitlager-

Anwendungen Competition for exciting plastic
plain bearing applications. No. 8 (2017), p. 85-85



Department of Process and Environmental Engineering



Contact

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Staff

- Professors: 2
- Assoc. Professors: 2
- Assist. Professors: 3
- Researchers: 1
- PhD. Students: 2 internal

Activities at the department

Date	Title of the event, activity characterizing the life at the Institute in 2017
05/2017	Reaccreditation of the Laboratory for objectivisation physical environmental factors, Košice, Slovakia
10/2017	Organization 8th International Conference "To Protect our Global Environment for Future Generation" ICEEE 2017, Tatranska Lomnica, Slovakia
11/2017	Organisation of the 8th conference "Assesment of quality environment", Poráč, Slovakia

EDUCATION AT THE DEPARTMENT STUDY PROGRAMMES

Bachelor's degree:

- **Management of Technical and Environmental Risks in Mechanical Engineering**

Number of the students (2016/2017)

- 6 internal form of study
- 0 external form of study

Master's degree:

- **Management of Technical and Environmental Risks in Mechanical Engineering**

Number of the students (till 31. 01. 2017)

on the study programs guaranteed by the department:

- 1 internal form of engineering study
- 0 external form of engineering study

PhD. degree:

- **Technology of Environmental Protection**

Number of the students (till 31. 09. 2017)

2 PhD. students in the internal form of study

GRADUATE PROFILE

BACHELOR PROGRAMMES (Bc.)

Technology of Environmental Protection

Greening in the engineering must be focused on a complex life cycle from design through its stages of production and consumption to disposal for its survival. To this end, graduates receive, not just Bachelors fundamentals of environmental engineering, but also comprehensive knowledge in the field of environmental protection technology aimed at greening in the area of mechanical engineering. Study program is taught in daily form and in the distance form.

Management of technical and environmental risks in mechanical engineering

The structure of the study program "Management of technical and environmental risks in mechanical engineering" is primarily focused on the possibility of its graduates to pursue in a wide range of corporate, public and the central government sector with a focus on industrial technology. The structure of the study program enables to graduates of study program to be ready to study in master's degree of university study and with possible profiling of graduates by compulsory optional courses, especially for programs: Quality production (Engineering of Quality Production), Safety of Technical Systems, Environmental Management or Technology of Environmental Protection. The graduates will have a general knowledge from the area of mechanical engineering and from wider range of management

activities. They are not closely profiling, which allows them to wider application also in the labour market.

MASTERS PROGRAMMES (ING.)

Technology of Environmental Protection

The study is focused on issues of development and environmental protection. Students after a common basis of science and engineering studies are profiling on the impact of machine production on the environment, treatment of industrial waste, machinery and equipment for environment, greening of products and production processes, monitoring of environmental technology and protection of the biosphere. Study program is taught in daily form and in the distance form.

Management of technical and environmental risks in mechanical engineering

Management of technical and environmental risks in engineering based on an integrated quality management systems, management of technical and human risks and environmental management using modern methods of ICT. Graduates of the Department of Process and Environmental Engineering have knowledge of the variability of the operation of the man - environment. They have knowledge of environmental aspects and impacts, they know the principles of rational use of natural resources and regulatory limits and standards for the environment. The knowledge they can apply in managing environmental processes, including the prevention of environmental risks and accidents. Study program is taught in daily form and in the distance form.

PhD. PROGRAM (PhD.)

Technology of Environmental Protection

Studying in the third level degree in Technique of environmental protection and equipment is designed to prepare highly qualified specialists of scientific research and development in all areas and workplaces, where they apply scientific knowledge of the all fields of creation and environmental protection. Doctoral program, and III study program degree focuses on the acquisition of knowledge based on current scientific knowledge in the field. The study is a reflection of individual creative student activities in scientific research and his own contribution to scientific knowledge. PhD students in their studies dealing with the science and research development and environmental protection. They deal with monitoring, objectivization and evaluation of the environment. They work in various scientific and research projects. The standard length of study for a doctoral program in full-time is 3 years and, the distance form of more than 5 years.

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

Technology of Environmental Protection

- | | |
|---|--|
| ✓ Basics of environmentalist | ✓ Environmental management systems |
| ✓ Recyclation and a recycling technologies I. | ✓ Noise and vibrations |
| ✓ Environment and industrial production | ✓ Engineering of protection of water and soil |
| ✓ Machines and machinery to environmental protection I. | ✓ Legislative aspects of environmental productions |
| ✓ Separate processes | ✓ Ecologization of products and production |
| ✓ Techniques of working environment | ✓ Methodology of environmental impacts assessment |
| ✓ Waste management | ✓ Constantly sustained progress |
| ✓ Environmental engineering | ✓ Semester project |
| ✓ Semester project | ✓ Environmental legislation |
| ✓ Theory of environmental control | ✓ Objectivization of environmental factors |
| ✓ Technologies of environment protection | |

- ✓ Separate processes
- ✓ Machines and machinery
- ✓ Environment and engineering production
- ✓ Basics of toxicology
- ✓ Recyclation and a recycling technologies II.
- ✓ Assessment of environmental impacts
- ✓ Environmental toxicology
- ✓ Final project
- ✓ Ecologization of products and production
- ✓ Computer support of environmental protection control
- ✓ Machines and machinery to environmental protection II.
- ✓ Planning of environmental production
- ✓ Environmental safety of workplaces
- ✓ Ergonomics
- ✓ Diploma project
- ✓ Recycling oriented construction
- ✓ Diploma thesis
- ✓ Monitoring and diagnostics of environment
- ✓ Planning of environmental suitable production
- ✓ Final thesis

Management of Technical and Environmental Risks in Mechanical Engineering

- ✓ Machinery and equipment for environmental
- ✓ Greening of products and production
- ✓ Recycling and recycling technologies
- ✓ Ergonomy
- ✓ Methods of environmental quality evaluation
- ✓ Systems of environmental protection and control
- ✓ Technologies of environment protection
- ✓ Modelling and simulation I.
- ✓ Modelling and simulation II.
- ✓ Final project
- ✓ Final thesis

GRADUATE THESES**BACHELOR THESES:****Management of Technical and Environmental Risks in Mechanical Engineering**

Katarína Baloghová	Optimalization of acoustic properties for engineering product by psycho-acoustic methods
Veronika Cmárová	Separation of selected types of plastics
Andrea Janečková	Impact of selected physical agent of the working environment on employees efficiency
Monika Kababiková	Research of sound rates at the near European integrated school in Kechnec
Viktória Paľová	Analysis of energy intensity of the product a his environmental impact
Simona Verebová	Comparison of mathematical modeling noise pollutants in the interior of an industrial operation

MASTER'S THESES:**Management of Technical and Environmental Risks in Mechanical Engineering**

Jana Janoková	Proposal of measurement method and evaluation of acoustic material properties
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RESEARCH AT THE DEPARTMENT

Area of research:

- ✓ Physical factors of working environment
- ✓ Chemical factors of working environment
- ✓ Ergonomy
- ✓ Environmental protection technologies.
- ✓ Implementation and modification of technology for reducing cyanobacteriums in backwaters
- ✓ Environmental measurement and monitoring
- ✓ Environmental management systems
- ✓ Assessment of environmental impacts
- ✓ Ecologization of products and production
- ✓ Recycling oriented construction
- ✓ Planning of environmental production
- ✓ Waste management
- ✓ Objectivization and vizualization of environmental factors

Research characteristics:

Research of the department is directed to the greening of products and production, environmental design of production systems, techniques and technologies for production and environmental protection and management of environmental aspects and impacts of monitoring, simulation, computer support, assessment, evaluation and optimization. The scientific - research activities are oriented to the principles of recycling-oriented production and engineering evaluation of the environmental profile, methods of evaluation of environmental products and productions, waste water treatment methods, modeling removal products and recycling of logistics etc.

Areas of expertise's:

- ✓ Processing of assessments for the assessment of environmental impacts
- ✓ Acoustic and vibrations
- ✓ Thermal-humidity microclimate
- ✓ Light and illumination
- ✓ Noise maps
- ✓ Thermovision
- ✓ Electro-magnetic radiation
- ✓ Acoustic characteristics of materials
- ✓ Environmental management
- ✓ Environmental impact assessment
- ✓ Pollutions measurement
- ✓ Odors and volatile organics compounds
- ✓ Working performance and productivity

PROJECTS OF THE INSTITUTE

NATIONAL PROJECTS

Title of the project	Transfer of knowledge from scientific-researche activities into multimedial education process in the subject "Environment and manufacturing"
Type of the project	Grant project KEGA
Number of the project	048TUKE- 4/2015
Principal investigator	Dr.h.c. mult., prof. Ing. Miroslav BADIDA, PhD.

Time period of the project	2015 – 2017
Annotation of the project	The present project is aimed to exploit of the results of scientific-research activities of participant's workplace, foreign partners and results, knowledge and experience of selected foreign universities in teaching of the course "Environment and Mechanical Production / Manufacturing" and the course "Progressive Production Technologies" by using of multimedia technologies. The works will be based on a thorough analysis of the current state of the problem and studies of approaches to the given issue at the top universities abroad. There will be implemented the knowledge and experiences obtained in these workplaces. There will be created the conditions for the expansion of research and teaching laboratories (Laboratory of chemical analysis, Laboratory of solid aerosols, Lighting Laboratory, Laboratory of noise and vibration, etc.) as well as the personal, technical, software and methodical presumptions for the successful accreditation of selected laboratories and obtaining acquired skills. Also there will be a transfer of practical experiences of project participants gained in dealing with a wide range of research tasks, respectively the practical task into the educational process under the efficient support of multimedia technologies. The modern university textbooks "Environment and Mechanical Production" and "Progressive Production Technologies and Environment" will be developed. There will be a significant strengthening of laboratory works of students at the faculty.
Title of the project	Transfer of information from field of physical environmental factors into lifelong learning process
Type of the project	Grant project KEGA
Number of the project	039TUKE- 4/2015
Principal investigator	prof. Ing. Ervin Lumnitzer, PhD.
Time period of the project	2015 – 2017
Annotation of the project	The area of physical factors of environment is important in terms of risks in the working environment and comfort in the environment becomes more problematic. Care work environment and demands on its evaluation are more complicated. Methods for measuring and objectification of physical factors is complicated. Instrumentation and software is constantly evolving. A separate area of impact assessment processes are physical factors on human health. There is now a wealth of information in this field, constantly creating further information. The project deals with the transfer of information between universities and universities and practice, enabling faster and more efficient use of this information. The result is increasing of education level for university student, expert and other interested person in the field of quality of life environment.
Title of the project	Research of the impact of selected parameters of the working environment on working efficiency and productivity
Type of the project	Grant project VEGA
Number of the project	VEGA 1/0537/15
Principal investigator	Dr.h.c. mult. prof. Ing. Miroslav BADIDA, PhD.
Time period of the project	2015 – 2017
Annotation of the project	The basic idea of the project is to increase the level of interactive design and operation of manufacturing plants in clean technologies and a healthy

environment. Indoor environment quality production facilities along with clean technologies is undoubtedly one of the determining factors that affect perceived comfort and health of employees. This is a prerequisite to ensure high performance and productivity. The project will achieve a comprehensive innovative system design and assessment determining factors of the production environment with respect to their impact on labor productivity. The solution is applied to projects which comprise the interdisciplinary knowledge in the field of production facilities, the quality of the working environment and productivity. Specialized design concept of a healthy environment with the use of manufacturing processes takes into account the current trends and the changing needs of engineering practice.

Title of the project Identification of potential noise reduction of machines and equipment by visualization of applying methods

Type of the project Grant project APVV
Number of the project APVV-12 - 0432
Principal investigator prof. Ing. Ervin LUMNITZER, PhD.
Time period of the project 2013 - 2017
Annotation of the project

Technical properties of the industrial machines, devices and products are today still increased and customers also require fulfillment of the properties which increase their environmental quality. One of the most important characteristics is acoustic design. Technical acoustic and its development is nowadays very actual topic. Market requires products optimization not exactly only for quantity but also for the quality of the emitted noise. The important role are also psychoacoustics parameters, such as roughness of the noise, spectral characteristics, sharpness and timbre. Output noise emitted by the machines or devices can not disturb the people, often is required the level of the acoustic impulses and the properties have to be designed with applicable qualities of the emitted noise that is characterized by the acoustic design. Important role in these field represents nonspecific effects of the noise to human as non-hearing effects.

Title of the project Development and research and of methods for optimizing of acoustic characteristics and acoustic quality of emitting noise devices

Type of the project Grant project APVV
Number of the project APVV-15-0437
Principal investigator Dr.h.c. mult. prof. Ing. Miroslav BADIDA, PhD
Time period of the project 2016 - 2020
Annotation of the project

The object of the project is the Development and research of methods for optimizing of acoustic characteristics and acoustic quality of emitting noise devices. The emphasis is given to comparison of devices suitable for the needs of noise visualization and the determination of their application possibilities for the identification of noise sources of selected groups of household appliances. There shall be performed a comparison of selected visualization methods and the appropriateness of their application for localization and identification of noise sources. The focus will be on design and development of a methodology for the identification of noise sources, research and development of methodology for determining the of acoustic material properties applicable for the purposes of reducing noise, creating a database of materials and their acoustic properties, design and development methodology for establishing of psychoacoustic parameters

(roughness, sharpness, volume, colour audio/ sound, ...). The benefit will be the development and verification of optimization methodology of acoustic properties of household appliances. The content of the project is based on needs of the Directives no. 86/594 / EEC on airborne noise emitted by household appliances.

Title of the project	Pilot projects in the field of mechanical engineering (activity A.3.3)
Type of the project	OP Research and development
Number of the project	ITMS 26220220182
Principal investigator	Dr.h.c. mult. prof. Ing. Miroslav BADIDA, PhD.
Time period of the project	2016 - II. tape
Annotation of the project	The solution of project is focused on the development of new knowledge, techniques and methods, which they cover the full innovation cycle. It is allowing accelerate infiltration of innovation in conditions of the small and medium-sized enterprises in the form of knowledge intensive services. The aim of this project is building of a superior laboratory base, developing results of the solutions of the project centres of excellence (ITMS 26220120060) and other complementary activities of solvers and their enrichment about key aspects of knowledge-based economy, including the creation of a network of innovative partnerships. The department is involved on the project PP4: establishment of training, counseling and certified centres for risk management in safety engineering, safety and occupational health and environmental risks.
Title of the project	Research on the quality assessment of the working environment and its impact on the health of employees in the processes of engineering operations
Type of the project	Projects of Young Scientists
Principal investigator	Ing. Miriama PIŇOSOVÁ, PhD.
Time period of the project	2017- 2018
Annotation of the project	The solution of project is focused on the research on the quality assessment of the working environment and its impact on the health of employees in the processes of engineering operations

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUCIONS

Employees and students	State
Badida Miroslav, Dr.h.c. mult., prof., Ing., PhD.	Hungary, Kazachstan, Ukraine, Germany, Poland
Lumnitzer Ervin, prof. Ing. PhD.	Macedonia, Bosnia-Herzegovina
Králiková Ružena, doc., Ing., PhD.	Hungary, Poland
Sobotová Lýdia, doc., Ing., PhD.	Hungary, Poland, Kazachstan, Germany
Hricová Beáta, Ing., PhD.	Macedonia, Bosnia-Herzegovina
Moravec Marek, Ing., PhD.	Germany, Poland, Kazachstan, Romania
Liptai Pavol, Ing., PhD.	Germany, Poland, Kazachstan, Romania
Piňosová Miriam, Ing., PhD.	Germany, Macedonia, Bosnia-Herzegovina
Dzuro Tibor, Ing.	Germany, Kazachstan, Romania
Badidová Anna, Ing.	Hungary, Poland
Jamborová Miroslava, Ing.	Romania

MEMBERSHIP IN SLOVAK PROFESSIONAL ORGANISATIONS

Automotive Industry Association of the Slovak Republic – Environmental Legislative ENLA

Badida Miroslav, Dr.h.c.mult., prof. Ing. PhD.

Slovak Acoustical Society

Badida Miroslav, Dr.h.c. prof. Ing. PhD.

Lumnitzer Ervin, prof. Ing. PhD. - Vice chairman

Liptai Pavol, Ing. PhD.

Association of Industrial Unions v Bratislave Commission for the Environment

Badida Miroslav, Dr.h.c.mult., prof. Ing. PhD.

Journal “Fyzikálne faktory prostredia” – Physical Factors of Environment

Lumnitzer Ervin, prof. Ing. PhD.

Journal „Acta Mechanica Slovaca“

Piňosová Miriam, Ing., PhD.

Journal „Strojárstvo“ – Mechanical Engineering

Badida Miroslav, Dr.h.c. mult., prof., Ing., PhD.

SASI Slovak Association of Mechanical Engineers at the Association of Slovak Scientific and Technological Societies

Badida Miroslav, Dr.h.c.mult., prof., Ing., PhD.

Sobotová Lýdia, doc., Ing., PhD.

Králiková Ružena, doc., Ing., PhD.

Journal of Environmental Protection, Safety, Education and Management

Badida Miroslav, Dr.h.c.mult., prof. Ing. PhD.

Lumnitzer Ervin, prof. Ing. PhD.

Králiková Ružena, doc., Ing., PhD.

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

European Acoustic Association

Badida Miroslav, Dr.h.c. mult., prof., Ing., PhD.

Lumnitzer Ervin, prof., Ing., PhD.

ICEEE International Council of Environmental Engineering Education, Budapest, Hungary

Badida Miroslav, Dr.h.c. mult., prof., Ing., PhD.

Sobotová Lýdia, doc., Ing., PhD.

Moravec Marek, Ing. PhD.

DAAAM International Vienna

Badida Miroslav, Dr.h.c. mult., prof., Ing., PhD.

Králiková Ružena, doc., Ing., PhD.

European Strategy Forum on Research Infrastructures ESFRI, Brussel, Belgium

Badida Miroslav, Dr.h.c. mult., prof., Ing., PhD.

Czech Illumination Association (ČSO)

Králiková Ružena, doc., Ing., PhD.

Journal Acta Facultatis Ecologia

Badida Miroslav, Dr.h.c. mult., prof., Ing., PhD.

European Journal of Environmental and Safety Sciences

Badida Miroslav, Dr.h.c. mult., prof., Ing., PhD.

International Journal of Engineering, Romania

Badida Miroslav, Dr.h.c. mult., prof., Ing., PhD.

Lumnitzer Ervin, prof., Ing., PhD.

Hricová Beáta, Ing., PhD.

Journal The Holistic Approach to Environment, Croatia

Králiková Ružena, doc., Ing., PhD.

Acta Technica Corviniensis: Bulletin of Engineering, Romania

Badida Miroslav, Dr.h.c. mult., prof., Ing., PhD.

Lumnitzer Ervin, prof., Ing., PhD.

Hricová Beáta, Ing., PhD.

Scientific Letters of Academic Society of Michal Baludansky

Badida Miroslav, Dr.h.c. mult., prof., Ing., PhD.

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- [2] BADIDA, Miroslav - SOBOTOVÁ, Lýdia - DZURO, Tibor: **Strojárska výroba a životné prostredie I.** Elfa, s.r.o.Košice, 270p. ISBN 978-80-553-3019-8.
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Patents

- [1] SMOLNICKÝ, Michal - ŠEBO, Juraj - BADIDOVÁ, Anna - BADIDA, Miroslav: **Zariadenie na výrobu pitnej vody s využitím vírovej trubice**. Užitočný vzor SK 7970 YI/Banská Bystrica : ÚPV SR-2017. 6 p.
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INSTITUTE OF SPECIAL ENGINEERING PROCESSES



- Department of Safety and Quality
- Department of Biomedical Engineering and Measurement



Department of Safety and Quality of Production



Contact

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Staff

- Professors: 3
- Assoc. Professors: 4
- Assist. Professors: 2
- Researchers: 2
- PhD. Students: 3 internal, 5 external

Activities at the department

Date **Title of the event, activity characterizing the life at the department in 2016**

5/2017	National Forum on Maintenance 2017
10/2017	Conference: MachineDiagnostics DIS 2017
11/2017	Conference: Current Issues of Occupational Safety and Health 2017

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Bachelor's degree:

- Quality and Safety

PhD. degree:

- Safety of Technical Systems

Master's degree:

- Safety of Technical Systems
- Production Quality Engineering

Number of the graduates (2016/2017)

on the study programs guaranteed by the department:

28 students in the internal form of engineering study

GRADUATE PROFILE

BACHELOR'S PROGRAMS (Bc.)

Quality and Safety

Graduate of the study department:

- acquires knowledge in the field of quality management of production and safety and health at work in manufacturing in the field of engineering,
- Based on the knowledge gained, it has the potential to be employed in various manufacturing and non-manufacturing enterprises (mainly in the automotive industry)
- After graduation, he / she can work as a quality technician or safety technician.

MASTER'S PROGRAMS (Ing.)

Safety of Technical Systems

The programme covers a wide area of the assessment of technical safety of machines and devices. The most important part of study programme is the analysis of technical risk by employing modern identification methods that integrate several scientific disciplines. High standard of technical safety is the primary requirement in the construction of modern machines and systems. The graduates of this programme have the potential to succeed as safety managers, design engineers, OSH coordinators and safety engineers.

Production Quality Engineering

The study programme provides instruction related to production procedures of industrial technologies, process solutions, metrological skills, auditing and certification procedures, methodology of statistic regulation of production processes and the utilization of information technology. The graduates are able to design and implement quality management systems and manage or supervise complex processes and productions. They can find employment as senior quality managers, as they possess the knowledge and skills that enable them to manage production processes in industrial enterprises, efficiently use information technology and process complex data.

DOCTORAL PROGRAMMES (PhD.)**Safety of Technical Systems**

PhD. graduates have a good command of scientific methods and approaches to OSH, testing and evaluating various factors that influence the level of safety, defining and managing the safety culture and determining individual indicators for its application and evaluation. They have the potential to succeed as senior managers in the field of OSH management system and integrated systems, academic or research staff, and experts on OSH, fire protection and major industrial accidents prevention.

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT**Power machines and equipments**

- ✓ Fundamentals of H&S
- ✓ Legislative of H&S
- ✓ Semester Project
- ✓ Safety Protection at Workplace
- ✓ Risk Management
- ✓ Explosion and Fire Protection
- ✓ Quality of Production
- ✓ CAD – Modeling Simulation
- ✓ CA – Techniques for Risk Analysis
- ✓ Technical Diagnostics I.
- ✓ Maintenance Management I.
- ✓ Selected Chapters of H&S
- ✓ Final Project
- ✓ Final Work
- ✓ Quality Management Systems
- ✓ Crises Management
- ✓ Dangerous Substances and Personal Protection
- ✓ Quality Production Engineering I.
- ✓ CA - Methods of Construction Design I.
- ✓ Total Quality Management
- ✓ Maintenance Management II.
- ✓ Selected Chapters from Experimental Methods and Examine of Machines and Equipments
- ✓ Theoretical Basics of Selected Technical Diagnostics Methods
- ✓ QMS Documentation
- ✓ Selected Chapters from Quality Management System
- ✓ Occupational Safety in Production
- ✓ CA - Methods of Construction Design I.
- ✓ CA - Methods of Construction Design II.
- ✓ CA - Methods of Construction Design III.
- ✓ Diploma Work
- ✓ Diploma Project
- ✓ Integrated Management Systems
- ✓ Design of Safety Systems
- ✓ Legislation and Safety for Machine Design, Production and Operation
- ✓ Major Hazards Accidents
- ✓ Technical Diagnostics II.
- ✓ Development Trends in Branch
- ✓ Technical Tools of Fire Prevention
- ✓ Crises Management II.
- ✓ Selected Chapters of Quality Management System
- ✓ Quality Production Engineering II.
- ✓ Generic Management
- ✓ Accreditation, Certification, Audit
- ✓ Risk Predetermination and Risk Assessment
- ✓ Complex of Integrated Operating Management - Quality, Safety, Environment

GRADUATE THESES**Quality of Production MASTER'S THESES:**

Safety of Technical Systems

Palaščák Peter	GRAM application model for security monitoring devices
Bráz Patrik	Work safety in the construction of steel structures and technological equipment
Pota Marek	Fire diagnostics chimneys
Kupčo Patrik	Risk Analysis of technical equipment on the site in
Kička Oliver	Proposal of effective preventive measures in accordance with the legal requirements of major industrial accidents
Babej Tomáš	Risk assessment for the sampling of surface, ground and waste water
Špaňár Ivan	The role of the human factor in the management of risks in the context of Digital Factory
Smutný Patrik	Risk management as part of the effective operation of firefighting equipment
Ogurčák Livia	Analysis and design of key indicators for the management of maintenance engineering technology
Stečák Adam	Objectification and determine the effect of vibration on hand in accordance with legal requirements
Ferenc Jozef	Risk Analysis in logistics processes and their quantification
Kalmová Anna	Risk analysis on selected machinery and their quantification

Quality production engineering

Bognár Róbert	Type of communications with customers in automotive industry within the Industry 4.0
Straková Lenka	Verification of the selected product functionality and identification of error causes in the automotive area
Kerliková Darina	Verification of the selected product functionality and identification of error causes in the automotive area
Germanová-Sobeková Andrea	Establishment of education training program establishment and its documentation according to WCM system in the manufacturing organization
Eštok Martin	Causes analyses of non - conformity occurrence within process optimization
Volochová Štefánia	The optimization of the production process of high pressure casting components for the automotive industry
Palko Peter	Implement SPC for process stability for machinery for SPI and AOI
Jurušová Zuzana	Customer relationship management CRM according to the method
Čornej Martin	Optimization of the production process in the selected organization
Stieranková Michaela	Increase of production efficiency by modernization of production technologies
Liščinská Silvia	Analysis of production - trade activities of mechanical engineering organization
Pristaš Maroš	Application of selected quality improvement tools to eliminate non conforming products in production process
Hrabovská Michaela	Solving of internal complaints by using 8D methodics
Harvanová Nikola	Reduction of undesirable visual aspects in surface treatment of products in automotive industry
Benka_Rybár Jakub	Industry 4.0 in maintenance management process
Gergeľová Miriama	Tools of statistical process control in engineering production

RESEARCH AT THE DEPARTMENT

Area of research:

- ✓ Research into methods and approaches to management of new and emerging risks related to new technology and renewable energy sources.
- ✓ Analysis of technical, environmental and human risks, aiming for sustainable development of mechanical engineering production and products.
- ✓ Risk management processes related to machines and technological systems in the safety & security interface.
- ✓ Research into risks related to industrial technologies within the integrated safety as a precondition for sustainable development.
- ✓ Effective maintenance management methods utilizing KPI (Key performance indicators).
- ✓ Ergonomic analyses as risk prevention measures.
- ✓ Application of quality management related to industrial technologies and final products.
- ✓ Objectification of quality parameters in the field of research and education.

Innovation procedures:

- ✓ Design of vehicles with minimum fuel consumption, in connection with the Shell - Eco Marathon competition.
- ✓ Design of hydrogen - powered vehicles.
- ✓ Audit structure and effective certification procedures for companies and organizations.
- ✓ Leadership in the national policy on the quality of tertiary education in the Slovak Republic and also within the EU Structural Funds.
- ✓ Implementation of a project whose objective is to establish a certification and consulting centre for technical, environmental and human risks; a partial task included in the project of establishing a University Scientific Park at the Technical University of Košice.

Scientific analyses:

- ✓ Risks related to manufacturing technologies – analyses and development of effective prevention methods.
- ✓ Safety & security interface as a part of integrated safety – extended causal dependence.
- ✓ Safety of critical infrastructure.
- ✓ Major industrial accidents – effective risk minimization.
- ✓ Development of technical diagnostic methods for an integrated approach to preventing machine and system failures related to the development and implementation of new techniques and technology.
- ✓ Determination of quality parameters for new products in accordance with the legislation and customer requirements.

Department of Safety and Quality of Production offers drawing up fallback procedures for industries in accordance with Act of the National Council of the Slovak Republic No 261/2002, Coll. on the Prevention of Major Industrial Accidents:

- ✓ Categorization of the enterprise and preliminary risk assessment.
- ✓ Notification of the categorization findings.
- ✓ Risk evaluation (in collaboration with BESTOFT company).
- ✓ Major industrial accidents prevention programme.
- ✓ Safety management system.
- ✓ Fallback procedures, including scenarios and complete building floor plans.
- ✓ Safety reports.

Scientific analyses:

Co - organizing National Maintenance Forum conferences in Slovakia, scientific committee on conferences Occupational Safety and Health 2015 and Civil protection 2015 at VŠB TU Ostrava, Allgemeinen Unfallversicherungsanstalt (AUVA) in Austria, Applied Human Factors and Ergonomics in Florida.

ACHIEVED AWARDS FROM THE DEPARTMENT OF SAFETY AND QUALITY OF PRODUCTION FOR THE YEAR 2017



Asociácia technických diagnostikov v Slovenskej republike



Pri príležitosti XX. ročníka medzinárodnej vedeckej
konferencie - diagnostika strojov

DIS 2017

udeľuje
za dlhoročnú spoluprácu
a rozvoj v oblasti technickej diagnostiky

O C E N E N I E

prof. Ing. Hane PAČAIOVEJ, PhD.

V Košiciach, dňa 03. októbra 2017



doc. Ing. Viera Peťková, PhD.
prezidentka
Asociácie technických diagnostikov



On the occasion of the 20th year of the International Conference - Machine Diagnostics DIS 2017,
doc. Ing. Marianna Tomašková, doc. Ing. Michaela Balážiková and doc. Ing., Štefan Markulík, PhD.

PROJECTS OF THE DEPARTMENT

NATIONAL PROJECTS

Title of the project

**Development and application of risk management models
in terms of technological systems in line with the industry
(industry) 4.0.**

Number of the project

APVV -15-0351

Principal Investigator

Dr.h.c. mult. prof. Ing. Juraj Sinay, DrSc.

Years of implementation:

2017 - 2020

Annotation of the project :

Procedures for risk analysis in the new conditions of digital transmission of information (data), define relevant risk parameters, processes for obtaining them in hierarchical order, development evaluation algorithm risks and their ranking in order to determine objectively the priorities for ensuring effective prevention measures. Information processing in the risk management system ("Risk Network"), if necessary, will apply methods for data processing in the system of Big Data.

Title of the project	VEGA Development of implementation and verification methods for integrated safety systems of machines, machine systems and industrial technologies.
Number of the project	1/0150/15
Principal Investigator	Dr.h.c. mult. prof. Ing. Juraj Sinay, DrSc.
Years of implementation:	2015 - 2017

VISITS OF STAFF VISITS OF STAFF MEMBERS TO FOREIGN INSTITUTIONS

Employees and students	Country
Sinay Juraj, prof. Ing., DrSc.	Czech Republic, Germany
Pačaiová Hana, prof. Ing., PhD.	Czech Republic

MEMBERSHIP IN PROFESSIONAL ORGANISATIONS

Sinay Juraj, prof. Ing., DrSc.	Czech Republic, Germany	✓ Chairman of the Joint Commission for the PhD. defence in the fields of transport and handling equipment, machinery and safety of technical systems.
Pačaiová Hana, prof. Ing., PhD.	Czech Republic	✓ Chairman of the Scientific Council of TU Košice, Scientific Council of Zvolen, the Scientific Board of VSB TU Ostrava, the Scientific Council of the University of Trenčín in Trenčín A. Dubčeka and Scientific Council of the Faculty of Mechanical Engineering, TU. ✓ President of Automotive Industry Association of the Slovak republic.
Juraj Sinay, prof. Ing., DrSc.		Hana Pačaiová, prof. Ing., PhD. ✓ Member of accreditation group for education (No. 124/2006 Coll.). ✓ Member of Supervisory Board of Slovak Maintenance Society. ✓ Member of Association of Technical Diagnostics SR. ✓ ZPH
✓ Member of SOK/ Joint Trade Union Committee for the defence of doctoral dissertations in the field of transport and handling equipment and Chairman of SOK in the field of technical safety systems and safety.		Milan Oravec, prof. Ing., PhD. ✓ Member of Editorial Board Safety of Work, ASPOS

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

Juraj Sinay, prof. Ing., DrSc.	speaking professor of traffic engineering in Europe, based in Berlin - FRG.
✓ Member of the Working Group IVSS, Sektion Maschinenschutz based in Mannheim, FRG. ✓ Member of the Gesellschaft für Sicherheitswissenschaften /security company for technology/ VDI Wuppertal, FRG. - Member of the Conference of the German -	✓ Member of the editorial board of safe work Editorial Board member of the Human Factors and Ergonomics in Manufacturing, ISSN1520 - 6564, Wiley New York/ USA.

Hana Pačaiová, prof. Ing., PhD.

✓ Member of the organizational Board of the conference AHFE.

✓ Member of European Federation of National Maintenance Societies (EFNMS) – European Health, Safety and Environment committee.

PUBLICATIONS

Journals

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- [2] PAČAIOVÁ, Hana - SINAY, Juraj - TURISOVÁ, Renáta - HAJDUOVÁ, Zuzana - MARKULIK, Štefan: **Measuring the qualitative factors on copper wire surface** / Hana Pačaiová ... [et al.] - 2017.In: Measurement. Vol. 109 (2017), p. 359-365. - ISSN 0263-2241
- [3] MALINDŽÁK, Dušan - PACANA, Andrzej - PAČAIOVÁ, Hana: **An effective model for the quality of logistics and improvement of environmental protection in a cement** In: Przemysł Chemiczny. Vol. 96, no. 9 (2017), p. 1958-1962. - ISSN 0033-2496
- [4] TOMAŠKOVÁ, Marianna : **Evacuation of persons using fire lifts in the case of fire** In: Svet rada. Vol. 13, no. 6 (2016), p. 550-558. - ISSN 1451-7841
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- [8] DULEBOVÁ, Martina - BALÁŽIKOVÁ, Michaela: **Measuring low frequency noise with emphasis on auditory and non-auditory effects on human** In: Spektrum. Vol. 17, no. 1 (2017), p. 9-11. - ISSN 1804-1639
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- [12] MICHALÍKOVÁ, Monika - GORZÁS, Michal - ŽIVČÁK, Jozef : **Alternative design of the equipment for the finger strength evaluation** 2017.In: American Journal of Engineering Research. Vol. 6, no. 12 (2017), p. 319-324. - ISSN 2320-0847
- [13] MICHALÍKOVÁ, Monika - GORZÁS, Michal - ŽIVČÁK, Jozef : **The possibility of stability measurement of**

the elderly 2017.In: American Journal of Engineering Research. Vol. 6, no. 12 (2017), p. 313-318. - ISSN 2320-0936

Scientific work in home non-parent magazines

- [1] PAČAIOVÁ, Hana: **Model riadenia údržby a RBT**In: Údržba: Maintenance instandhaltung. Roč. 17, č. 1-2 (2017), s. 12-16. - ISSN 1336-2763
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- [3] DULEBOVÁ, Martina - BALÁŽIKOVÁ, Michaela: **Hodnotenie a meranie nízko-frekvenčného hluku s prihliadnutím na zdravie zamestnancov** / Martina Dulebová, Michaela Balážiková - 2017.In: Bezpečná práca. Roč. 48, č. 4 (2017), s. 3-7. - ISSN 0322-8347
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- [5] TOMAŠKOVÁ, Marianna - NAGYOVÁ, Marta: **Požiarne výťahy, analýza rizík a bezpečnostné pravidlá** / In: Delta. Roč. 11, č. 22 (2017), s. 28-37. - ISSN 1337-0863
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- [1] TURISOVÁ, Renáta - SINAY, Juraj: **Ergonomics versus product attractiveness** In: Theoretical Issues in Ergonomics Science. Vol. 18, no. 1 (2017), p. 1-13. - ISSN 1464-536X
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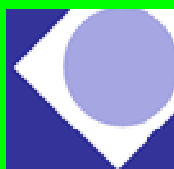


Department of Biomedical Engineering and Measurement



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Staff

- | | |
|-----------------------|------------|
| • Professors: | 2 |
| • Assoc. Professors: | 4 |
| • Assist. Professors: | 2 |
| • Researchers: | 1 |
| • PhD. Students: | 9 internal |

Activities at the department

25.- 27.9.2017 12. Trendy v biomedicínskom inžinierstve – Horní Lomná

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Bachelor's degree:

- **Prosthetics and Orthotics**

Number of the students (till 31.12.2017),
on the study programs guaranteed by department
78.

Number of the graduates (2016/2017),
on the study programs guaranteed by the
department:

- 9 students in the internal form of bachelor
study

Master's degree:

- **Biomedical engineering**

Number of the students (till 31.12.2017),
on the study programs guaranteed by department
19:

Number of the graduates (2016/2017),
on the study programs guaranteed by the
department:

- 20 students in the internal form of
engineering study

- **Measurement**

Number of the students (till 31.12.2017),
on the study programs guaranteed by department
0:

Number of the graduates (2016/2017),
on the study programs guaranteed by the
department:

- 0 students in the internal form of engineering
study

GRADUATE PROFILE

BACHELOR'S PROGRAMS (Bc.)

Prosthetics and Orthotics

The priority target of study program Prosthetics and Orthotics is preparation of university qualified medical workers, who are allowed, within health and rehabilitation care on the indication base of doctor, to design and repair orthotics and prosthetics equipment in whole range of biomedical engineering. This worker will be able to effectively collaborate with medical or non - medical workers in area of health and rehabilitation care.

MASTER'S PROGRAMS (Ing.)

Biomedical Engineering

The aim of the study is to realize theoretical knowledge and practical experiences in such an amount, to have absolvent as independent working partner in engineering and medical process:

- for application of actual technical, mathematical and physical knowledge about new biomedical and instrumental techniques,
- in the area of research, development and utilization of the automatic and biomedical systems for the decision features support.

Measurement

Graduate of a study programme Measurement possesses wide theoretical bases in given field and profound knowledge in chosen specialisation. They are able to analyse complex tasks in terms of actual state in the field, prepare a design of an experiment from the metrological point of view as well. Graduate can lead teams of co-workers with respect to safety at work and environment protection where they apply their knowledge of system analysis and optimal control.

Graduate gains the ability to:

- Develop and design own solutions of problems, creatively apply obtained knowledge, effectively decide when choosing methods, techniques and sources,
- Solve issues in new, unknown, multidiscipline contexts,
- Work on projects with identification of problems, analysis, design and implementation of systems, application of quality standards,
- Effectively work both individually and in teams, use systematic approach in management of projects,
- Maintain contact with development in given field, accept inevitability of ongoing professional development and lifelong education,
- Participate in concept creation and strategic processes when modernising solutions and measurement processes.

PhD. PROGRAMS (PhD.)

Biomedical Engineering

Doctoral program is focused on deepening and extension of theoretical knowledge gained in the previous study, to learn the scientific working methods and experimental habits and skills needed for scientific work in the biomedical engineering.

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

- ✓ Basic of cellular theory
- ✓ Basics of anatomy and physiology
- ✓ Basics of biomedical engineering
- ✓ Basics of Quality
- ✓ Biocybernetics
- ✓ Biomeasurement
- ✓ Biomedical Engineering I a II.
- ✓ Biomechanics
- ✓ Biomechanics in prosthetics and orthotics I. a II.
- ✓ Biomechanisms
- ✓ Biophysics in BE
- ✓ CAD/CAM Systems in Protetics and orthotics
- ✓ Coincidence Measurement
- ✓ Components and Modules of Medical Devices
- ✓ Computed tomography
- ✓ Coordinate measuring technique
- ✓ Design and Manufacturing of prosthetic and orthotic aids
- ✓ Design of measuring instruments and measuring systems
- ✓ Design of medical technology
- ✓ Desing of Experiment
- ✓ Diagnostics and Treatment in Orthopedics
- ✓ Dimensional measurement
- ✓ Diploma work
- ✓ Electric drivers
- ✓ Engineering Metrology
- ✓ Ergnomic and Kinesiology Measurements
- ✓ Ergonomic Measurements
- ✓ Experimental methods in BE
- ✓ Final work
- ✓ Functional anatomy
- ✓ Gauge calibration
- ✓ Geometrical precision products
- ✓ Geometrical specification products
- ✓ Goniometry in Protetics and orthotics
- ✓ Goniometry of human locomotion system
- ✓ Human biomechanics
- ✓ Implants and Implantology
- ✓ Intelligent Measuring Systems for Biomedical Engineering
- ✓ Introduction to biophysics in BE
- ✓ Introduction to prosthetics and orthotics
- ✓ Measurement of measurand
- ✓ Medical devices
- ✓ Methodology of Biomeasurement
- ✓ Micromechatronics
- ✓ Non-contact measurement methods
- ✓ Precision mechanics
- ✓ Prosthetic, orthotic and calceotic systems
- ✓ Prosthetics and orthotics I. a II.
- ✓ Quality in healthcare
- ✓ Rehabilitation technology
- ✓ Reverse engineering
- ✓ Semestral project
- ✓ Specialistic practice
- ✓ Surgical tecnology
- ✓ Technics of clinical examination
- ✓ The basics of technical prosthetics and orthotics
- ✓ Year-Class Project

GRADUATE THESES

BACHELOR'S THESES:

Prosthetics and Orthotics (- 2016/17)

Mária Csalová	Possibilities of prediction, prophylaxis and treatment of diabetic foot
Gabriela Dancáková	Experimentally solution of dental implants
Michal Dorčák	Evaluation of biomechanical parameters of selected activities athletes
Veronika Beňová	Analysis and overview of spinal implants
Jana Marčeková	Creation of the database of objects for Use in Virtual Reality
Mária Goliášová	3D printing of flexible structures and testing proposal
Viktória Plavuchová	Possibilities of somatotype determining
Slávka Maťaščíková	Footwear influence on posture
Dagmara Varcholová	Verification of the relationship of BMI and postural stability

MASTER'S THESES:

Biomedical engineering (- 2016/17)

Dávid Bábás	Selection of system for measuring of runout inner surface of hollow shafts
Branko Štefanovič	Design and printing of lowcost finger and hand prosthesis
Barbora Delejová	Possibilities of surface finishing of orthotics and prosthetics parts made by 3D printing
Matej Dilý	Metrological verification of the samples manufactured by Fortus 450mc device using different production setting
Mário Balla	Evaluation of the surface of the dimension of products manufactured by FDM technology
Martin Nováček	Metrological verification of the samples manufactured by Concept Laser Mlab cusing R device using different production setting
Martin Szöke	Measurement of magnetic field of selected habitats and comparison of deplagment and activity of the Ixodes ricinus as valuable vectors of agents of humans diseases
Michaela Dilýová	Termovision diagnostics of selected parts of human body and corelation of the attractiveness of the Ixodes ricinus with thermal deviations of the selected parts
Jaroslava Szűcsová	Design of custom made medical devices specific for palate cleft deformities made by additive manufacturing technology
Patrícia Glajcová	3D reconstructons of Palatin Thurzo's face
Jakub Poláček	Influence of metallic powder properties on output parameters of products at additive manufacturing
Matúš Kiraľ	Evaluation of the accuracy of temperature measurement by thermovision camera
Lukáš Kačmár	Verification of the manufacturing process of dental models
Zoltán Mihók	Analysis of measuring distance influence to output using computed tomography
Ladislav Gášpár	Design of device for measuring of air flow velocity.
Tibor Szabari	Verification of micrometer for measuring of the outer dimension.

Eduard Jakubkovič	The balance of the measurement uncertainty of the measurement chain with triangulation distance sensor.
Ján Kotuľák	Laserinterferometer uses in coordinate metrology
Jozef Molnár	Diagnosis of sexually transmitted diseases by multiplex RT-PCR
Klaudia Franková	Fabrication and testing of scaffolds for tissue replacement of damaged urethra using 3D bioplotter

RESEARCH AT THE DEPARTMENT

Area of research:

- ✓ Technology in the diagnosis of components and modules Computerized tomography (CT).
- ✓ Center for research of control of technical, environmental and human risks for permanent development of production and products in mechanical engineering.
- ✓ Excellence center of biomedical technology research.
- ✓ Research of new diagnostic methods in invasive implantology.
- ✓ New strategy for effective measurements with coordinate measuring machines with multi sensor systems.
- ✓ Optimization of technology method of orthotics and prosthetics with infrared thermography diagnostic.
- ✓ Virtual laboratory for 3D coordinate measurement.

Research characteristics:

The research of the Department of Biomedical Engineering and Measurement is oriented to:

- ✓ Technology in the diagnosis of components and modules by computerized tomography (CT).
- ✓ New diagnostic methods in invasive implantology.
- ✓ Optimization of technology methods of orthotics and prosthetics with infrared thermography diagnostic.
- ✓ New strategy for effective measurements with coordinate measuring machines with multi sensor systems.

PROJECTS OF THE DEPARTMENT

Title of the project	Research of Strategies: Coordinate Measurement of Free-Form Surfaces Using Contact and Non-Contact Measurement System.
Type of the project	VEGA
Number of the project	1/0182/15,
Principal investigator	Dovica Miroslav, prof. Ing., PhD.
Annotation of the project	Project is oriented at research of methodologies, techniques and various processes of coordinate measurements of parts with free-form surfaces with emphasis on contact and non-contact measurement. Research deals with geometric description methods of design models or measurement data and the free-form surface localization and comparison techniques. To create of corresponding relationship questions will be solving of 3D transformation and measurement data to design model comparison or

	surfaces to surface distance calculations.
Time period of the project	01/2015 - 12/2017
Title of the project	Development and construction of low-cost modular prostheses of upper limbs manufactured by additive technologies
Type of the project	VEGA
Number of the project	1/0971/16
Principal investigator	Hudák Radovan, doc. Ing., PhD.
Annotation of the project	Providing a patient with an upper-limb prosthesis is currently a demanding and complex process, significantly depending on the experience and skills of orthopaedic technicians involved in the manufacturing process. Current global situation requires the development of new types of prosthetics or the modification of the existing concepts with the aim to reduce manufacturing costs and time, while maintaining, or even improving, functional abilities of a device. Manufacture of shape-specific components applying the additive technology facilitates fast response in case the shape modification is required for individual orthoses and prostheses. Incorporation of the additive technology not only into the manufacturing process but primarily into the designing stage will significantly accelerate and simplify the prosthetics manufacturing.
Time period of the project	01/2016 - 12/2018
Title of the project	Metrological processing of biomedical data obtained by 3D scanners for educational purposes
Type of the project	KEGA
Number of the project	063TUKE-4/2016
Principal investigator	Živčák Jozef, Dr.h.c. prof. Ing., PhD.
Annotation of the project	Modernization and improvement of work efficiency involves the implementation of new technologies. A similar trend has also been made in dental prosthetics and dental fittings production, which implements 3D scanners into the practice. As profilation students of Department of Biomedical Engineering will start in dental production specialisation, we need to increase their level of knowledge in this field. Based on this factors the be application of 3D scanners to the of the educational process, will relates with above mentioned factors. he aim is to increase the credit students on the market by education the fundamental principles of operation of various types of scanning systems, but also the operation with the appropriate software suite and evaluation of collected data. The planned output of the proposed project will: Guide to simplify work with different 3D scanners in biomedical engineering and dentistry. The scientific community will benefit from a full review of the developed 3D scanning systems published in reputable scientific journal. For the general scientific public will be accessible e-learning course focused on metrological processing and evaluation of the obtained data in the field of biomedical engineering. Multimedia material will be summarized into a format called "Learning by

	Doing" that teach students a practical applications 3D scanning systems.
Time period of the project	01/2016 - 12/2018
Title of the project	Improvement of students' knowledge and skills in the area of designing and application of methods and devices for measurement of geometrical parameters
Type of the project	KEGA
Number of the project	014STU-4/2015
Principal investigator	Dovica Miroslav, prof. Ing., PhD.
Annotation of the project	The project focuses on broadening and implementation of new forms and means of education in the area of measurement of geometrical parameters. The aim of this project is to design and implement new didactic aids for measurement of geometrical parameters into teaching methods to support education focusing on the measurement process. Besides, new methods and processes will be based on the newest findings in a particular area using the most modern techniques. Designed processes, methods and teaching mode will be oriented on the improvement of students' knowledge and skills mainly in the newly established studying programme Measurement (2nd degree) and Mechanical Engineering (1st degree). The improvement of knowledge basis and acquirement of skills and customs of graduates directly relate to the improvement of competitiveness of companies up to the level of other companies in the global market. Goal of this project will be to create a course book that would focus on the newest findings and results of own research in the area of measurement of geometric parameters. These will be targeted at the students of the studying programme Measurement (2nd degree) at the Faculty of Mechanical Engineering TU Košice and will be used during following courses: Measurement of geometric parameters, Geometrical product specifications, Calibration of measurement machines. To support this goal, bachelor and diploma thesis will be elaborated with the output in the form of functional models and equipments. These didactic aids are crucial for teaching, since the students acquire practical knowledge while working with them. In the future, students can easily solve difficult tasks from practice.
Time period of the project	01/2015 – 12/2017
Title of the project	Experimental and computerised biomechanical testing of implantable medical devices and the implementation thereof in the education process
Type of the project	KEGA
Number of the project	064TUKE-4/2016
Principal investigator	Hudák Radovan, doc., Ing., PhD.
Annotation of the project	Biomechanical tests as a process of a validation of implantable medical devices (IMD) are crucial stage of a process of its development and production. Nowadays, thanks to additive manufacturing technologies IMD's take the lead, because each musculoskeletal system is unique. Due

to this reason, each IMD has to be individually tested. Because of this, there is a need to implement practical participation of students to the education process. Their role will be a personal participation in biomechanical testing and in current research in the field.

The essential of the proposed project is in the creation of the methodics of the mechanical (static/ dynamic) testing of the IMD's and its simulation in the environment of the FEA software. Created methodics will be implemented to education process to increase the practical qualification of the students in the field of experimental and computational biomechanics. With participation on the research students will acquire design of experiment methodics. Research tasks will be focused on the students theses. Simultaneously, the results of the biomechanical tests and simulations will be used to optimize individual IMD's design.

Aim is to prepare and create practical seminars for students in sense of "Learning by doing" in the field of experimental and computational biomechanics. From the processed methodics the seminar manuals, textbooks, book and e-learning portal will be created. For the specialized society the methodics of the testing and optimizing the IMD's will be presented at specialized conferences. Results will be published in Slovak and international journals.

Time period of the project

01/2016 - 12/2018

Title of the project

Research of new measuring methods of machine condition.

**Type of the project
Number of the project**

APVV
APVV-15-0149

Principal investigator

Dovica Miroslav, prof. Ing., PhD.

Annotation of the project

The research focuses on new possibilities of machine state monitoring. They are more meaningful in accuracy of identification of failure state, in estimation of residual time until the failure and in earliness of revelation of the beginning of failure state. Newness comes from the elaboration of measurement methods of stiffness of machine components. Based on the results of analysis, actual state of machine or machine knot is set. CNC cutting machines and coordinate measurement machines (CMM) are the object of the measurement. Measurement is aimed at the determination of static and dynamic stiffness in the confrontation of changes and other state parameters, such as temperature, vibrations, deformations, positioning accuracy, etc. Relationship of changes between static and dynamic stiffness is supported by elaboration of proper mathematical apparatus. Results of basic research are directed into the development of new effective diagnosis methods and devices.

Time period of the project

07/2016 – 06/2020

Title of the project	Manufacturing and testing of custom made bone scaffolds made of hydroxyapatite (HA) by use of 3D printing technology
Type of the project	APVV
Number of the project	APVV-14-0294
Principal investigator	Hudák Radovan, doc. Ing., PhD.
Annotation of the project	Clinical practice recently requires an alternative for implants manufactured from titanium alloys, which are optimal for specific types of individual anatomical defects of hard tissues. Project solves production and testing of individual hard tissues scaffolds made of hydroxyapatite (HA) by 3D printing technology (3DP). One of the advantages of 3DP is its possibility to produce free form implants with applicated porous structures for better osseointegration. These tissues will be tested from material, biomechanical and biological point of view and prepared for clinical applications.
Time period of the project	07/2015 - 06/2018

Title of the project	Design and complex characterization of biocompatible tubular 3D-scaffolds made of biosynthetic extracellular matrix intended as potential substitutes of damaged human urethra
Type of the project	APVV
Number of the project	APVV-15-0111
Principal investigator	Hudák Radovan, doc. Ing., PhD.
Annotation of the project	In recent years, regenerative medicine and tissue engineering studies have led to the development of novel biomaterials mimicking the extracellular matrix, which are suitable for autologous or pluripotent (stem) cellular colonization. One of intensively studied areas is the use of tubular scaffolds generated by 3D-printing and their colonization by epithelial (autologous, respectively initially pluripotent) cells and smooth muscle cells with the purpose of implantation and replacement of damaged urethra in humans. The goal is to design an optimal biodegradable and biofunctional scaffolds which will be colonized by cells (epithelial and stem cells). It will be tested on animal model, which will facilitate the transfer to clinical practice.
Time period of the project	07/2016 - 06/2020

Title of the project	Analysis of the PEEK polymer and the additive manufacturing possibilities
Type of the project	APVV
Number of the project	APVV-15-0356
Principal investigator	Živčák Jozef, Dr.h.c. prof. Ing., PhD.
Annotation of the project	Project solves production of the individual hard tissue scaffolds made from Poly-ether-ether-ketone (PEEK) by CAD/CAM technology. Additive 3D printing technology allow produce free form implants with applicated porous structures on implants surface for better osseointegration. Manufactured implant scaffolds will be tested from material, biomechanical and biological point of view and prepared for clinical applications.
Time period of the project	07/2016 - 06/2019

VISITS OF STAFF MEMBERS FROM FOREIGN INSTITUTIONS

Employees and students	Country
Kneppo Peter, prof. Ing., DrSc.	ČVUT Prague, Faculty of Biomedical Engineering
Sidun Jaroslaw . Assoc. Professor, Eng., PhD	Politechnika Bialostocka, Poland

MEMBERSHIP IN SLOVAK PROFESSIONAL ORGANISATIONS

Member of scientific boards of domestic and foreign magazines

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

A member of the journal "Metrológia a skúšobníctvo" (Metrology and Testing) – Slovak Republic

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

A member of the journal Acta Mechanica Slovaca – Slovak Republic

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

Member of the board of home magazine Trauma ISSN 1335 - 8588, Slovak Republic

Chairman of the National Grant Agency KEGA MŠ VVaŠ, Slovak Republic.

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

Chairman of Committee TC 18, Slovak Republic.

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

Member of scientific boards: TU SjF

Košice, TU Košice, PU FZO Prešov, PU

Prešov, TU SjF Žilina, ČVUT FBI

Prague, KU – TF Ružomberok, FŠ PU v

Prešove, SMU Bratislava.

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

The main course supervisor of Biomedical Engineering field.

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

The main course supervisor of scientific discipline Bionika a biomechanika.

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

The main course supervisor for the habilitation rights and inauguration in the field of Biomedical Engineering.

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

Chairman of FOK (faculty committee) in the field of Biomedical Engineering.

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

Member of the Privy Council for project preparation.

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

Member of scientific boards of domestic and foreign magazines.

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

Member of the board of a foreign magazine

Lékař a technika (The Clinician and Technology) ISSN 0301 - 5491 (Czech Republic)

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

Acta Mechanika a automatika Poland Reflexotherapy (Poland)

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

Representative of Slovak Republic and Biomedical engineering field in a membership

of Technical University of Košice v EAMBES – European Alliance for Medical and Biological Engineering Science.

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

Member IFSA No. 20040120 - 001 – International Frequency Sensor Association.

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

Representative of Slovak Republic v IMEKO – TC 18 – Measurement of Human Functions.

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

Member of the scientific committee IOP – „Inżynieria ortopediечно protetična“ (Poland).

Jozef Živčák, Dr.h.c. prof. Ing., PhD.

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PROTOTYPING AND INNOVATION CENTER

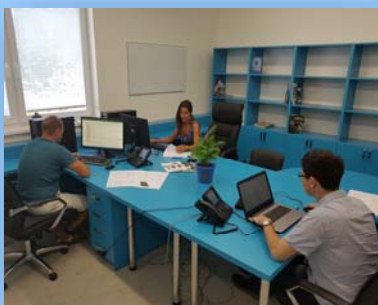


PROTOTYPING AND INNOVATION CENTER



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Staff

- Assoc. Professor: 1
- Researchers: 5
- Secretary: 1
- Engineer: 1

LIST OF SUBJECTS GUARANTEED BY THE CENTRE

- | | |
|---|---|
| ✓ Basic of Information and Computer Systems | ✓ Informatics and PC II. |
| ✓ Basic Informatics | ✓ Information Systems in Maintenance |
| ✓ CA Methods in Mechanical Design | ✓ Information Technology |
| ✓ CA Methods in Mechanical Design I. | ✓ Introduction to Computer Technology |
| ✓ CA Methods in Mechanical Design II. | ✓ Introduction to PC Hardware |
| ✓ CA Methods in Mechanical Design III. | ✓ Introduction to PC Software |
| ✓ CAD | ✓ Introduction to Programming Languages and Tools |
| ✓ CAD Methods in Mechanical Design | ✓ Maintenance Information Systems |
| ✓ CAD - Introduction to Solid Modeling | ✓ Modeling and Simulation of Systems |
| ✓ CAD - Introduction to Surface Modeling | ✓ Processes Design by CAD |
| ✓ Computer Aided Design | ✓ Information training and information literacy |
| ✓ Concepts of Information and Computing Systems | ✓ Programming techniques |
| ✓ Construction and CAD | |
| ✓ Informatics and PC I. | |

ACTIVITIES OF THE CENTRE

• TEACHING PROCESS

- system of open access to Centre for students and their teachers
- recruitment and training of students interested in work on machine tools with possibility to participate in manufacturing of prototypes
- involvement of students in the design phase of work as team members

• RESEARCH

Areas of research:

- ✓ CAD systems
- ✓ CNC Machining
- ✓ Programming techniques
- ✓ CA Technologies
- ✓ IT Technologies
- ✓ Robots for harsh environment
- ✓ Robotic cells for spraying

Areas of expertise:

- | | |
|-------------------------|-----------------------|
| ✓ Computer Hardware | ✓ Wifi Administration |
| ✓ Computer Software | ✓ CA – Technologies |
| ✓ Server Administration | ✓ Service robotics |

Projects of the Centre:

- **Increasing the academic qualifications of TUKE research staff**

This project deals with improving the qualifications of researchers. Expanding knowledge of CA technology, finite element analysis, design and construction machines, flow and others.

- **Research into the technology of composite components joining by adhesive bonding, using an intelligent robotic system in mass production**

APVV project submitted in 10/2017. Partner - Slovak Academy of Science.

- **Network of teleoperated and reconfigurable intelligent swarm robots for harsh environment**

H2020 (ICT-25-2016-2017) project submitted in 04/2017. Coordinator University of Surrey (UK).

- **MANUFACTURING**

- Training of operators of CNC machine tools
- Commissioning of all machine tools and testing of their parameters
- Specification and public procurement preparation for ancillary equipment for machine tools
- Administrative preparation of production process
- Ensuring the compliance with ISO9001 and safety standards
- Second phase of infrastructure completion
- Start of prototype manufacturing for the internal needs of university

- **PR AND MARKETING**

- Centre's WEB page (SK/EN) and brochure preparation
- Open doors day co-organisation
- Preparation and coordination of the European Robotics Week in SR
- Presentation of the Centre to industrial and academic partners

PUBLICATIONS

Journals

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