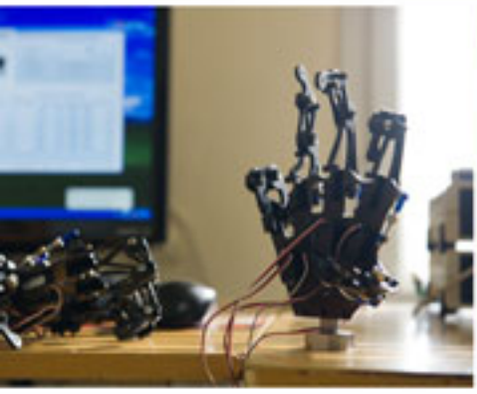


FACULTY OF MECHANICAL ENGINEERING

TECHNICAL UNIVERSITY OF KOŠICE
SLOVAKIA

ANNUAL REPORT
2015

ANNUAL REPORT
2015

Technical University of Košice
Faculty of Mechanical Engineering

ANNUAL REPORT 2015

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

Publisher:
Deans Office of FME TU of Košice, Letná 9/B, 042 00 Košice Slovakia
www.sjf.tuke.sk

Design:
doc. Ing. Jaroslav Jarema, CSc.

Photo:
Ing. Róbert Klik and archive FME TUKE

Edition:
203 pages, 50 pieces, 1st edition, April 2016

PREFACE

The Faculty of Mechanical Engineering at the Technical University of Košice belongs into the European university educational area as an integrated part of it and at the same time the Faculty is a full-valued member of the European research community. The main task of the Faculty of Mechanical Engineering, Technical University of Košice is enhancing of the educational and research level, interconnection of the academic education with the community requirements and contributing to the development of intelligence, science and culture in our country. Professional position of the mechanical engineer, together with the role of technical education is irreplaceable within the contemporary dynamical development of the society, taking into consideration the excellent results achieved in the range of science and technology. Therefore, the Faculty of Mechanical Engineering is oriented towards such professional branches of the engineering that are focused on innovative and sophisticated technical solutions, together with the added value and with the best occupational possibilities offered for the graduates.

It is a great honour for me to lead this Faculty already during the fourth functional period. I highly appreciate a confidence of the Academic Senate members as well as trust of the whole academic community. Quality of the Faculty staff and material equipment, together with the overall top level of the Faculty, were also verified in the form of the final evaluation, which is resulting from the actual complex accreditation process. The Faculty has successfully passed the Complex Accreditation in five research domains and in this way it ensures a wide range of the study branches in the engineering area. The Faculty obtained the best final evaluation degree “A” in two research areas, whereas one of them is just the “Engineering”, which incorporates the main part of the study programmes. The Faculty was evaluated with the best classification within the framework of the Slovak Republic in the engineering study programmes, which were actualised or modified according to the

requirements from the industrial practice. There is emphasised an importance of the professional-practical working experiences for our students, also the language preparing of the students, together with the engineering projection works and design activities. The study subjects, which are involved in the given study programmes, were supplemented and innovated with regard to a bilateral connection between the theoretical knowledge base and the industrial background. The Faculty is authorized to realize habilitation procedures and inauguration processes in 14 branches. The educational process of the 21st century predicts such kind of graduate, who will be able to play the leading role during a future development of the whole society. The analytical and technical skills are the most important educational characteristics nowadays. Transformation process, which is oriented towards the above-mentioned changes relating to the education, should become the highest priority for the universities. Practical aspect of the

educational activities is an unavoidable necessity.

The Faculty was awarded by the distinguished appreciation, namely by the "National Quality Award of the Slovak Republic 2015", which confirms excellence of the Faculty. The Faculty of Mechanical Engineering, Technical University of Košice became a winner in the category C (Public Sector Organisation) in the year 2015. This nation-wide success is a result of the pedagogical and scientific-research activities of the Faculty employees. At the same time and in the same category there was also awarded the best scientific contribution from the authors of this Faculty. Another proof of the Faculty excellence represents the top scientific Faculty team, which is working in the Research Area 17 – "Engineering and Technologies – Centre of Applied Biomedical Engineering", as well as the HONORARY DOCTORATE OF LETTERS IBC Cambridge awarded to the Dean of Faculty.

The recent evaluation of our Faculty, which was performed by the Slovak "Academic Ranking and Rating Agency", sounds positively and this evaluation result reflects an improvement in all relevant indicators, mainly in the area of the grant projects, citations and attraction of study. These improvements resulted in a jump of our Faculty from the previous 15th position to the actual 6th position, i.e. the Faculty is a "jumper of the year" 2015.

The Institute of Transport and Procedural Engineering at the Faculty prepared to accreditation process a new combined study programme, which should be realised in the 1st and 2nd study degree – namely it is the study programme "Automotive Engineering", which creates conditions for professional practical intership of our students. This trainee-ship should be realised during one complete study term. The study programmes of our Faculty are modified and extended with regard to the requirements of the present digitalised world.

It is a well-known fact that the engineering or engineering industry is one of the most relevant factors for the next dynamic development of the national economy, whereas the engineering production is also important for the future development of the other industrial branches. The Faculty of Mechanical Engineering, Technical University of Košice is prepared for quality education of mechanical engineers, who will be able to manage the most demanding tasks. Unemployment rate of our graduates is the lowest because our graduates can be employed successfully in various engineering positions.

The development strategy of the mechanical engineering study at our Faculty is focused on the perspective research and development activities, together with education of the future professionals – innovators. The main strategic goal of the Faculty, which is defined in the area of education, is increasing of the educational process quality in each of the three levels of the university study, whereas the competent teachers are implemented in the research activities. Another important task is modifying of the individual study programs so that the future graduates could be flexible enough with regard to meeting the changing requirements of the industrial and social practice. The Faculty fulfils an important condition of complexity relating to the structures of the individual study branches and it is prepared to react promptly to the new challenges.

Adaptation of the study programmes, taking into consideration the practical requirements, is an absolute necessity nowadays. It is necessary to perform the flexible changes concerning responses of universities to the new and changing demands coming from practice. A better preparation of students with regard to practical experiences enables to improve their importance and personal participation in development of the whole society. The students should be oriented towards the analytical and technical skills. The basic teaching subjects are relevant, of course, however but they should be integrated with an ability to apply knowledge and skills, as well as with a critical thinking. There is also important practical and correct application of knowledge in new situations, analysis of information, understanding new suggestions, communication and

cooperation during solution of problems or for making relevant decisions.

The Faculty was successful during the year 2015 also in allocation of domestic and foreign grant projects. The scientific-research activities of the Faculty are based on solution of the projects from the Operational Programme "Science and Research", as well as on solution of the grant projects and other projects that are meeting the requirements arising in technical and production practice. The scientific-theoretical and experimental results obtained during solution of these projects create an unavoidable potential for the following publication activities and for practical implementation of the scientific-research results.

Beginning of the 21st century is characterised by a start of the so-called information revolution. Information is a substantial moving force in the industrial production and economy. On the present, importance of the non-material product is predominant in comparison with the material product. Price of information creates a relevant part within the total product costs. The knowledge-based society enables to change not only the economical productivity of the whole community, but it also influences the global conditions of human life in the era of great changes. It is necessary so that the graduates would be able to contribute to development of the society on the changing conditions. Therefore it is needed to create a set of competences and to support innovations in connection with the new terms "Internet of Things" and "Smart System". The 4th industrial revolution is based on communication among the individual technical devices. From this reason it is substantial to dispose of correct data, what is the first step towards digitisation of the production or the whole plant. The second step is digitisation of the products, which enables to suggest and to optimise a large amount of the production processes. Transformation of production towards the Industry 4.0 is an oncoming challenge for our Faculty

The Faculty of Mechanical Engineering, Technical University of Košice has a lot of bright ambitions. One of them is completion of the Centre for Prototypes and Innovations, together with supplementation of personal and material equipment of the Faculty Institutes, as well as to increase number of the research workers and PhD.-students. These individual steps are necessary in order to create a sufficient scientific-research capacity of the Faculty with regard to fulfilment of our main strategic goals, whereas the highest priority is intention to be the scientifically oriented faculty, which will be implemented into the structure of the best technical faculties in the EU.

In Košice, the 22th April 2016

Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.
Dean of the Faculty

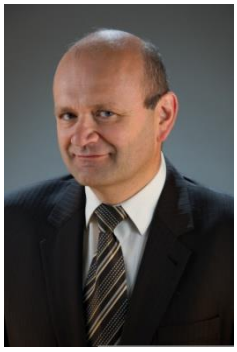
MANAGEMENT OF THE FACULTY

Dr.h.c. mult. prof. Ing. František TREBUŇA, CSc.
DEAN OF THE FACULTY

prof. Ing. Miroslav DOVICA, PhD.
VICE - DEAN RESPONSIBLE FOR DEVELOPMENT, EVALUATION AND PROJECTS COORDINATION

prof. Ing. Michal KELEMEN, PhD.
VICE - DEAN RESPONSIBLE FOR SCIENTIFIC - RESEARCH ACTIVITIES, FOREIGN RELATIONS AND FOR STUDY IN 3rd DEGREE

prof. Ing. Janette BREZINOVÁ, PhD.
VICE - DEAN RESPONSIBLE FOR STUDY IN 1st A 2nd DEGREE



prof. Ing. Ervín LUMNITZER, PhD.
CHAIRMAN OF ACADEMIC SENATE

Ing. Alžbeta ZAPACHOVÁ
SECRETARY OF THE FACULTY

SCIENTIFIC BOARD

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prof. Ing. Eva Zdravecká, CSc.
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prof. Ing. Marián Peciar, PhD. - SjF STU Bratislava, prorektor
prof. Ing. Jozef Peterka, PhD. - MtF STU Trnava, dekan
doc. Ing. Štefan Rosina, PhD. - Matador Group, a.s., Bratislava
prof. Dr. Ing. Milan Sága - SjF ŽU Žilina, dekan
Ing. Vladimír Slezák - Siemens Slovensko, generálny riaditeľ
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prof. Ing. Mikuláš Hajduk, PhD. – KR
prof. Ing. Emil Evin, CSc. – KAV
prof. Ing. Ildikó Maňková, CSc. – KPPT
doc. Ing. Ján Viňáš, PhD. – KSTaM
prof. Ing. Jozef Kováč, CSc. – KPIaM
prof. Ing. František Šimčák, CSc. – KAMaSI
prof. Ing. Mária Čarnogurská, CSc. – KET
prof. Ing. Jaroslav Homišin, CSc. – KKAaDI
prof. Ing. Peter Demeč, CSc. – KVT
prof. Ing. Hana Pačaiová, PhD. – KBaKP
Students:
Ing. Radko Popovič
Bc. Michal Grajcar
Bc. Miroslava Jámborová
Bc. Matúš Ondáš
Tomáš Képes
Stanislav Kolečanyi
Jozef Kostka

EDUCATION

Accreditation for:

Bachelor level

1) Automotive Production
2) Computer Aided Engineering Production
3) Industrial Engineering
4) Prosthetics and Orthotics
5) Technology of Environment Protection
6) Mechanical Engineering – new
7) Technology, Management and Innovation in Machinery Production – new
8) Management of Technical and Environmental Risks in Mechanical Engineering - new

Master (Engineer) level

1) Applied Mechanics
3) Automation and Control of Machines and Processes
5) Automotive ProductionSafety of Technical Systems
7) Production QualityBiomedical EngineeringTransport Machines and LogisticsPower Supply Machines and MachineryMechatronicsComputer Aided Engineering Production
13) Industrial EngineeringEngineering TechnologiesMachines and Machinery for Building Industry, Agriculture and DressingMechanical Engineering
17) Technology of Environment ProtectionProduction Machines and Machinery
19) Measurement
20) Plastics Technologies
21) Management of Technical and Environmental Risks in Mechanical Engineering

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) Industrial Engineering
10) Engineering Technologies and Materials
11) Technology of Environmental Protection
12) Production Machines

Numbers of Students

STUDY LEVEL	FULL - TIME STUDENTS	EXTERNAL STUDENTS	TOGETHER
BACHELOR	701	11	712
ENGINEER	610	56	666
DOCTORAL	40	64	104
			1482

Habilitations and Inaugurations

Habilitations

Ing. Peter Kaššay, PhD.

Thesis:	Modelovanie, analýza a optimalizácia torzne kmitajúcich mechanických sústav
Lecture:	Aktuálne problémy a trendy ovládnutia torzného kmitania

Ing. Silvia Medvecká-Beňová, PhD.

Thesis:	Neštandardný eliptický ozubený prevod s plynule sa meniacim prevodovým číslom a asymetrickým profilom zubov
Lecture:	Spôsoby určovania tuhosti ozubenia

Ing. Patrik Šarga, PhD.

Thesis:	Uplatnenie mechatronických princípov pri riešení úloh experimentálnej mechaniky
Lecture:	Moderné trendy v oblasti merania zvyškových napätí

Ing. Ján Kráľ, PhD.

Thesis:	Overovanie presnosti 3D CNC obrábacieho stroja pri výrobe matematicky definovaných tvarových súčiastok
Lecture:	Vplyv geometrickej nepresnosti CNC strojov pri výrobe presných tvarových plôch

Ing. Teodor Tóth, PhD.

Thesis:	Využitie počítačovej tomografie v procese navrhovania individuálnych implantátov
Lecture:	Počítačová tomografia ako nástroj hodnotenia vnútorných štruktúr a komplexnej geometrie výrobkov

Ing. Kamil Židek, PhD.

Thesis:	Automatické rozpoznávanie a klasifikácia výrobných povrchových chýb na báze vstavaných kamerových systémov
Lecture:	Využitie MEMS snímačov v automatizovaných systémoch

Inauguration

doc. Ing. Janette Brezinová, PhD.

Lecture: Výskum tvorby, vlastnosti a možnosti využitia povrchových vrstiev strojárskych výrobkov

doc. Ing. Michal Kelemen, PhD.

Lecture: Mechatronické prístupy k návrhu výrobkov

Distinguished Awards

National Quality Award of the Slovak Republic 2015

The Faculty of Mechanical Engineering, Technical University of Košice became a winner in the category C (Public Sector Organisation) in the year 2015. This nation-wide success is a result of the pedagogical and scientific-research activities of the Faculty employees. At the same time and in the same category there was awarded the best scientific contribution (authorship researcher) Team of authors from the Faculty of Mechanical Engineering T. Toth, R. Hudak, J. Živčák.


SIEŇ SLÁVY
NÁRODNEJ CENY SLOVENSKEJ REPUBLIKY ZA KVALITU
VÍŤAZI SÚŤAŽE ZA ROKY 2000 - 2014
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
2015
SIMS
CEIT
TSU


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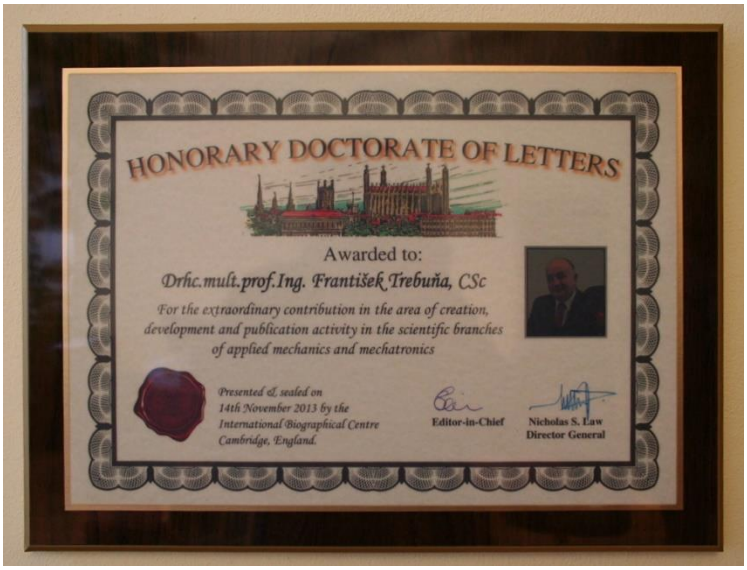
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
2015
SIMS
CEIT
TSU

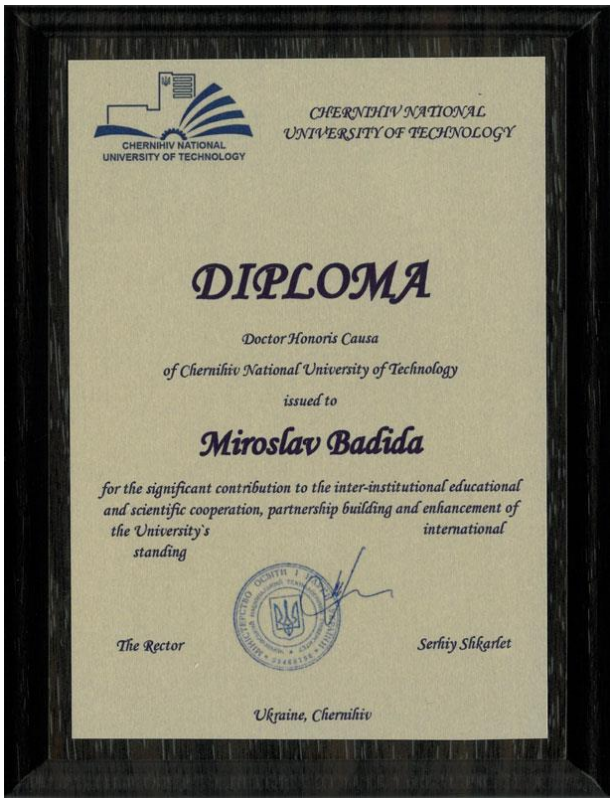
Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.

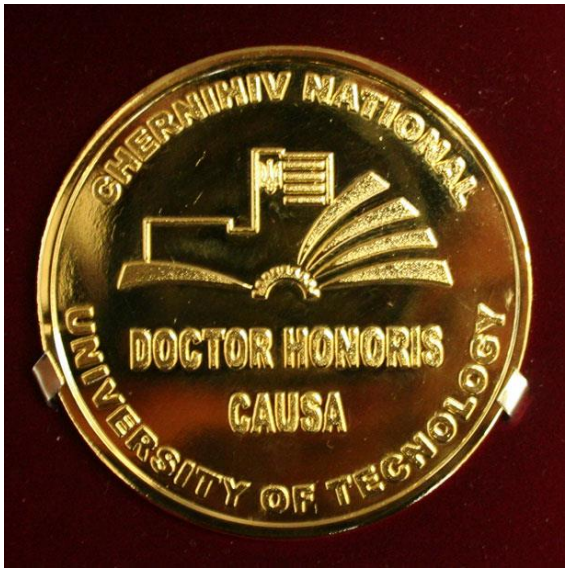
Honorary Doctorate of Letters “For the extraordinary contribution in the area of creation, development and publication activity in the scientific branches of applied mechanics and mechatronics,” International Biographical Centre Cambridge, England



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

Chernihiv National University of Technology, Chernihiv, Ukraine awarded the title of Doctor Honoris Causa (Dr.h.c.) our employee Dr.h.c. mult. prof. Ing. Miroslav Badida, PhD. Department of process and environmental engineering.





Commemorative medals

Slovak Welding Society appreciated the cooperation with our faculty, department STaM and its employees commemorative medal

SLOVENSKÁ ZVÁRAČSKÁ SPOLOČNOSŤ
SLOVAK WELDING SOCIETY
Kocelova 15, 815 94 Bratislava 2, SR

si dovoľuje
pri príležitosti 60. výročia založenia
udeliť

PAMÄTNÚ MEDAILU

Strojníckej fakulte
Technickej univerzity v Košiciach

Košice, 08. októbra 2015

Ing. Pavol RADIČ
predseda Slovenskej zváračskej spoločnosti

SLOVENSKÁ ZVÁRAČSKÁ SPOLOČNOSŤ
SLOVAK WELDING SOCIETY
Kocelova 15, 815 94 Bratislava 2, SR

si dovoľuje
pri príležitosti 60. výročia založenia
udeliť

PAMÄTNÚ MEDAILU

Katedre strojárskych technológií a materiálov
Strojníckej fakulte
Technickej univerzity v Košiciach

Košice, 08. októbra 2015

Ing. Pavol RADIČ
predseda Slovenskej zváračskej spoločnosti

si dovoľuje
pri príležitosti 60. výročia založenia
udeliť

PAMÄTNÚ MEDAILU
ZA SPOLUPRÁCU
prof. Ing. Emilovi SPIŠÁKOVI, CSc.

si dovoľuje
pri príležitosti 60. výročia založenia
udeliť

PAMÄTNÚ MEDAILU
ZA SPOLUPRÁCU
prof. Ing. Janette BREZINOVEJ, PhD.

si dovoľuje
pri príležitosti 60. výročia založenia
udeliť

PAMÄTNÚ MEDAILU
ZA SPOLUPRÁCU
doc. Ing. Jánovi VIŇÁŠOVI, PhD.

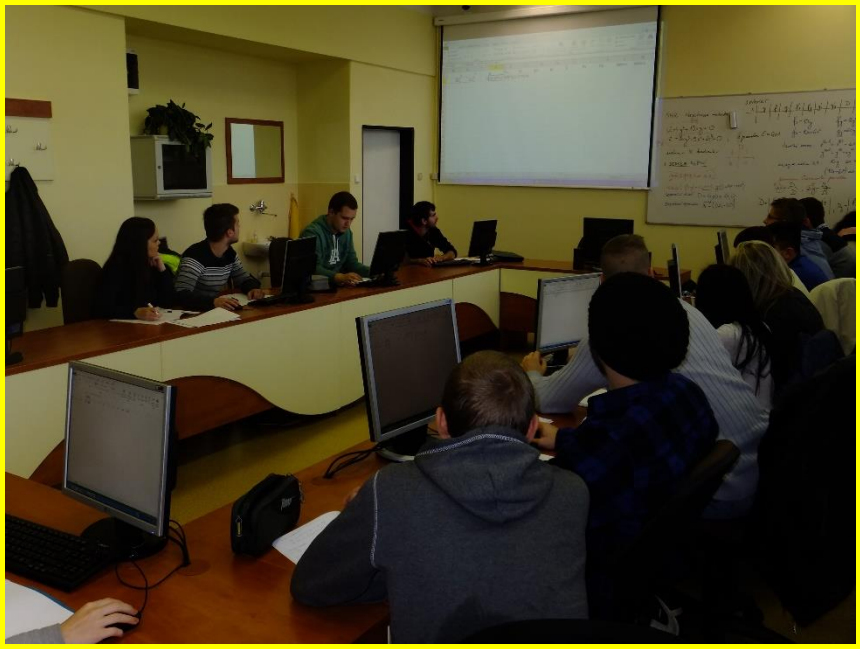
INSTITUTE OF AUTOMATION, ROBOTICS AND MECHATRONICS

- 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

The head:	Bača Martin, prof. RNDr., CSc.
E - mail:	martin.baca@tuke.sk
Address:	Letná 9, 041 87, Košice, SR
Phone no.:	+421 55 602 2215
Fax.:	+421 55 602 2223



Staff

- Professors: **1**
- Assoc. Professors: **1**
- Assist. Professors **7**
- Researchers: **0**
- PhD. Students: **0**

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2014
03/2015	16th Conference of Košice Mathematicians, Herľany (prof. RNDr. Martin Bača, doc. RNDr. Andrea Feňovčíková, PhD., RNDr. Zuzana Kimáková, PhD.)
07/2015	20th International Conference on Magnetism, Barcelona, Spain (RNDr. Jana Füzerová, PhD., RNDr. Lucia Gálisová, PhD., RNDr. Denisa Olekšáková, PhD.)
09/2015	The Second International Conference on Graph Theory and Information Security 2015, Institut Teknologi Bandung, Bandung, Indonesia (prof. RNDr. Martin Bača, CSc., doc. RNDr. Andrea Feňovčíková, PhD.)
09/2015	Graphs Masters Workshop 2015, Jember University, Jember, Indonesia (prof. RNDr. Martin Bača, CSc., doc. RNDr. Andrea Feňovčíková, PhD.)
10/2015	International Conference on Mathematics, Statistics, Computer Sciences and Mathematics Education 2015, Hasanuddin University, Makassar, Indonesia (prof. RNDr. Martin Bača, CSc., doc. RNDr. Andrea Feňovčíková, PhD.)

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

Bachelor study

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

GRADUATE THESES

MASTER'S THESES:

Soňa Betáková	Using statistical quality management tools in analysing and evaluating in the selected production process
Stanislav Hoššo	Crimping process optimization with using statistical quality management tools

RESEARCH AT THE DEPARTMENT

Area of research:

- ✓ Asymptotical properties of ordinary differential equations with distributed arguments.
- ✓ 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 mathematical model for calculation of the coercivity.
- ✓ The study of permeability dependence on the frequency and simulation of function by the mathematical models.
- ✓ The theoretical study of lattice Hamiltonians of the spin systems for zero and non - zero temperatures.
- ✓ Exactly soluble spin models on decorated lattices.
- ✓ Statistical processing control.
- ✓ Using 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 differential equations, graph theory and mathematical calculations in theoretical physics.

Areas of expertises:

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

PROJECTS OF THE DEPARTMENT

Title of the project	**University Science Park TECHNICOM for Innovation Applications with the Support of Knowledge-Based Technologies**
Type of the project	EU – OP Research and Development
Number of the project	ITMS code 26220220182; OPVaV - 2012/2.2/08 - RO
Principal investigator	doc. Ing. Ján Spišák, PhD.
Time period of the project	2013 - 2015
Annotation of the project	The primary objective of sub-activity is the provision of comprehensive services in the field of testing and analysis of raw materials, intermediate products, reinforcing materials, rubber compounds and finished rubber products such as tires, conveyor belts and rubber technical products to achieve sustainable quality in accordance with the new technical standards. Research and development activities will work in line with developments in the field of research. Quality and sustainable development department ensures that the following subtasks: design and specification of test and verification work rubber products and the identification of maintenance service, secure online collaboration research team with external national and foreign institutions and implementation of research and development FTaVP GV in selected production systems and services.

NATIONAL PROJECTS

Title of the project	**The influence of interaction of ferromagnetic iron based particles on the magnetic properties of composite materials**
Type of the project	Grant project VEGA
Number of the project	1/0861/12
Principal investigator	prof. RNDr. Peter Kollár, CSc.
Time period of the project	2012 - 2015

Annotation of the project	The project is focused on experimental study of the structure and magnetic properties of advanced materials with heterogeneous structure consisting of ferromagnetic particles based on iron embedded in magnetically active or inactive matrix which insulates ferromagnetic particles (organic binders, ferrite and silica). The particles with the size of 2 nm - 0.1 mm have amorphous, nano - or microcrystalline structure. The particles with size of 2 nm - 100 nm will be prepared by chemical methods: nanocasting method or by the reverse micelle method and larger particles by mechanical milling. The study will be focused on the explanation of the influence of the interaction of these particles on their magnetic properties under various physical conditions (temperature and magnetization method). Expected results should further expand the application potential of the advanced materials for recording media with high density and soft magnetic materials suitable for application at frequencies above 20 kHz, where are ferrites used.
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	RNDr. Ján Füzer, 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	**Research of the Impact of Material Characteristics and Technological Parameters of Belt Conveyors on the Intensity of Contact Forces and Resistance to Motions of Hose Conveyors Using the Experimental and Simulation Methods**
Type of the project	Grant project VEGA
Number of the project	1/0922/12
Principal investigator	doc. Ing. Gabriel Fedorko, PhD.
Time period of the project	2012 - 2015
Annotation of the project	The essence of scientific research project is to interact pair of conveyor belt - guide rollers within the tubular conveyor roller stool. The project focuses on research conditions that affect the size of the resistance movement and contact forces. The basis of the research is based on experimental measurements on a special measuring device and subsequently analyzing, examining the measured values with high simulation software.

Title of the project	**Mathematical support of the education in the area of biomedical engineering with orientation on the work in specialized laboratories**
Type of the project	Grant project KEGA
Number of the project	072TUKE - 4/2014
Principal investigator	prof. RNDr. Martin Bača, CSc.
Time period of the project	2014 - 2016
Annotation of the project	The project is aimed at the modernizing and the improving of the mathematical support education in biomedical engineering with a focus on work in specialized laboratories, in particular to support mathematical modeling and preparation, implementation, evaluation and interpretation of experiments in these laboratories. The primary aim of the project is to support of the study of lesson Mathematics modeling for II. degree study program of Biomedical engineering and the promotion of the working in specialized laboratories, in particular in making theses for II. and III. degree study for this program. The project will be developed university textbooks, scientific monograph and selected parts of the project results will be processed for modern web forms of the education.
Title of the project	**Innovation in laboratory technology educational program of study Industrial Engineering**
Type of the project	Grant project KEGA
Number of the project	079TUKE - 4/2013
Principal investigator	Dr.h.c. mult. prof. Ing. Jozef Mihok, PhD.
Time period of the project	2013 - 2015
Annotation of the project	The project focuses on strengthening of laboratory teaching of technology in the field 05/02/52 Industrial Engineering study program in Industrial Engineering. It focuses mainly on the second and third cycle of higher learning to foster not only knowledge, innovative thinking and practical skills. Application of innovative training methods, particularly laboratory activities, interactive participatory design verification and simulation of business processes and systems throughout the value chain is considered essential for the development trend of learning processes. The solution is the extension of the existing base laboratory of the Department of Industrial Engineering new technical, computer and software resources.
Title of the project	**Intensification of modeling in education of II. and III. degree in the field of study 05/02/52 Industrial Engineering**
Type of the project	Grant project KEGA
Number of the project	004TUKE - 4/2013
Principal investigator	doc. Ing. Peter Trebuňa, PhD.
Time period of the project	2013 - 2015
Annotation of the project	The purpose of this project and its main objective is to increase the attractiveness of the study puts the Department of Industrial Engineering 5.2.52 for both students and prospective students, but primarily for industrial practice, for which students are an essential input into the production process based on knowledge acquired during their studies, methodologies and working practices. The current corpus of field of study is relatively unchanged since 2004, accredited study program, Faculty of Mechanical Engineering, Technical University of Kosice, where his interest in the study or not stop now. To increase its attractiveness, it is necessary to inspect the program conceptually and upgrading its parts especially in the second and third level of study in particular the introduction of new for the current industrial

	practice of the necessary things they can use študentom immediately after graduation.
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	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 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	**Collective phenomena in coupled electron and spin systems**
Type of the project	Grant project APVV
Number of the project	APVV-0097-12
Principal investigator	RNDr. Pavol Farkašovský, CSc.
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 insulatig 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.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUTIONS

Employees and students	Country
Jana Füzerová, RNDr., PhD.	Spain (04.07.2015-11.07.2015)
Lucia Gálisová, RNDr., PhD.	Spain (04.07.2015-11.07.2015)
Denisa Olekšáková, RNDr., PhD.	Spain (04.07.2015-11.07.2015)
Bača Martin, prof. RNDr., CSc.	Indonesia (19.09.2015-05.10.2015)
Andrea Feňovčíková, doc. RNDr., PhD.	Indonesia (19.09.2015-05.10.2015)

VISITS OF STAFF MEMBERS FROM FOREIGN INSTITUTIONS

Employees and students	Country
Haryeni Debi Oktia	Institut Teknologi Bandung, Indonesia (11.9.2015-04.12.2015)
Rahmadani Desi	Institut Teknologi Bandung, Indonesia (11.9.2015-04.12.2015)
Susilavati Susilavati	Institut Teknologi Bandung, Indonesia (11.9.2015-04.12.2015)
Mirka Miller	University of Newcastle, Australia (14.06.2015-20.06.2015)
Joe Ryan	University of Newcastle, Australia (14.06.2015-20.06.2015)
Dushyant Tanna	University of Newcastle, Australia (06.05.2015-02.07.2015)

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.
Jana Füzerová, RNDr., PhD.
Gabriela Ižaríková, Mgr., PhD.
Zuzana Kimáková, RNDr., PhD.
Marcela Lascsáková, Mgr., PhD.
Denisa Olekšáková, RNDr., PhD.

Slovak Mathematical Society
Martin Bača, prof. RNDr., CSc.

PUBLICATIONS

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Department of Mechatronics

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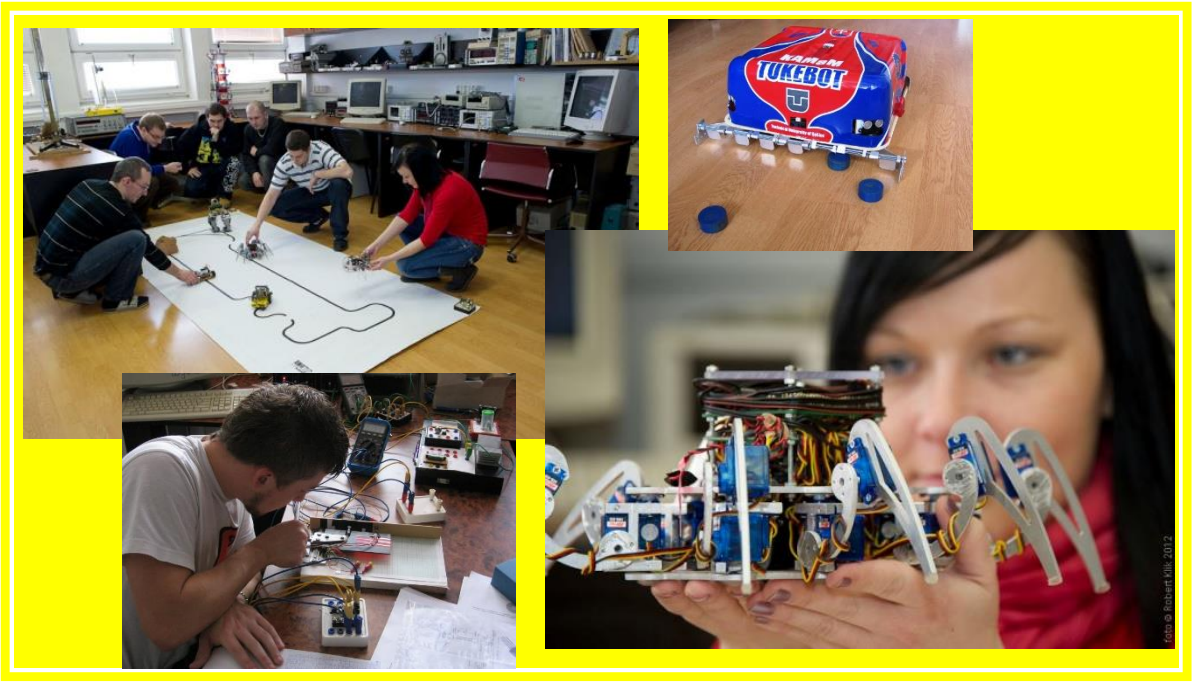

Staff

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

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2015
5/2015	Department's competition of student scientific and technical activities.

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Master's degree:

- **Mechatronics**

Number of the students
(till 30. 10. 2015) on the study programs guaranteed by the department:

first year of bachelor study:
– 13 internal form of study

first year of engineer study:
– 8 internal form of study

second year of engineer study:
– 14 internal form of study

PhD. degree:
– 1 PhD. students in the internal form of study

Number of the graduates (2014/2015)
on the study programs guaranteed by the department:
– 9 students in the internal form of engineering study
– 1 PhD. student in the internal form of study (defended PhD. thesis)

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 analyze, 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
- ✓ Theory of Dynamic Systems

Automation and control of machines and processes (Master study)

- ✓ Mechatronic Systems

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.
- ✓ Microprocessor Systems
- ✓ Microprocessor Technology
- ✓ Modeling and simulation of mechatronic systems
- ✓ Programming of Application
- ✓ Sensors and converters
- ✓ Term Project I.

GRADUATE THESES

MASTER'S THESES:

Miriama Fialková	Examination of properties of distance sensor based on Hall effect
Marcel Krempaský	Application of Matlab-Simulink in testing device for friction force monitoring in abrasion
Vladimír Leško	Device for testing of shape memory alloy actuators
Maroš Michna	Design of actuators and control electronics of humanoid robot hand
Štefan Mrkva	Design of redundant manipulator joint
Adam Prusák	Maximization of productivity and capacity of production line
Milan Škurka	Quadrocopter - analysis and modeling
Michal Štefanič	Design of snake-like robot with non-holonomic limitation
Ladislav Vaško	Design of functional and produceable internal optic of given paramers of frontal headlight BASIS with retaining homologization conditions

PhD. THESES:

František Menda	Measurement automatization and results evaluation in Ring-Core method

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	**Using of methods of experimental and numerical modelling for increasing of competitiveness and innovation of mechanical and mechatronics systems**
Type of the project	APVV – applied research and development
Number of the project	APVV - 0091 - 11
Principal investigator	Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.
Time period of the project	07/2012 - 12/2015
Annotation of the project	Methods of experimental and numerical modelling of mechatronic systems are significant part of acceleration of product design with substantially shorter time of introduction of product into production and on market. They support reduction of errors, more powerful and sophisticated products with high added value. They have nowdays important position not only in research and development, but also in technology of their production. With respect to current equipment of solution workplace by devices, hardware and software as well as personal, it is possible to transform all important results gained in laboratories into applications in specific individual products and accordingly support sector with high added value. In Slovakia and all around the world the big attention is devoted to questions of numerical modelling. The workplace of applicants has all knowledge resulting from base research and increase competitiveness of machine production and products. There will use methods of experimental modelling, especially interferential methods based on image correlation, Photostress method, method ESPI, methods of modal analysis. In the frame of project solution these methods will be used in design of metamorphic robots and robotic systems that will have ability of flexible reconfiguration of its own kinematical and functional structure and they are designed on workplace of applicants.

Title of the project	**Numerical modelling of mechatronic systems**
Type of the project	VEGA
Number of the project	VEGA 1/1205/12
Principal investigator	prof. Ing. Jozef Bocko, CSc.
Time period of the project	2012 - 2015
Annotation of the project	The aim of the project is creation of numerical models of mechatronics systems with a specific application. This is concerned to simulation of snake - like robot locomotion when it moves through narrow unstructured

passages for purpose to perform a task such as maintenance inside pipes. The snake - like robot utilize concertina snake gait which is the most suitable for this activity in both horizontal concertina motion and vertical concertina motion. The mathematical model for numerical simulation is based on the framework of non - smooth dynamics. Moreover, the mathematical and simulation model of the snake - like robot for concertina gait is created for purpose of controller design described by an ordinary differential equation. In terms of project experimental function model of snake - like robot on the basis of theoretical knowledge for purpose comparison with numerical model will be created.

Title of the project	**Development of non - traditional experimental methods for mechanical and mechatronic systems**
Type of the project	VEGA
Number of the project	VEGA 1/0937/12
Principal investigator	Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.
Time period of the project	2012 - 2015
Annotation of the project	Development of non - traditional experimental treatments of deformation and stress analysis in supporting elements of mechanical and mechatronic systems with priviledged orientation to optical methods – digital image correlation (DIC), electronic speckle interferometry (ESPI) and reflection photoelasticimetry (Photostress). Precising and enhancement of residual stress measurement and evaluation. Application of optical methods of stress fields determination in vicinity of measured point. Verification of new - developed methods of lifespan and reliability evaluation of machine and equipment design as well as design of mechanical and mechatronic systems.

Title of the project	**Using of modern optical methods of experimental mechanics for development of knowledge basis of students of second andthird level of university education.**
Type of the project	KEGA
Number of the project	021TUKE-4/2013
Principal investigator	Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.
Time period of the project	2013 - 2015
Annotation of the project	Project is oriented to the development of modern optical methods ofmechanics (procedures that use digital image correlation - DIC, electronic speckle interferometry – ESPI, transmission and reflectionphotoelasticimetry - Photostress as well as interferency of coherentlight) and their implementation into education process at the second andthird level of high school education. Above-mentioned methods areup-to-date and they are able to detect deformations, strains and stresseson the surfaces of real structures or models. Application of suchtreatments is connected with using of non-standard computer programs for evaluation data resulting from experiments and their verification bynumerical methods. Elaborated procedures will cultivate creative andinnovative thinking of students mainly in the area of structural membersoptimization as well as in evaluation of life span and reliability ofstructures. The main output of the project will be two monographs, inwhich the theoretical basics, principles and applications of individual methods will be described.

Title of the project	**Increasing of knowledge base of students in area of application of embedded systems in mechatronic systems**
Type of the project	KEGA
Number of the project	048TUKE-4/2014

Principal investigator	prof. Ing. Alexander Gmiterko, CSc.
Time period of the project	2014 - 2016
Annotation of the project	Project deals with extending and establishment of new forms and devices of education in area of mechatronic systems with focusing on embedded systems, which are as inseparable integral part of mechatronic systems. Embedded systems are as subsystem, which is dedicated for controlling of functions in mechatronic systems. Aim of the project is to design and integration of new didactic instruments of mechanical, electrical and electromechanical subsystems into education process with aim to supply education with focusing to embedded systems included in mechatronic systems. Created new procedures, methods and forms in education will be oriented to improvement of knowledge and skills of students in study programs Mechatronics and Mechanical Engineering and also other similar study program.
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.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUTIONS

Employees and students	**Country**
Peter Frankovský, doc. Ing. PhD.	Uniwersytet Zielonogórski Instytut Budowy i Eksploatacji Maszyn Wydział Mechaniczny Poľsko

MEMBERSHIP IN SLOVAK PROFESSIONAL ORGANISATIONS

Slovak Association for Mechanics

National Centre of Robotics

Peter Frankovský,doc. Ing., PhD

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

IEEE Institute of Electrical and Electronics Engineers

Alexander Gmiterko, prof. Ing., PhD.

PUBLICATIONS

Books:

[1] TREBUŇA, František - ŠIMČÁK, František - HUŇADY, Róbert - PÁSTOR, Miroslav - FRANKOVSKÝ, Peter - HAGARA, Martin: **Využitie optických metód v experimentálnej mechanike** 2 / 1. vyd - Košice : TU - 2015. - 260 s. - ISBN 978-80-553-2273-5

Textbooks:

[1] BOCKO, Jozef - FRANKOVSKÝ, Peter: **Nosné konštrukcie automobilov** / 1. vyd. - Košice : TU - 2015. - 110 s.. - ISBN 978-80-553-1991-9.

[2] HUŇADY, Róbert - HRONCOVÁ, Darina - MIKOVÁ, Ľubica: **Základy práce v simulačnom programe MSC.ADAMSVIEW** / 1. vyd. - Košice : TU - 2015. - 375 s.. - ISBN 978-80-553-2211-7.

[3] SEGĽA, Štefan - FRANKOVSKÝ, Peter: **Kinematika** / 1. vyd - Košice : Technická univerzita - 2015. - 103 s.. - ISBN 978-80-553-2293-3.

Journals:

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Department of Automation, Control and Human Machine Interactions

Contact

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Phone no.:	+421 55 602 2654
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Staff

- Professor: **1**
- Assoc. Professors: **4**
- Assist. Professors: **0**
- Researchers: **0**
- PhD. students: **2 internal, 2 external**

Activities at the department

Date	Title of the event, activity characterizing the life of the department in 2015
2/2015	Int. Conference ARTEP2015, Stará Lesná, Slovakia. Conference co-organising.
6/2015	Final examinations of Master students in study program “Automation and control of machines and processes”
6/2015	Opening of the new laboratories of the Institute of Automation, Robotics and Mechatronics

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Bachelor's degree:

No study program at bachelor level

Master's degree:

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

PhD. degree:

- **Automation and Control (AC)**

Number of the students (till 30. 10. 2015)
on the study programs guaranteed by the department:
first year of study: 11 internal form of study

second year of study: 9 internal form of study

Number of the graduates (2014/2015)
on the study programs guaranteed by the department: 9 students in the internal form of engineering study

GRADUATE PROFILE

MASTER’S PROGRAM (Ing.)

Automation and Control of Machines and Processes

Graduates of this study program 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. PROGRAM (PhD.)

Automation and control

Postgraduates obtain wider theoretical knowledge in the field of informatics, automatic control, communication and artificial intelligence. Their 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

- ✓ Application of Neural Networks
- ✓ Automated Production Systems
- ✓ Automatic Control Theory I.
- ✓ Automatic Control Theory II.
- ✓ Automatic Control Tools I.
- ✓ Automatic Control Tools II.
- ✓ CIM and Information Security
- ✓ Computer Systems and Networks
- ✓ Control of Complex Systems
- ✓ Electrical Technology for Automation
- ✓ ICT for Ambient Intelligence
- ✓ Identification, Modelling and Simulation of Systems
- ✓ Logic Control
- ✓ Industrial Control Systems
- ✓ Information and Control Systems
- ✓ Master Thesis
- ✓ Mechatronic Systems
- ✓ NC Machines and Systems
- ✓ Programming Languages and Tools
- ✓ Reliability and Safety of Technical Systems
- ✓ Semestral Project
- ✓ Semestral Project I.
- ✓ Sensor Systems
- ✓ Servo Systems
- ✓ Systems with Artificial Intelligence
- ✓ Technical Measurement and Diagnostics

List of subjects guaranteed by the department at another programs of Mechanical Engineering Faculty

- ✓ Automatic Control Theory
- ✓ Automation of Industrial Technologies
- ✓ Base of Automation
- ✓ Car electronics
- ✓ Computer aided measurement and monitoring
- ✓ Fieldbus and interface for industry
- ✓ Electrotechnics and electronics
- ✓ History of Technology
- ✓ History of Science and Technology
- ✓ Information and Management Systems
- ✓ Intelligent Manufacturing Systems
- ✓ Management of Products Development
- ✓ Medical Electronics
- ✓ Transmitters and data bus for measurement

GRADUATE THESES

MASTER'S THESES:

Automation and Control of Machines and Processes

BAKAĽAROVÁ Zuzana	Experimental verification of partial functions of rehabilitation robot
FECKANIČ Peter	Design of graphic interface for visualization and interaction with rehabilitation equipment
HUDÁK Pavel	Information-security system for remote control of the entry of unauthorized visits
KOVALČÍK Matúš	Automated data collection from body sensor systems using the Plux platform
LIESKOVSKÝ Matúš	Extension of MonAMI services using wearable sensors Arduino
LISY Lukáš	Experimental verification of gyroscopic device for 3D motion monitoring
SIPOS Roland	Multi-agent systems in sensor networks

ŠTOFA Miroslav	Design and implementation of an automated warehouse in the education system FMS 500
VIŠŇOVSKÝ Martin	The implementation of the user interface for automated warehouse manufacturing system FMS 500

PhD. THESES:

Automation and Control

BIROŠ, Ondrej	Sensor networks in automation and home monitoring using wireless technologies
KARCHŇÁK, Ján	Inertial sensors in monitoring of physical activities and events
MORE, Marcel	The use of intelligent methods in control of rehabilitation robots with the force feedback

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 interfaces.
- ✓ 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 and services, application of artificial intelligence methods for the identification, modelling, simulation and control of non - linear systems and in biometrics, modelling and communication interface man – machine, wireless sensor networks, tele - monitoring and control, ambient intelligence, rehabilitation robotics, ICT services and home automation, e - Accessibility and Autonomy.

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
- ✓ switched reluctance motor control

PROJECTS OF THE DEPARTMENT

Title of the project	**Research and development of the Intelligent non - conventional actuators based on artificial muscles**

Type of the project	OP Research and Development, Implementation of knowledge and technologies obtained by research and development
Number of the project	ITMS 26220220103
Principal investigator	doc. Ing. Ján Piteľ, PhD.
Time period of the project	10/2010 - 09/2013 (extended till 2015)
Annotation of the project	The expected project output is the design and implementation of intelligent artificial muscle - based actuator and its technical documentation in such a way that it is be possible to use it for manipulation and rehabilitation tasks in practice. The actuator shall be able to adapt to varying parameters in controlled process using sophisticated intelligent control techniques and methods. Another project output is the design of progressive and energetically cost - effective artificial muscle - based manipulation and rehabilitation devices with positive impact on: - productivity of manipulation processes in manufacturing, - rehabilitation process resulting in better health of patients after rehabilitation and decreased manual demands on rehabilitation workers.

NATIONAL PROJECTS

Title of the project	**Implementation of wireless technologies into the design of new products and services to protect human health**
Type of the project	Grant project VEGA
Number of the project	VEGA 1/0911/14
Principal investigator	prof. Ing. Dušan Šimšík, PhD.
Time period of the project	01/2014 - 12/2016
Annotation of the project	The project is focused on identification of needs for monitoring, diagnostics and rehabilitation of vulnerable persons (elderly people, people with disabilities) using information and communication technologies, automation tools, wireless sensors and actuators networks. A complex approach will be used for the development of new sophisticated rehabilitation devices with mechatronical units as well for new services for support of the social inclusion, security and health of vulnerable citizens. Our design methodology will be based on principles of design for all and user-oriented design focused on the development of social inclusion. Proposed devices and ICT services will be tested in laboratory conditions (living lab) with the prospective users. The elements of telemedicine and rehabilitation based on the use of robotics and biological signals will be applied to control devices and monitor physiological status of users.

INTERNATIONAL PROJECTS

Title of the project	**ASPIRE – Access to society for people with individual requirements**
Type of the project	TEMPUS IV
Number of the project	530345 – TEMPUS – 1 – 2012 – 1 – GE – TEMPUS – JPHES
Principal investigator	prof. Ing. Dušan Šimšík, PhD.
Time period of the project	10/2012 – 9/2015
Annotation of the project	ASPIRE program aims to foster the rights of individuals with special needs to access education and enjoy the right of participation in everyday society, to combat discrimination of the individuals with special needs by instilling awareness and acceptance in society as in line with Bologna Process and the UN Convention on the Rights of Persons with Disabilities.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUTIONS

Employees	Country
Šimšík, Dušan, prof. Ing., PhD.	Armenia, Georgia, Italy, Czech Republic
Galajdová, Alena, doc., Ing., PhD.	Armenia, Georgia, Czech Republic
Líška, Ondrej, doc. Ing., CSc.	Czech Republic
Šeminský, Jaroslav, doc. Ing., PhD.	Czech Republic
Maxim, Vladislav, doc. Ing., PhD.	South Korea
Students	
Barbora Havrilová	Italy
Michal Lucík	South Korea
Peter Balázs	South Korea

VISITS OF STAFF MEMBERS FROM FOREIGN INSTITUTIONS

Employees	Country
Vítečková, Miluše, prof. Ing., CSc.	Czech Republic
Šeda, Miloš, prof. RNDr. Ing. Ph.D	Czech Republic
Janáčová, 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 (Slovenská lekárska spoločnosť – odborná spoločnosť pre fyziatriu, balneológiu a liečebnú rehabilitáciu)

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

Dušan Šimšík, prof. Ing., PhD.
Member of Int. committee IMEKO TC 17 – Measurement in robotics
Member of the Board and National coordinator of AAATE - Association for the Advancement of Assistive Technology in Europe
Chairman of ICTA Europe – International Commission on Technology and Accessibility, Subcommision of Rehabilitation International (RI); member of RI Executive Commission
National Contact of EDEaAN – European Design for All e - Accessibility Network;
National Contact of EASTIN – European Assistive Technology Information Network

Alena Galajdová, doc., Ing., PhD.
Member of AAATE - Association for the Advancement of Assistive Technology in Europe;
Secretary of ICTA Europe – International Commission on Technology and Accessibility, Subcommision of Rehabilitation International (RI);
Member of EDEaAN – European Design for All e - Accessibility Network;
Member of EASTIN – European Assistive Technology Information Network;

PUBLICATIONS

Books

[1] MAXIM, Vladislav - ŽIDEK, Kamil: **Strojové zariadenia so spínaným reluktančným motorom v teórii a praxi**. 1. vyd. - Košice: TU - 2015. - 125 s. - ISBN 978-80-553-1865-3.

Textbooks:

[1] GRINČOVÁ, Anna et al: **Matematika 1 pre študentov s poruchami zraku.** 1. vyd. - Košice: TU - 2015. - 110 s. [CD ROM]. - ISBN 978-80-553-2170-7.

Journals

[2] CHARVÁTOVÁ, Hana et al.: **Calculation of the Optimal Economic Costs by Enzymatic Hydrolysis of Biomaterial Waste with MAPLE.** In: International Journal of Applied Mathematics and Informatics. Vol. 9 (2015), p. 1-8. - ISSN 2074-1278. Spôsob prístupu: *http://www.naun.org/cms.action?id=10193*.

[3] RÁKAY, Róbert et al.: **Testing properties of E-health system based on Arduino**. In: Journal of Automation and Control. Vol. 3, no. 3 (2015), p. 122-126. - ISSN 2372-3033

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[15] KARCHŇÁK, Ján et al: **Feasibility Evaluation of Wearable Sensors for Homecare Systems.** In: Acta Mechanica Slovaca. Roč. 19, č. 2 (2015), s. 1-8. - ISSN 1335-2393. Spôsob prístupu: *http://www.actamechanica.sk/e-publications/2015/volume-19-issue-no-2*.

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Engineering Research in Africa. Vol. 18 (2015), p. 123-129. - ISSN 1663-3571. Spôsob prístupu: *http://www.scientific.net/JERA.18.123*.

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[11] JOBBÁGY, Boris et al.: **Štúdia zvyšovania počtu stupňov voľnosti pohybu v robotickom ramene pre rehabilitáciu hornej končatiny**. In: Automatizácia a riadenie v teórii a praxi: ARTEP 2015. - Košice: TU, 2015 S. 62-1-62-8. - ISBN 978-80-553-1968-1

[12] PETRIK, Stanislav et al.: **Navrhovanie vitruálneho pracoviska s použitím softvérového vybavenia Tecnomatix**. In: Automatizácia a riadenie v teórii a praxi: ARTEP 2015. - Košice: TU, 2015 S. 75-1-75-7. - ISBN 978-80-553-1968-1

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Department of Robotics

Contact

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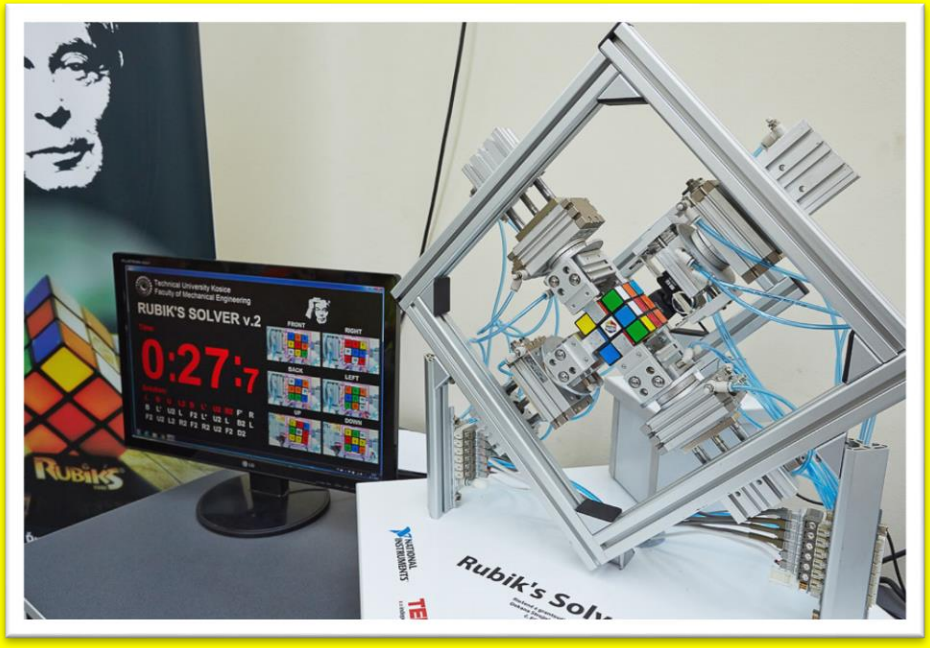
e-mail: mikulas.hajduk@tuke.sk
Address: Park Komenského 8, 042 00 Košice
phone no.: +421 55 602 2193



Staff

- Professors: **1**
- Assoc. Professors: **2**
- Lectures: **3**
- Researchers: **4**
- PhD Students: **2 full-time, 5 distance**

Activities at the department

Date	Title of the event, activity characterizing the life at the Department in 2014
4/2015	Lecture of expert from the practice – Ing. Semančík, SCHUNK Intec s.r.o., Nitra
5/2015	ŠVOČ – Student's Scientific and Professional Activity (2. place – Ondrej Juruš)
9/2015	Researchers' Night 2015 Košice – presentation of robotic show
11/2015	Lecture lectures at scientific roadshow "Čak Vedný odboris a jeho crew"
11/2015	EU Robotics Week, Robotic show

EDUCATION AT THE DEPARTMENT
STUDY PROGRAMMES

Master's degree:

- **Mechatronics**

Number of the students (till 31. 12. 2015)
on the study programmes guaranteed by the institute:
first year of studies:
– 13 internal form of study
second year of studies:
– 21 internal form of study
– 9 extern al form of study

- **Robotic technology**

Number of the graduates (2015/2016)
on the study programs guaranteed by the institute:

- 20 students in the internal form of engineering study

11 students in the external form of engineering study

Doctoral degree:

- **Production systems**

Number of the students (till 31. 12. 2014)
on the study programmes guaranteed by the institute:
Internal students: 2
External students: 5

LIST OF SUBJECTS GUARANTEED BY THE DEPARTMENT

- ✓ Automated production systems
- ✓ Basics of fluid mechanisms
- ✓ Basics of informatics
- ✓ Basics of service and maintenance
- ✓ Computer seminar
- ✓ Construction and design of interoperable manipulation
- ✓ Diploma thesis
- ✓ Diploma project
- ✓ Evolution trends in robotics
- ✓ Evolution trends in production technology
- ✓ Experimental methods
- ✓ Final work
- ✓ Final project
- ✓ Fluid mechanisms
- ✓ History of Technique design
- ✓ Information systems in maintenance
- ✓ Innovation and renewal of machinery and devices
- ✓ Laboratory practice
- ✓ Machines and robots programming
- ✓ Operation of robotic systems
- ✓ Peripheral devices of production systems
- ✓ Project management
- ✓ Robotics
- ✓ Robotic and handling technology for production systems
- ✓ Robot control
- ✓ Robotic systems
- ✓ Robotics systems in automobile production
- ✓ Robotic technology
- ✓ Semestral project
- ✓ Service robots
- ✓ Service systems
- ✓ Technology for integrated production
- ✓ Theory of Robot Design
- ✓ Thesis seminar

GRADUATE THESES

MASTER'S THESES:

Robotic technology

Ivan Sabol	Application ROS system at the workplace with the robot Motoman SDA 10F
Michal Rimbala	Proposal to interlink 3D camera system with robot
Jozef Kmec	Automation of welding manganese scabs on crotch chassis
Peter Ferenčík	The project of assembly workplace for crotches
Martin Dominik	The project of robot palletization of compressors
Pavol Dubovský	The project of robotic welding workplace
Martin Sroka	Multifunctional Effector for Specific Applications in Assembly Technology
Alexander Hajdecker	Design of Virtual Robotic Rehabilitation
Ondrej Juruš	Proposal Manipulator Arm for Mobile Robot SCORPIO
Peter Tamás	Design of Chassis for Service Robot Based on Bellows Actuator
Alena Kobularčíková	Proposal of Workplace for Scanning Objects
Peter Drotár	Proposal improvements robotic hand MechaRobot
Vladimír Slávik	Structural design bending machines for workshop purposes
Monika Schmidtová	Proposal biokinetic mobile robotic platform
Marek Rusinkovič	Proposal verification workplace for robotic wrist with three degrees of freedom
Stanislav Šavlík	Database for rotary positioning modules used in robotics
Matej Petruška	Proposal robotic measuring workplaces
Rajmund Antl	Robotic exchange of cutting inserts for machine tools
Peter Tancsák	The internal positioning system for mobile robots
Miroslav Mertan	Proposal for universal internal positioning system for service robotics
Pavol Kačmár	Proposal for control of intelligent service robot
Leonard Demko	Proposal behavior of a multi-agent system with mobile robots.
Lucia Gibaľová	Change feeder filling in an automated bakery line
Patrik Vinter	Proposal for inspection and correction of sealant applicator
Rastislav Dimun	Application of vibration diagnostics to analyze the operability of the railway vehicle
Štefan Suchý	The design of increase user properties of laboratory pneumatic press
Martin Hutňan	Automation in the process of mixing loose spices
Tomáš Jevický	Proposal for a robotic workstation for intelligent manipulation of selected objects
Štefan Palfi	Proposal for robot control architectures cooperating with human

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	**059TUKE-4-2014**
Main solutionist	Mikuláš Hajduk, prof. Ing., PhD.
Time period of the project	**2014 - 2016**
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.

APPLIED RESEARCH TASKS

Title of the project	**University scientific park TECHNICOM for innovating applications with knowledge technology support**
Type of the project	OPVaV
Number of the project	**26220220182**
Main solutionist	Mikuláš Hajduk, prof. Ing., PhD.
Time period of the project	**2013 - 2015**
Annotation of the project	The project aims to build an experimental workplace to verify the innovations of mechatronic modules and systems of reconfigurable robotics. The workplace will be able to design reconfigurable robots on a level of synthesis of technical systems using specific methods of constructing from the field of mechatronics. In addition, the workplace will be able to carry out testing of individual mechanical and electronic building blocks of a reconfigurable robot, including software.

Title of the project	**Applied research of intelligent manipulation systems in industrial robots with un-oriented 3D objects**
Type of the project	OPVaV
Number of the project	**26220220164**
Main solutionist	Mikuláš Hajduk, prof. Ing., PhD.
Time period of the project	**2012 - 2015**
Annotation of the project	The project aims to build a research institute for laboratory tests to verify selected algorithms of identification and methods of reliability of grasping randomly positioned objects. The project will carry out analysis of new trends in the scanning area, sensing and distinguishing 3D objects with the selection of suitable sensors for further research.

Title of the project	**Research of modules for intelligent robotic systems**
Type of the project	OPVaV
Number of the project	**26220220141**
Main solutionist	Mikuláš Hajduk, prof. Ing., PhD.
Time period of the project	**2011 - 2015**
Annotation of the project	The project is focused on the area of service robotics. The project is to create a new generation of modules for building robots, characterized by the integration of multisensory equipment with distributed intelligence, resulting in cognitive skills for generating the autonomous function of a human-robot cooperation. New modules will be offered on the market in a variety of attractive modifications, such as rescue work, security, pyrotechnic scouting, fight against terrorism, but also areas such as handling large pieces, assembly operations and operations requiring high performance and precision.

INTERNATIONAL PROJECTS

Title of the project	**RoboReha – Robotics in Rehabilitation**
Type of the project	LdV - TOI
Number of the project	**13310 0530**
Main solutionist	Mikuláš Hajduk, prof. Ing., PhD.

Time period of the project	**2013 - 2015**
Annotation of the project	The global objective of the project is to create teaching-training and informational materials for the new field of rehabilitation - robotic rehabilitation and support the training of medical workers, increase educational level of rehabilitation workers focused on the latest trends in the world. **RUSOS – Robotics for teachers of secondary vocational schools**
Title of the project	
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, Poland, Romania, Singarure, Germany
Semjon Ján, Ing., doc., PhD.	Germany, Romania Poland, Czech Republic
Sukop Marek, Ing.,doc., PhD.	Hungary, Austria, Czech Republic
Jánoš Rudolf, Ing., PhD.	Poland, Czech Republic
Koukolová Lucia, Ing., PhD.	Germany, Romania
Baláž Vladimír, Ing., PhD.	Poland, Czech Republic, Romania
Vagaš Marek, Ing., PhD.	Romania, Poland
Varga Jozef, Ing., PhD.	Romania, Poland

PUBLICATIONS

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INSTITUTE OF TECHNOLOGIES AND MANAGEMENT

- 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: **4**
- Assist. Professors **5**
- Researchers: **1**
- PhD. Students: **5**

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2014
10/2015	PRO-TECH-MA 2015 International Scientific Conference
10/2015	SURFACE ENGINEERING Scientific Conference

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Bachelor's degree:

- **Technology, Management and Innovation of Mechanical Engineering**

Master's degree:

- **Mechanical Engineering Technology**

PhD. degree:

- **Mechanical Engineering Technology and Material**

Number of the students (till 30. 10. 2015) on the study programs guaranteed by the department:
first year of bachelor study:
– 11 internal form of study
– 20 combined form of study
second year of bachelor study:
– 29 internal form of study
– 11 combined form of study
third year of bachelor study:
– 113 internal form of study
– 11 combined form of study
first year of engineer study:
– 22 internal form of study
second year of engineer study:
– 22 internal form of study
– 20 external form of study

Number of the graduates (2014/2015)
on the study programs guaranteed by the department:

– 21 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.)

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 applicatable as manufacturing technologist, engineers of tools and equipment, workers in CAx technology service, specialist for testing, operation and maintenance, expecially 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.

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
- ✓ CAD Design of Product and Manufacturing
- ✓ CAD in Technology
- ✓ CAx Technology in Preparation and Management 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
- ✓ Modeling and Optimization of Production Processes
- ✓ Modeling and Simulation of Manufacturing Processes and Systems
- ✓ Modeling and Simulation of Technological Processes
- ✓ Modeling of Technological Processes
- ✓ Monitoring of Technological 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:

Lucia Korbová	Evaluation of depreciation and cuttability analyse of high strenght steel sheets
Tomáš Kušnír	E-learning portal design for metal forming technology
Matúš Kiraľ	Analysis of shearing tool wearing using Solidworks
Richard Filakovský	Design and visualization of chosen spare part in CAD system
Lukáš Gajdoš	Design and visualization of cutting tool for high strenght steel sheets
Monika Nigutová	The creation of educational materials in the field of surface treatment of automobile parts
Daniela Okošová	The imaging methods in surface engineering
Lenka Štrbková	Evaluation micro geometry thin layers on forming tools
Bohuš Kachman	PVD and CVD coating on steel
Rastislav Vozarský	The coating methods of cutting tools

Michal Sobotka	Mechanism of weapon propellant systems in practice
Vojtech Csala	Computer aided analysis of cutting edge obtained by selected cutting methods
Dominik Daňko	Proposal of form production for production of orthopedical instrument
Ján Takáč	Innovation of testing programm on production line and proposal of nest for locking mechanism
Daniel Szoták	The processing of an overview of possibilities of using supertechnopolymers in practice
Daniel Gaduš	Design and modeling of calibration tool of the final tester for car locks
Katarína Kašická	The processing of an overview of surface finishes of composites with computer support
Dávid Bábás	The role of CAD at the design of plastic moldings
Oliver Šuba	Design and modeling of bracket of control sensor for logo on RF key
Zoltán Segecs	Progressive technologies in automobile production
Barnabáš Tóth	New materials in the automobile production
Viktória Fedorová	Influence of coatings on the corrosion resistance of automobile body sheets
Tatiana Huľvejová	Optimization and design of workplace for safety fence production
Dominik Mních	Evaluation of weld deposits using non-destructive methods
Eduard Pankovčin	Progressive methods of hardfacing metal
René Lacko	Methods of tool preparation checking when milling form surfaces
Martin Slavkovský	CAD milling strategies to produce shaped surfaces
Peter Körösi	Quality evaluation of composite coatings
Jakub Brezina	Methods for welding components in the production of seats for passenger
Maroš Matalík	Plasma CNC cutting-off
Zuzana Durkotová	Production analyse of plastic packagings
Tomáš Gabáni	Removal of surface and subsurface defects of slabs - scarfing
Erika Rácová	Industry markings of steel products
Štefan Pčola	Production proposal of packings
Michal Danko	Hybrid technologies in metal forming
Ján Imrich	Touch probes and their application in the field of CNC programming
Tomáš Štovčik	Application possibilities of 5 axis machining in the control system Heidenhain
Peter Rozek	Possibilities of using experimental methods in the process of high-strength steel sheets shearing
Maroš Leško	Evaluation methods of thermally sprayed coatings properties
Dávid Gnip	Utilization of powder metallurgy in automotive components
Lukáš Jurko	Use of magnesium alloys in automobile manufacturing
Tomáš Rjaby	Quality analysis of laser welds

MASTER'S THESES:

Maroš Grega	Evaluation of depreciation and cuttability analyse of high strenght steel sheets
Miroslav Sim	Analysis of the quality of joint made by resistance welding
Anna Mnichová	Optimization of surfacing technology using bronze wire on steel rollers
Martin Cupper	Analysis of the production of plastic part by injection molding
Andrej Bialko	Proposal for experimental cutting tools using CAD
Ernest Krompigel	Influence of laser welding to forming limit curves

Rudolf Topoli	Proposal of the manufacturing technology for HG-ULG clutch part body
Matej Lengyel	Optimisation of welding at maintainance and repair of carriages
Marek Macejko	The study of surface changes after the mechanical treatment of titanium alloy by using PC
Ondrej Szabó	Computer aided analysis of hardfacing surfaces
Dávid Leško	The evaluation analysis of the cast steel quality
Terézia Gibeľová	Analysis of quality of laser welded joins
Erik Šveda	Optimisation of production process for flanged draw-piece using Pam Stamp
Štefan Soós	Computer aided design of souvenir for SjF
Dušan Tóth	Proposal of production process and die design for joining of plastic components
Ondrej Seman	Proposal of production process and die design for cable connectors of passenger vehicles
Alexander Agócs - Kiss	Proposal of production process and die design for sheet metal shower bathtub
Jozef Kohan	Proposal of production process for graving chipper including design of production dies.
Daniela Revická	Analyse of coating effect on durability and lifetime of shear cutting tools
Petronela Petrová	The effect of friction on blanked edge quality in blanking of steel sheets
Peter Tilický	Possibilities of using Sinutrain Operate 4.5 software in programming of CNC machine tools
Marek Jánoš	Evaluation and optimization of chosen cutting tools within engine production at KIA Motors Slovakia
Slavomír Bartoš	Measurement of friction forces under abrasive tests
Oliver Vaňo	Utilization of MQL system in machining operations at Getrag company
Jana Bednárová	Design and modeling of calibration tool of the final tester for car locks
Pavol Petrek	Influence of technological parameters of extrusion on properties of PVC parts
Tomáš Farkašovský	Design of clamping mechanism for stabilizing the position of connected connecting rods on the RT 403 machine
Andrej Kriak	Methods of the thickness evaluation of thin layers
Jozef Kropko	Design and preparation of relief surfaces with defined microgeometry
Daniel Goduš	Application of hybrid welding method in the production of pressure vessels using CrNi steels
Juliána Szűcsová	Increasing lifespan of tensometric rollers used in cold rolling at U.S. Steel Kosice
Michal Köver	Assessment the possibility of application austenitic steel X2CrMnNi 17-7-5 for the production of cryogenic pressure vessels
Peter Žak	The effect of punch-die clearance on blanked edge quality in fine blanking of aluminum sheets
Ján Šefčík	Manufacture of parts on the portal milling machine Hartford Mirage HEP 3150 by using a control system Heindenhain iTNC 530
Peter Repko	Application strategy iMachining when machining engineering components
Lenka Bonková	Microscopic study of metallic materials after abrasive wear
Dávid Medvec	Workshop programming as part of the programming support in practice for products in automobile production
Dušan Kudas	CAM system as part in the design, manufacture and comparison of toolpath strategies in the production of shaped surfaces
Matej Štec	Effect of sliding speed on the abrasive wear resistance of materials

Marek Vancák	Study selected properties of coatings applied by HVOF technology
Michal Štefan	Influence of material preparation on protective and functional properties of unique organic coatings
Marek Ševčík	Metallographic study of the structure of sintered materials
Ján Hudák	Study of corrosion properties of titanium alloys
Lukáš Dulaj	Utilization of 3D replicas for non-destructive testing of materials
Martin Lenárt	Evaluation of composite coatings based on WC-Co
Ján Jazudek	Effect of heat process on the properties of steel castings
Lukáš Hamrák	Analysis of causes of inlet valve fracture in hermetic reciprocating compressor

PhD. THESES:

Anna Šúňová	Study of machining quality for chosen types of form surfaces

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 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	**University Science Park TECHNICOM for Innovation Applications Supported by Knowledge Technology**
Type of the project	ITMS
Number of the project	26220220182
Principal investigator	prof. Ing. Emil Spišák, CSc.

Time period of the project	2013 - 2015
Annotation of the project	The aim of the center is to create a sustainable business of projection-development department to support product innovation and technology, optimization of manufacturing processes and rapid reconfigurable production. To meet that objective will be created “Development and production center for the creation and delivery of prototype products, tools, molds, jigs and laboratory equipment” integrating product design, reverse engineering, production of prototypes (using Rapid Prototyping and Rapid Tooling); research and development in manufacturing technologies and optimization of manufacturing and assembly processes.

NATIONAL PROJECTS

Title of the project	**Application of progressive tool coatings for increasing the effectiveness and productivity of forming sheets made of modern materials**
Type of the project	Grant project APVV
Number of the project	1/0682/11
Principal investigator	prof. Ing. Emil Spišák, CSc.
Time period of the project	2012 – 2015
Annotation of the project	Project solves problems of forming process optimization and increasing of forming dies lifetime by application of thin coatings to die`scontact surfaces and researches interaction of tribologic pair die surface – sheet surface. Tribologic system die surface – sheet surface will be researched from the view of their surface topology, adhesive and abrasive wearing and deformation and failure mechanisms of die and sheet coatings. Research of active parts of forming dies will be focused to system coating - die material in initial state, after deposition of conventional coating Ti - Al - N type and after deposition of new composite coatings TiN, TiCN and TiAlN after mechanical loading and after simulation of working conditions. Degradation of system coating - die material will be diagnosed using modern experimental techniques at known qualitative distribution of stresses in analysed area. The project focuses on identification of strength and structural parameters of system coating - die material that are experimentally measurable and have dominant influence to surface quality of processed sheets and total working time of forming die.

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	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	**Research and development of advanced composite coatings and layers for engineering products innovation**
Type of the project	Grant project VEGA
Number of the project	1/0600/13
Principal investigator	prof. Ing. Janette Brezinová, PhD.
Time period of the project	2013 - 2016
Annotation of the project	The project is aimed at research selected properties of composite layers, functional and protective coatings deposited by progressive Technology of thermal spraying and surfacing. Subject of investigation will be quality of composite layers exposed in conditions of thermal cyclic loading, tribological and corrosion stress simulating real operating load. Properties of the surfaces will be evaluated using fractal analysis. To meet determined scientific goals there will be utilized progressive corrosion monitoring methods (electrochemical noise analysis – ENA, electrochemical impedance spectroscopy - EIS) together with innovative tribo techniques (pin-on-disc, ball-on-disc). Quailty of layers will be evaluated using indentation fracture toughness (IFT). Research will continue with the study and testing surface treatment of composite materials, design and optimization the application technology.

Title of the project	**Tribosimulations on realistic models of joint replacements made of DLC coated Ti-6Al-4V alloy**
Type of the project	Grant project VEGA
Number 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	**Research on the preparation of active surfaces for advanced tools produced by CNC profile milling**
Type of the project	Grant project VEGA
Number of the project	1/0360/15
Principal investigator	doc. Ing. Jozef Beňo, CSc.
Time period of the project	2015 - 2017
Annotation of the project	Project is aimed on the preparation of active surfaces on advanced tools, by which are shaped changes of the blank determined to the final product. The preparation of active surfaces is focused on the tool elements employed in sheet metal stamping and plastic injection. Active surfaces are currently produced by 3 – 5 axis milling and are composed of free-

form and relief surfaces. The aim of active surfaces preparation is to reduce finishing operations within manufacturing tools production. The expected result is methodology proposal and verification of preparation processes of active surfaces to reduce friction during stamping and flow control when injection molding.

Title of the project	**Research and optimization of drawability and joinability evaluation of high-strength steel sheets and aluminium sheets**
Type of the project	Grant project VEGA
Number of the project	1/0872/14
Principal investigator	Prof. Ing. Emil Spišák, CSc.
Time period of the project	2014 - 2016
Annotation of the project	The progressive Technology of processing of light metals and their alloys according to industry demands are the main aims of the research. It is mainly about high-strength steels, aluminium and magnesium alloys. In the area of forming, the research is oriented to the forming processes and incremental forming processes with the focus on the defining the correlation among mechanical properties of materials, technological parameters of the process and index of integrity of surface layers of high-strength steels and aluminium and its alloys drawn parts. The project focuses on the research of limiting formability and joinability of progressively conceived materials on the base of ferrous and non-ferrous metals. The formablity will be evaluated in various stress-strain relations (uniaxial tension, biaxial tension, cupping test). The aim of the project is obtaining the original knowledge about technological formability and joinability of the materials with experimental research and numerical simulation.

INTERNATIONAL PROJECTS

Type of the project	**Investigation of cracking and wear laws of materials for metallurgical equipment**
Type of the project	Project of bilateral cooperation
Number of the project	SK- UA-2013-0013
Principal investigator	Prof. Ing. Janette Brezinová, PhD.
Time period of the project	2014 - 2015
Annotation of the project	The aim of this project is to evaluate the damage of technical facilities caused by multiple cracking and to develop the recovery by high wear resistance protective layers welding. The project is focused on study the degradation processes. Initiation and development of cracks in the material of continuous casting machine (CCM) roll and will propose the approaches for optimization its manufacturing process, which will increase the design life. Ensuring the reliable operation of metallurgical equipment, accurate assessment of their wear state and prediction of residual life of elements requires the study of microstructure degradation of mechanical properties and heat-resistant steels corrosion cracking and limit state of important structural components and assemblies using modern techniques and experimental methods under operation conditions. The most common reason of this type of damage is thermal fatigue of metallurgical equipment elements and high-temperature wear. In addition, the technological measures are being applied to extend the life (during the manufacturing and the repair). One of such measures is the SAW welding up to technological size and oversize. The restoration of damaged structures is possible only if timely inspection and removal of structural element from operation are carried out. This requires the creation of systematic inspection, taking into account the current state of structural elements and development of modern repair and restoration

measures on the basis of technical diagnostic approaches and fracture mechanics. The main sectors of the project usage are the mechanical engineering and metallurgy. In this project the laws of changes in the structure and deformation behavior of heat-resistant steels under static, cyclic and dynamic loading will be studied. Infrastructure of both partners includes all necessary equipment and instrumentation equipment for the implementation of experimental measurements.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUTIONS

Employees and students	Country
Spišák Emil, prof. Ing., CSc.	Lviv Polytechnic National University, Lviv, Ukraine
Brezinová Janette, prof. Ing., CSc.	Ternopil Ivan Puluj National Technical University, Ukraine
Guzanová Anna, doc., Ing., PhD.	Ternopil Ivan Puluj National Technical University, Ukraine
Dulebová Ľudmila. Ing., PhD.	Lviv Polytechnic National University, Lviv, Ukraine
Vrabeľ Marek, Ing., PhD.	Ternopil Ivan Puluj National Technical University, Ukraine Tomas Bata University Zlin, Czech Republic Otto von Guericke University, Magdeburg, Germany Vienna University of Technology, Austria
Sleziak Tomáš, Ing.	Vienna University of Technology, Austria

VISITS OF STAFF MEMBERS FROM FOREIGN INSTITUTIONS

Employees and students	Country
Krzyzak Aneta	Polish Air Force Academy, Deblin, Poland
Ruhowicz Jerzy	Lublin University of Technology, Lublin, Poland
Jachowicz Tomasz	Lublin University of Technology, Lublin, Poland
Emmer Thomas	Otto von Guericke University, Magdeburg, Germany
Schmidt Konrad	Otto von Guericke University, Magdeburg, Germany
Schundt Sascha	Otto von Guericke University, Magdeburg, Germany
Zurawska Sylwia	Lodz University of Technology, Lodz, Poland
Garbacz Tomasz	Lublin University of Technology, Lublin, Poland

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

International Deep - Drawing Research Group
Emil Spišák, prof. Ing.,CSc.

Advances in Science and Technology Research Journal
Emil Spišák, prof. Ing.,CSc.

Journal Tribologia (PL)
Eva Zdravecká, prof. Ing.,CSc.

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, Ing., PhD.

Slovak Association of Mechanical Engineers
Emil Spišák, prof. Ing.,CSc.
Ľudmila Dulebová, Ing., PhD.

Slovak Association for Tribology and Tribotechnology
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Department of Automotive Production

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Staff

- Professors: **3**
- Assoc. Professors: **0**
- Assist. Professors **5**
- Researchers: **2**
- PhD. Students: **1 internal**

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 2014/2015:
Bachelor's study:
first year of study:
- 69 internal form of study Automotive Production

third year of study:
- 34 students in the internal form of bachelor study Automotive Production

Master's study:
first year of study:
- 39 internal form of study Automotive Production
- 11 internal form of study Plastics Processing

second year of study:
- 41 internal form of study Automotive Production

PhD. degree:
- 1 PhD. students in the internal form of study

in academic year 2015/2016:
Bachelor's study:
first year of study:
- 68 internal form of study Automotive Production

second year of study:
- 61 internal form of study Automotive Production

Master's study:
first year of study:
- 19 internal form of study Automotive Production
- 14 internal form of study Plastics Processing

second year of study:
- 39 internal form of study Automotive Production
- 13 internal form of study Plastics Processing

PhD. degree:
- 1 PhD. students in the internal form of study

Number of the graduates (2014/2015)
on the study programs guaranteed by the department:
- 34 students in the internal form of bachelor study Automotive Production
- **43** students in the internal form of engineering 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 favors. 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

Master degree:
Automotive Manufacturing Management
CAx Technologies in Preparation and Management of Production
Small business I
Technical Creativity
Automotive Supply Chain Management
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 III.
CA Methods in Technological Processes III.
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

GRADUATE THESES

BACHELOR 'S THESES:

Automotive Production

Barto Michal	Analysis of an innovative approach of selected supplier in automobile production - Autoliv
Ceheľský Marek	Analysis of an innovative approach of selected supplier "system integrator" in automobile production
Dopirák Filip	Reverse engineering for car components production
Dupej Michal	Using of the platform system in the car industry
Duračka Ľuboš	Innovations of the rear car´s axis
Dutko Michal	Overview of approaches to increasing the efficiency of internal combustion engines
Fröhlich Lukáš	Benchmarking progressive technologies for body components of composite materials
Fusek Marián	Analysis of automobile manufacturers approaches in the field of sustainable development
Gášpár Ladislav	Application of robots body paint
Halčin Viktor	Production of the experimental car body prototype
Jancura Pavol	The analysis of car prototypes production methods
Kotuľák Ján	Proposal innovation of selected car's component in CAD environment

Kožuško Dominik	Application of robot welding car bodies
Lejko Patrik	Module transfer system for LEAN laboratory
Mišenčík Tomáš	Innovative design and models of car interior
Mitro Ladislav	Car braking systems analysis
Mižák Rudolf	Cars consumption decreasing
Nagy Adrián	Innovative profile automotive supplier Hyundai Mobis
Nalevanko Maroš	Sport car design study
Pello Marko	Propose of assembly procedure for brake yoke
Roháč Marián	Creating e-learning module for education in area of automotive production
Roth Gűnter	Manufacture proposal of automotive component using fine blanking
Rusnák Marek	Benchmarking of progressive materials to car body components
Růža Juraj	Analysis of marketing activities of selected automobile manufacturers
Sabo Matúš	Production and sales analyses of hybrid and electric vehicles in selected Asian countries
Skalský Marek	Increasing of the turbodiesel engines performance
Sviatko Martin	Production and sales analyses of hybrid and electric vehicles in America
Szabari Tibor	Innovations of the front car´s axis
Tkáč Jozef	Experimental self-drive cars and their potential in the real traffic
Tomeček Michal	Production and sales analyses of hybrid and electric vehicles in Europe
Vahalec Ján	Analysis and perspectives of autonomous vehicles development
Zvolánek Maroš	Innovative profile of automotive supplier ZF Friedrichschafen AG
Želinský Michal	Innovative profile of automotive supplier Continental AG
Župčan Viktor	Analysis of the development of the supply sector for automotive production in Slovakia

MASTER'S THESES:

Automotive Production

Bálint Attila	Draft assembly process of production of the main restraints
Bodnár Roland	Rapid production of composite components in the car production
Bučko Peter	Application of the fibre composites into the supporting part of cars
Buzsek Tomáš	Production technology of Shell large plastic parts of cars
Cmur Vladimír	Workstation lay-out design for production of selected component
Čonka Juraj	Assembly time analysis methods of selected automobile component in laboratory LEAN LAB
Dibala Michal	Optimization of robotic welding in the workplace Skoda Mlada Boleslav
Dráč Patrik	Evaluation of innovation potential performance of university spin-off companies
Drobňák Radovan	Experimental determination of the deformation properties of laser welding sheet metal blanks
Dulaj Lukáš	Utilization of 3D replicas for non-destructive testing of materials
Dzurický Tomáš	Efficiency of the composite fibres in car safety parts

Eperješi František	Analysis of key performance parameters for evaluation of sustainable production in the automotive industry
Ferenčík Roman	Innovative project of plates using the combined technologies
Ferko Radoslav	Innovation proposal of Pick to light system function in LEAN LAB laboratory
Filičko Ján	Deformation analysis of a vehicle doors reinforcements with numerical simulation
Gabzdil Richard	Conception solution of the student's car body
Goffa Ondrej	Application of nano in the car
Hajdú Peter	Lighting solution configuration of a student car
Halás Juraj	Design of the student´s car interior
Ivan Maroš	Design of the die tool for the production of B-pillar door with hydroforming
Juriš Viliam	Solution configuration main parts of student cars of the future
Kalmár Ladislav	Project of car back mirror assembly
Kál Martin	Innovative project of workplace servicing trucks
Kohlšovský Richard	Dashboard design study of student´s car
Lenárt Martin	Evaluation of composite coatings based on WC-Co
Leskovjanský Štefan	Engineering design of adjustable pedal box
Letanovský Matúš	Proposals for flexible configuration of workstation to prototyping
Mačovský Lukáš	Design of production process for CNC machined parts
Miháľ Jakub	Design of the stand for modelling the stress component body by impact
Nagyová Adriána	Benchmarking of performance characteristics of electric, hybrid and internal combustion vehicles
Oros Štefan	Analysis for the establishment of start-up firms for engineering and automotive production
Orosz Attila	Analysis and project solutions to improvement the activities of the selected company from the automotive industry in the service sector
Paulina Martin	Design of the student's car exterior
Pavlík Ján	Using of the rapid treatment methods for the development and production of car component´s prototypes
Pitoňák Martin	Strength of the metal-composite joint for using in the car production
Slivka Tomáš	Innovation project in the company of services in the automotive industry
Starigazda Matej	Trends in logistics and management in global supply chain for agile automotive production
Straka Jozef	The Impact of an adhesive material on the mechanical properties of composite materials
Suchý Patrik	Seats and other interior parts of student´s car
Takáč Ladislav	Future car design study
Vajda Martin	The treatment and surface adjusting of the components made from composite materials
Vaňo Oliver	Utilization of MQL system in machining operations at Getrag company
Vavrek Radovan	Optimization of machining operations times gear shafts in company Getrag Ford Transmissions

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	**Study of tribological aspects of formability of surface - treated steel sheets and tailored blanks.**
Type of the project	Grant project VEGA
Number of the project	1/0824/12
Principal investigator	prof. Ing. Emil Evin, CSc.
Time period of the project	2012 - 2015
Annotation of the project	The concept of autobody defined in the framework of the ULSAB project pointed to opportunities for improving its performance (toughness, ability to absorb impact energy, lifetime, emissions, etc.). One of ways is application of high - strength Zn - coated steel sheets and tailored blanks; and sophisticated procedures for optimizing the mechanical properties, technological conditions and technological stamping processes (hydroforming). The subject of investigation will be the optimization of friction processes between the contact surfaces of tribological pairs “blank – die”. The character, size and wear mechanism of contact surfaces of tribological pairs during particular process cycles will be diagnosed. Based on the experimental results the multi parametric purpose function (of friction coefficient, galling) will be derived for optimization of the selection of tribological properties of contact pairs “blank - die” (uncoated and coated) in relation to mechanical loading of stamping dies.

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	**Technological and design aspects of extrusion and injection moulding of thermoplastic polymer composites and nanocomposites**
Type of the project	Seventh Framework Programme
Number of the project	**PIRSES-GA-2010-269177**
Principal investigator	prof. Ing. František Greškovič, CSc.
Time period of the project	(04/2011 – 03/2015)
Annotation of the project	The most important objective of the project is to strengthen the research and didactic potential of researchers, particularly early stage researchers employed by universities acceding to the project. Owing to training, seminars, and research, the researchers will acquire new experience in the field of processing of advanced thermoplastic polymer composites by means of machines with screw plasticizing systems of innovative and original design. The staff exchange as well as the synergy and the mutual complementation will contribute to the transfer of knowledge between the individual partners, i.e. between European Union research centres and a third country university in Ukraine taking part in the project. Work will be implemented in four Work Packages. Each partner will be responsible for one issue. Single screw extrusion of thermoplastic composites will be conducted at the Lublin University of Technology, while twin screw extrusion – at the West Saxon University of Applied Science in Zwickau. Actions connected with injection moulding will be carried out at the Technical University of Kosice. Experiments on the properties of thermoplastic composites will be performed at the Lviv Polytechnic

National University. The expected results include: knowledge transfer, improving the qualifications of staff members, initiating and strengthening cooperation at a high scientific and technological level, and defining the vision of the further development of research on extrusion and injection moulding of advanced materials and the design of plasticizing systems in single and twin-screw extruders, which should result in new research projects. In consequence, a permanent, long-term collaboration with Ukraine will be developed.

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aspects of modern methods of composite and nanocomposite processing : Book of abstracts : 18-19 February 2015, Lviv, Ukraine. - Lviv : Nacionaľnij universitet Ľvivskaja Politechnika, 2015 P. 8. - ISBN 978-617-607-711-4

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Patents

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[78] SIKORA, Janusz - GREŠKOVIČ, František: **Znak graficzny - Wzor przemyslowy PL 21764 WUP 112015** - Rzeczpospolita Polska : Urzad Patentowy Rzeczypospolitej Polskiej - 2015. - 4 p..

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[79] GREŠKOVIČ, František - DULEBOVÁ, Ľudmila - VARGA, Ján: **Spracovanie plastov pre automobilový priemysel**. 1. vyd - Košice : TU, SjF - 2015. - 156 s.. - ISBN 978-80-553-1946-9.

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[86] DÚBRAVČÍK, Michal - KENDER, Štefan: **Diagnostika automobilov.** - 1. vyd. - Košice : TU - 2015. - 116 s.. - ISBN 978-80-553-2210-0.

Department of Computer Supported Technologies

Contact

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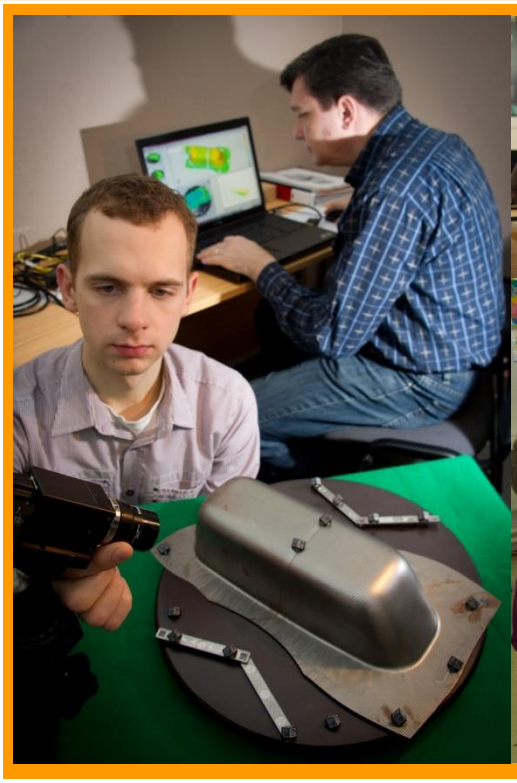

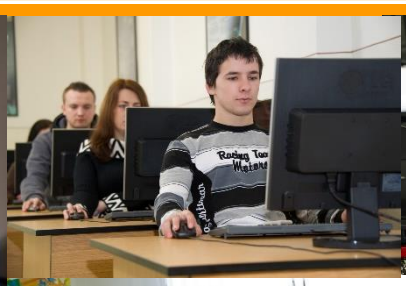

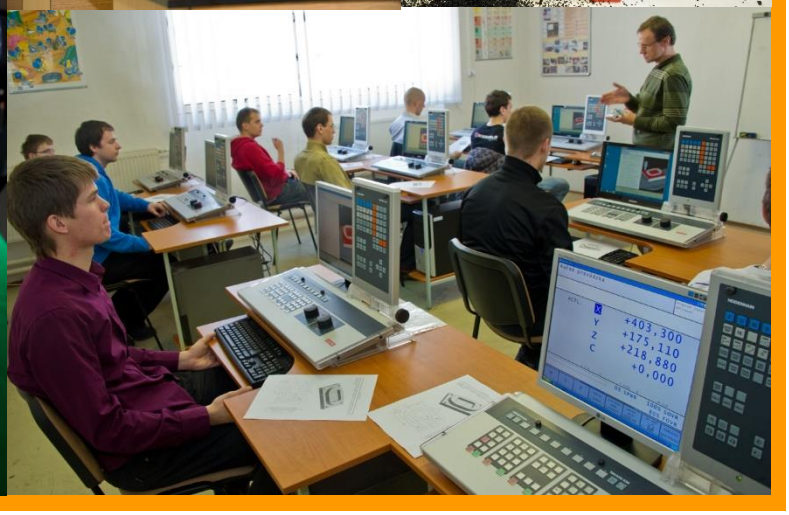

Staff

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

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2015
3/2015	KEYENCE Int. (Japan), Ing. Rastislav Ošťádal - presentation - 3D frame analysis with utilization of microscope VHX-5000
3/2015	SERVIS ARMATÚR (Czech Republic), Ing. Kuška, Ing. Novák - presentation - Utilization of HVOF Coatings In Mechanical Engineering
3/2015	CNC Programming Contest - for students, in collaboration with Sova Digital, DMG MORI, NEKTEN and others
12/2015	PROCEQ (Switzerland), Ľuboš Misák – Measuring of Hardness by Dynamic and Static Method by Portable Hardness Tester (presentation)

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. 2014) on the study programs guaranteed by the department:

- first year of bachelor study: 27
- first year of engineer study: 24
- second year of engineer study: 45

Number of the graduates (2014/2015) on the study programs guaranteed by the department:

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

GRADUATE THESES

BACHELOR'S THESES:

Babás Dávid	Function of CAD During Development of Molded Parts
Baľo Róbert	Utilization of PVD and CVD Coatings in Surface Forming Processes
Csala Vojtech	Computer Aided Analysis of Cutting Edge after Material Splitting
Danko Michal	Hybrid Technologies in Metal Forming
Daňko Dominik	Design of Die for Orthopaedic Aid Manufacture
Durkáč Viktor	Evaluation of Chosen Types of Coating
Filakovský Richard	Design and Visualization of Chosen Replacement Part in CAD System
Gajduš Daniel	Design and Modelling of Calibration Fixture for Final Testing of Automobile Lock
Gajdoš Lukáš	Design and Visualization of Shearing Tool for High-Strength Sheets Shearing
Gomoľa Andrej	Design of Flying Robot Model
Grófová Katarína	Processing of Overview of Surface Treatment of Composites with PC Utilization
Halász Norbert	Modelling of Gear Box Cut for Educational and Presentation Purposes
Halász Štefan	Design of Visualization of Manufacturing System for Company Purposes
Imrich Ján	Contact Probe and their Applications in CNC Programming
Kiraľ Matúš	Analysis of Shearing Tool Wear in Solidworks Software
Kušnír Tomáš	Proposal of E-Learning Portal for Education of Surface Forming
Lacko René	Proposal of Methods for Inspection of Tools for Milling Shaped Surfaces
Mních Dominik	Evaluation of Weld Deposits by Non-Destructive Methods
Norko Roman	CAD/CAM Modules of Systems for Design of Forming Tools
Pankovčin Eduard	Progressive Methods of Weld Depositions
Ragan Lukáš	Design of Improvement of Mechabox and Equipment for AK 47
Rási Grabriel	Evaluation of Factors Influencing Tool Life in Mechanical Joining by Means of Clinching
Rozek Peter	Possibilities of Utilization of Experimental Methods in Shearing of High-Strength Sheets
Sakmár Martin	Evaluation of Limit Characteristics of Steel Sheets With Utilization of Numerical Simulation
Segecs Zoltán	Progressive Technologies in Automotive Production
Slavkovský Martin	CAD Proposal of Milling Strategies for Manufacturing of Shaped Surfaces
Smik Dominik	Application of Robots During Machining
Sobotka Michal	Mechanism of Driving Gear of Weapon Systems in Practice
Šarinský Jozef	Analysis of CNC Controller of Machines for Progressive Manufacturing Technologies
Štovčík Tomáš	Possibilities of Application of 5-Axis Machining in Controlling System Heindenhain
Štrbková Lenka	Evaluation of Microgeometry of Coatings Deposited on Forming Tools
Šuba Oliver	Design and Modelling of Holder for Sensing and Inspection of RF Key Logo
Tešinský Ján	Innovative Trends in Material Joining Utilized in Automotive Industry
Tóth Barnabáš	New Materials in Automotive Production

MASTER'S THESES:

Bartoš Slavomír	Measuring of Frictional Forces During Abrasive Test
Bednárová Jana	Extending Life of Cutting Tools by Application of Coatings
Bialko Andrej	Design of Experimental Shearing Tool with CAD
Bonková Lenka	Microscopic Study of Metal Materials after Abrasive Wear
Csanak Szabolcs	Design of Joining Component for Electric Current Conduction
Cupper Martin	Analysis of Manufacturing of Mold Part by Injection
Dirga Dávid	Monitoring of Performance Parameters During 3D Milling
Dučák Lukáš	Injection Molding Process Optimalization During Molding of Metal Parts By Using Software Product
Dzurik Jozef	Utilization of Computer Aid During Creation and Implementation of Changes on Compressor
Eštok Martin	Modernization of Magnetic Filter and Design of Technological Changes
Farkaš Peter	Utilization of 3D Milling for Engraving
Farkašovský Tomáš	Clamping Device Design for Stabilization of Location of Connecting Rod on Machine Rt 403
Gallik Maroš	Manufacturing Technology Design of Molded Part
Grega Maroš	Innovation of Manufacturing Process of Expanded Pearlite
Gumán Patrik	Design of Batching Device for Filling of Cartouche With Mass of 310 Ml
Hanobik Stanislav	Verification of Optimization Methods of Chosen Drilling Parameters
Ivan Peter	Numerical Simulation of Deep Drawing Process with Flat Braking Bars
Koza Ivan	Design of Double-Component Aerodynamic Aluminium Rim for Škoda Automobile
Krajný Peter	CAD of Showroom for Multimedia Presentation of GETRAG FORD Transmissions Portfolio
Kriak Andrej	Methods for Evaluation of Thickness of Coatings
Kropko Jozef	Design of Preparation of Embossment Surfaces With Given Microgeometry of Surface
Kuchár Ján	Controller Design for Fusion Adapter and its Design Integration Into Existing Serial Product
Lipták Tomáš	Study of Properties Change of Nanocomposite System PA6/MMT After Wear
Macejko Marek	Study of Surface Changes of Titanium Alloy After Mechanical Pre-Treatment by PC
Majirský Ladislav	Influence of Coatings on Microgeometry and Cutting Capability of Chosen Milling Tools
Medvec Dávid	Programming as a Part of Aid in Practice for Parts in Automotive Industry
Miloň Ľubomír	Analysis of Adjustment of Controlling Parts of Automobile with Utilization of Virtual Model
Mitruška Jozef	Desing and Testing of Posrprocessor for CAD/CAM System Creo
Neupauer Pter	FEM Analysis of Conforming Tempering System of Mold Tool
Porubský Viktor	Application of Data Glove During Solution of Assembly Job in Automotive Industry
Repko Peter	Application of Imachining Strategy During Machining of Mechanical Engineering Parts
Ristvej Tomáš	Design of Forming Tool With Utilization of Progressive Die Wizard
Semaník Maroš	Application of Information Technology During Optimization of Workplace
Slanina Martin	Verification of Nakajima Test by Numerical Simulation
Soós Štefan	Proposal of CA Manufacturing of Memorial Object for SjF

Stanislav Jakub	Influence of Numerical Simulation Boundary Conditions on Stamping Precision Prediction
Szabó Ondrej	Analysis of Surface of Hardface Layer Surface
Ščensný Marián	Desing of Monitoring System for Sensing Force and Performance During Milling
Šípošová Eva	Design of Fixture for Switching of High-Pressure Washer's Hinge Door
Šromovský Dominik	Experimental Proceedings for Evaluation of Cutting Tool's Performance
Štec Matej	Influence of Sliding Velocity on Abrasive Resistance of Materials
Šveda Erik	Optimization of Manufacturing Technology Progression of Stamped Part With the Utilization of Pam-Stamp
Tomčák Tomáš	Design of Parts Manufactured by Additive Technology FDM
Topoli Rudolf	Design of Technology for Machining of Cluth Component HG-ULG
Trojčák Tomáš	Comparison of CAM Systems Based on Precision During Manufacturing of Shaped Surfaces

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 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 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	**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 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	**Implementation of The Artificial Intelligence into Optimisation of the Selected Advanced Removal Processes**
Type of the project	Grant Project APVV
Number of the project	SK-SRB-2013-0037
Principal investigator	prof. Ing. Ildikó Maňková, CSc.
Time period of the project	2015-2018
Annotation of the project	The proposed project is aimed at the mutual use of human resources, industrial equipment, laboratory equipment, special equipment and software products for research, development and application of advanced intelligent systems. The research activities of the project are focused on experimental studies, modelling and simulation of selected metal removal processes and working with advanced applications of artificial intelligence in the design of intelligent manufacturing systems based on knowledge in the field of advanced materials removal technology, which increasingly penetrate into production. Research activities are focused on the implementation of artificial intelligence to optimize the selected advanced removal processes. Advanced metal removal methods of material processing are very intensively developed and applied in modern productions mainly used in the processing of parts of complex geometric shapes that so called conventional processes can be complicated to achieve.

Title of the project	**Advances in Machining - Innovation Procedures for Joint Education and Research, Part 2**
Type of project	CEEPUS Project
Number of the project	SK-0067-11-1516
Principal investigator	prof. Ing. Ildikó Maňková, CSc.
Time period of the project	2006-2017
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 Zlin (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).

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUTIONS

Employees and students	Country
Ildikó Maňková, prof. Ing., CSc.	Otto von Guericke Universitat Magdeburg, Magdeburg, Germany
Ivan Gajdoš, Ing., PhD.	Politechnika Kielce, Kielce, Poland
	Lviv Polytechnic National University, Lviv, Ukraine

VISITS OF STAFF MEMBERS FROM FOREIGN INSTITUTIONS

Employees and students	Country
Thomas Emmer	Otto Von Guericke University, Magdeburg, Germany
Konrad Schmidt	Otto Von Guericke University, Magdeburg, Germany
Sascha Schmidt	Otto Von Guericke University, Magdeburg, Germany
Dr. Agota Dregelyi-Kiss	Obuda University, Budapest, Hungary
Group of Students	14 Countries of EU
MSc. Richard Horváth	Obuda University, Budapest, Hungary
prof. János Kundrát, DrSC.	University Miškolc, Hungary
Ing. István Sztankovics	University Miškolc, Hungary
prof. Pavel Kovac	University of Novi Sad, Novi Sad, Serbia
prof. Marin Gostomirovic	University of Novi Sad, Novi Sad, Serbia
Ing. Boris Savkovic	University of Novi Sad, Novi Sad, Serbia

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

International Deep - Drawing Research Group
Ján Slota, doc. Ing., PhD.

Society of Plastic Engineers
Ivan Gajdoš, Ing., PhD.

Instutute of Research Engineers and Doctors
Ivan Gajdoš, Ing., PhD.

PUBLICATIONS

Textbooks

[1] SPIŠÁK, Emil - SLOTA, Ján - TOMÁŠ, Miroslav: **Počítačová simulácia procesov tvárnenia.** Košice : TU - 2015. - 156 s. ISBN 978-80-553-2240-7

[2] SPIŠÁK, Emil - SLOTA, Ján: **Technology 2. -** 1. vyd. - Košice : TU - 2015. - 125 s. ISBN 978-80-553-2131-8

[3] SPIŠÁK, Emil - GAJDOŠ, Ivan: **Structure and properties of materials.** - 1. vyd. - Košice : TU - 2015. - 110 s.. - ISBN 978-80-553-2088-5

Journals

[4] KARPUSCHEWSKI, Bernhard - SCHMIDT, Konrad - BEŇO, Jozef - MAŇKOVÁ, Ildikó - FROHMÜLLER, Ralf - PRILUKOVA, Julia: **An Approach to the Microscopic Study of Wear Mechanisms During Hard Turning with Coated Ceramics**. In: Wear. Vol. 342-343 (2015), p. 222-233. ISSN 0043-1648

[5] VRABEĽ, Marek - MAŇKOVÁ, Ildikó, IŽOL, Peter - FRANKOVA, Mária - PALO, Miroslav: **RSM Optimization of Hard Turning**. In: Transfer inovácií. Č. 32 (2015), s. 212-215. ISSN 1337-7094

[6] MAŇKOVÁ, Ildikó - VRABEĽ, Marek - KOVAČ, Pavel - GOSTIMÍROVIC, Marin: **Artifical Neural Network Application to Predict of Tool Wear when Drilling Udimet 720** Chapter 8**.** In: Development in Machining Technology : Scientific Research Reports : vol. 5. - Kraków : University of Technology, 2015 P. 84-97. - ISBN 978-83-7242-844-8

[7] BEŇO, Jozef - MAŇKOVÁ, Ildikó - DRAGANOVSKÁ, Dagmar - IŽOL, Peter: **Sampling based assessment of the free-form milling strategies.** In: ICPM 2015. - Novi Sad : Faculty of Technical sciences, 2015 P. 51-56. - ISBN 978-86-792-742-3

[8] ECKSTEIN, Martin - MAŇKOVÁ, Ildikó - VRABEĽ, Marek - BEŇO, Jozef: **Comparison of Sensors Signal Quality when Drilling Inconel 718.** In: In: CIRP International Conference on Intelligent Computation in Manufacturing Engineering, CIRP ICME 2014. Vol. 33 (2015), p. 227-232.

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Conference Proceedings

[1] SPIŠÁK, Emil - GUZANOVÁ, Anna - KAŠČÁK, Ľuboš - DULEBOVÁ, Ľudmila: **Effect of Tool's Elastic Deformation on Adhesion of PVD Coatings.** In: Pro-tech-ma 2015 and Surface Engineering 2015 - Košice : TU - 2015. - 121 s. ISBN 978-80-553-2204-9

[2] IŽOL, Peter - TOMÁŠ, Miroslav - BEŇO, Jozef: **The effect of the CADCAM software when simulating the forming dies' functional surfaces production.** In: In: PRO-TECH-MA 2015 and Surface engineering 2015. - Košice : TU, 2015 S. 35-36. - ISBN 978-80-553-2204-9

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[4] MORAVSKYI, Volodymyr - GARBACZ, Tomasz - GAJDOŠ, Ivan: **Thermoplastic metal-filled polyvinylchloride composite.** In: Technological and design aspects of modern methods of composite and nanocomposite processing : Book of abstracts : 18-19 February 2015, Lviv, Ukraine. - Lviv : Lviv Polytechnic National University, 2015 P. 16. - ISBN 978-617-607-711-4

[5] JACHOWICZ, Tomasz - MORAVSKYI, Volodymyr - GAJDOŠ, Ivan: **Numerical modeling of cooling conditions of thermoplastic injection-molded part.** In: Technological and design aspects of extrusion and injection moulding of thermoplastic polymer composites and nanocomposites : Volume 3 : Monography. - Lublin : Lublin University of Technology, 2015 P. 31-49. - ISBN 978-83-89263-37-7

[6] KRASINSKYI, Volodymyr - SUBERLYAK, Oleh - KLYM, Yurii - GAJDOŠ, Ivan - JACHOWICZ, Tomasz: **Nanocomposites on the basis of thermoplastics and montmorillonite modified by polyvinylpyrrolidone.** In: Technological and design aspects of extrusion and injection moulding of thermoplastic polymer composites and nanocomposites : Volume 3 : Monography. - Lublin : Lublin University of Technology, 2015 P. 103-112. - ISBN 978-83-89263-37-7

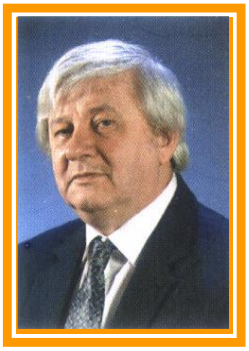
[7] [GAJDOŠ, Ivan - SPIŠÁK, Emil - KRASINSKYI, Volodymyr: **Injection mold for preparation of tensile test**

specimens from composites with weldline : Technological and design aspects of extrusion and injection moulding of thermoplastic polymer composites and nanocomposites : Volume 3 : Monography. - Lublin : Lublin University of Technology, 2015 P. 181-191. - ISBN 978-83-89263-37-7

Research reports

[1] ZDRAVECKÁ, Eva - ONDÁČ, Miroslav - SLOTA, Ján - VOJS, Marián - MARTON, Marián: **Skúšobné zariadenie - ABRAZ tribometer.** Patent no. 200-2015, Banská Bystrica : ÚPV SR - 2015.

Department of Industrial Engineering and Management



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Staff

- Professors: **2**
- Assoc. Professors: **4**
- Lectures: **5**
- Researchers: **2**
- PhD Students: **3**

Activities at the department

Date	Title of the event, activity characterizing the life at the Institute in 2015
07/2015	Journal Transfer inovácií 31/2015
12/2015	Journal Transfer inovácií 32/2015
12/2015	18th International Scientific Conference Trends and Innovative Approaches in Business Processes, Košice © 2015

EDUCATION AT THE DEPARTMENT
STUDY PROGRAMMES

Bachelor's degree:
Industrial Engineering

Master's degree:
Industrial Engineering

Doctoral degree:
Industrial Engineering

Number of the students (2015/2016)
on the study programmes guaranteed by the department:
Bachelor's degree:
- 17 internal form of study
- 0 external form of study

Master's degree:
- 66 internal form of study
- 33 external form of study

Doctoral degree:
- 3 internal form of study
- 7 external form of study

Number of the graduates (2014/2015)
on the study programmes guaranteed by the department:
Bachelor's degree:
- 0 internal form of study
- 0 external form of study

Master's degree:
- 42 internal form of study
- 17 external form of study

Doctoral degree:
- 2 internal form of study
- 1 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.

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.

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 DEPARTMENT

Industrial Engineering

- ✓ Basics of Digital and Virtual Technologies
- ✓ Basis of Industrial Engineering
- ✓ Business Strategies
- ✓ Business Controlling
- ✓ Business Economics
- ✓ Business Information System
- ✓ Business Management
- ✓ Business Processes and Systems
- ✓ Business Strategy of Small and Middle Sized Company
- ✓ 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
- ✓ Final 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 Management
- ✓ Production Preparation
- ✓ Project Management
- ✓ Production and Products Innovation
- ✓ Semestral Project
- ✓ Teamwork

- ✓ Diploma Work
- ✓ Economic Tools of Business Management
- ✓ Engineering Economics
- ✓ Enterprise Information and Communication Systems
- ✓ Ergonomics, Analysis and Work Measurement

GRADUATE THESES

BACHELOR'S THESES:

Industrial Engineering

Jana Labayová	Trends in modelling digital production systems
Michaela Mičáková	Designing industrial flooring machine production
Tomáš Mičuda	Study on production logistics rationalization in company
Michal Onderčín	Utlization the micromotion studies by assessment the manual work activity
Jozef Trojan	Improving production processes using PLM systems in selected engineering company
Lucia Vavreková	Innovative methods supporting competitiveness in small and medium enterprises

Above mentioned Bachelor Students were supervised by the Department of Industrial Engineering, and succesfully graduated the study programe Technology and Innovations of Engineering Production.

MASTERS THESES:

Industrial Engineering

Ľudmila Bančanská	Performance measurement in industrial company
Lea Bartošová	Evaluation of ergonomic aspects of selected workplace in furniture production
Katarína Božidarová	Visual reporting in industrial company
Blažena Cibuľová	Supply chain management in the organization
Zuzana Čajková	Proposal of monitoring system and evaluation of selected production process indicators
Viera Duchová	Proposal of continual improvement of production process in the Whirpool company
Marek Dufala	Visualization of 3D virtual scenes through virtual reality
Tomáš Fedorek	Controls and their eligible use in symbiosis Man - Machine in Industrial Environment
Erik Fryc	Analysis of wasting and its possible elimination in specific manufacturing conditions
Peter Gorej	Utilization the software application Tecnomatic Jack in designing work activity
Veronika Handzušová	Project management as the integral part of the modern enterprise
Tomáš Huľvej	Design of plant layout using innovative approach

Miloš Jurčišin	Modelling the manufacturing system utilizing software support
Nikoleta Kocichová	Proposal of the product marketing strategy
Milan Kočiš	Using of time and motion studies to solve assembly activities
Peter Kočiš	Modeling Project Engineering of customer production - Technicom
Jaroslav Kokorďák	Financial and economic management under deviations
Petra Komjáti – Nagyová	Assessment and improvement of logistics flows for selected product
Martin Košár	Designing digital models of manufacturing systems
Ján Leško	Possibilities of using natural materials for engineering applications
Tomáš Maliňák	Feasibility study of production of cam switches
Martin Marinič	Postaudit of investment project
Michal Mikláš	Optimization of the production process using the tools of Industrial Engineering
Martina Nemčková	Feasibility study of production of steel components for agricultural machinery
Jaroslava Palenčárová	Risk management of investment project
Matej Petrík	Modeling peripheral and infrastructure engineering production Technicom
Martina Pilátová	Implementation of marketing tools in the undertaking providing the service
Enikő Polláková	Evaluation of the company´s financial stability
Pavol Prekop	Digital models of production systems
Tomáš Rajňák	Re-design of processes and adjustment of production flows using innovative methods
Dominik Sabó	New types of services in the manufacturing enterprise
Martin Saksa	Project of the electrical equipment construction
Tomáš Salaj	Experimental verification of data gloves in the process of virtual reality
Oľga Sopková	Rating the production effectiveness in industrial company
Miriam Straková	The assessment of physical load by application JSI methods
Matúš Špirko	Agile enterprise systems
Jana Tirpáková	Analysis and optimization of selected production process using risk assessment methods in GETRAG FORD Transmissions Slovakia, Ltd.
Gabriel Tóth	Analysis of inter-department handling possibilities on the gear boxes department
Stanislav Valčo	Project mixed reality system
Maroš Varga	Application of methods of work analysis and measurement in chosen company
Vargová Iveta	The use of statistical methods in the context of process improvement
Jaroslav Vojtek	Analysis of complex reconstruction turnout units in terms of efficiency
Tomáš Balla	Decentralized modular self-organized production systems
Jaroslav Balog	Storage and ordering of spare parts and materials for maintenance activities
Milota Bilá	Long-term business assets management
Peter Bubák	New types of human-machine interface
Anna Dudová	Optimizing a line layout on the basis of operating conditions
Lucia Gajdošová	Application of lean workplace concept in Richelieu company
Imrich Hleba	Performance measurement processes in the chosen company
Richard Glosner	Impact velocity rolled to a final temperature in the low temperature coiling assortments affecting the mechanical properties
Jozef Kočiš	Introduction of professional maintenance (PM) in the factory methodology of World Class Manufacturing (WCM)
Katarína Koťuhová	Application of lean production concept in Embraco company
Róbert Kozel	Application of Lean principles in small series production
Matej Krupa	Creating of the work environment for flexible work activity

Róbert Sasfai	Design and innovation performance measurement geometry forehead crow bar in the process of continuous casting
Roman Schindler	Optimization of the time structure of production process in the selected company
Lilla Szakácsová	The cost of the process-oriented quality management systems
Marianna Tomková	Proactive crisis management on the principles of controlling
Michal Zambo	Optimization of KANBAN for the supply and manufacturing process

PhD THESES:

Industrial Engineering

Ing. Lenka Kalafusová	Simulation Of the Risk Management Business Processes
Ing. Marek Kliment	Implementation of PLM software systems in experimental modeling
RNDr. Martin Ružinský, PhD.	Business Innovation Performance Management In Crisis

RESEARCH AT THE DEPARTMENT

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	**Package of accessories for further reform of education at TUKE – Faculty of Mechanical Engineering TUKE**
Type of the project	EU project
Number of the project	**ITMS: 26110230093**
Main solutionist	prof. Ing. Jozef Kováč, CSc., doc. Ing. Juraj Šebo, PhD., doc. Ing. Peter Trebuňa, PhD., Ing. Jaroslava Janeková, PhD., Ing. Peter Malega, PhD.
Time period of the project	**2013-2015**
Annotation of the project	The goal of the package is to improve a quality of education and development of human resources in the area of research and development, in order to achieve continuous adaptation of universities to the current and prospective needs of the knowledge society. A scientific education and transfer of know-how and results of research and development activities between universities, research and development institutions and enterprises would be supported.

Title of the project	**University science park TECHNICOM for innovative applications with support of knowledge-based technology - Faculty of Mechanical Engineering TUKE.** - Activity A.3.3 Pilot systems in the engineering field. PP 3 Research, development and implementation

centre for innovative research and development services for flexible technology and reconfigurable production

Type of the project EU project
Number of the project **ITMS: 26220220182**
Main solutionist

prof. Ing. Jozef Kováč, CSc., doc. Ing. Peter Trebuňa,PhD., doc. Ing. Juraj Šebo, PhD., doc. Ing. Vladimír Rudy, PhD., Ing. Peter Malega, PhD.

Time period of the project **2013-2015**
Annotation of the project

Specific goal is establishing a sustainable activities for design-research facility intended for support of product and technology innovation, optimalization of production processes and rapid reconfigurability of a production.
Major areas includes:

- Development, prototype production and testing of engineering products
  - Innovations of engineering products and technology
  - Optimalization of production and assembly processes
  - Development, prototype production, testing, optimalization and use of tools, instruments, forms and agents
  - Guidenance in case of optimalization of production processes and reconfiguration of production facilities, particularly with a focus on innovation level, competitiveness, material efficiency and environmental friendliness of industrial technological applications

Title of the project

Agile, adapting to market business systems with highly flexible corporate structure
Type of the project VEGA
Number of the project **1/0879/13**
Main solutionist Dr.h.c. mult. prof. Ing. Jozef Mihok, PhD.
Time period of the project **2013-2014**
Annotation of the project

New generation production systems with groundbreaking innovations have characteristics of agile and intelligent manufacturing base. The concept of this production structure proves ability to survive and succeed in the competitive environment of continuous and unpredictable changes that may occur in turbulent markets, technologies, business relationships and in all other aspects of business. To overcome the global challenges, a new strategy of development and design based on the new perception of business models, is needed. This requires decentralized, flexible reconfigurable, modular and autonomous production systems, grouped in well cooperating logistic network of plants (subcontracting firms) and supported by innovative management techniques. In connection with expected trends, the project specializes on research and development of innovative concepts of agile, to market adapting business systems with a highly flexible structure.

Title of the project **Proactive crisis management of industrial enterprises based on the concept of controlling**
Type of the project VEGA
Number of the project **1/0669/13**
Main solutionist doc. Ing. Jaroslava Kádárová, PhD.

Time period of the project	**2013-2015**
Annotation of the project	In recent years there has been significant changes in the activities of businesses and how their management. It is caused by developments on the world market, as well as changing conditions of business environment in Slovakia. Turbulence and variability of conditions internal and external business environment calls for the modification of traditional approaches, concepts, methods, techniques and tools of corporate governance and there is a need innovative and creative management practices. Existing management approaches to penetrate advanced approaches and techniques and management process moves to proactive approaches focused on preventive measures. The project aims to propose a methodology for the identification of emerging issues in the enterprise and innovative approaches to crisis management. The methodology will build on existing methods of controlling such as BSC, DEA, ABC, BCM and others and will be adjusted to the conditions and needs of industrial companies operating in Slovakia.

Title of the project	**Intensification of modeling in education of II. and III. degree in the field of study 05/02/52 Industrial Engineering**
Type of the project	KEGA
Number of the project	**004TUKE-4/2013**
Main solutionist	doc. Ing. Peter Trebuňa, PhD.
Time period of the project	**2013-2015**
Annotation of the project	The purpose of this project and its main objective is to increase the attractiveness of the study at the Department of Industrial Engineering 5.2.52 for both students and prospective students, but primarily for industrial practice, for which students are an essential input into the production process based on knowledge acquired during their studies, methodologies and working practices. The current corpus of the field of study has been relatively unchanged since 2004. It is accredited study program at the Faculty of Mechanical Engineering, Technical University of Kosice. To increase its attractiveness, it is necessary to review the program conceptually and upgrade its parts, especially in the second and third level of study, in particular the introduction of new current practises prevailing for the industrial practice that students can use immediately after graduation.

Title of the project	**Innovation in laboratory technology educational program of study Industrial Engineering**
Type of the project	KEGA
Number of the project	**079 TUKE-4/2013**
Main solutionist	Dr.h.c. mult. prof. Ing. Jozef Mihok, PhD.
Time period of the project	**2013-2014**
Annotation of the project	The project focuses on strengthening of laboratory teaching of technology in the field 05/02/52 Industrial Engineering study program in Industrial Engineering. It focuses mainly on the second and third cycle of higher learning to foster not only knowledge, innovative thinking and practical skills. Application of innovative training methods, particularly laboratory activities, interactive participatory design, verification and simulation of business processes and systems throughout the value chain is considered essential for the development trend of learning processes. The solution is the extension of the existing base laboratory of the

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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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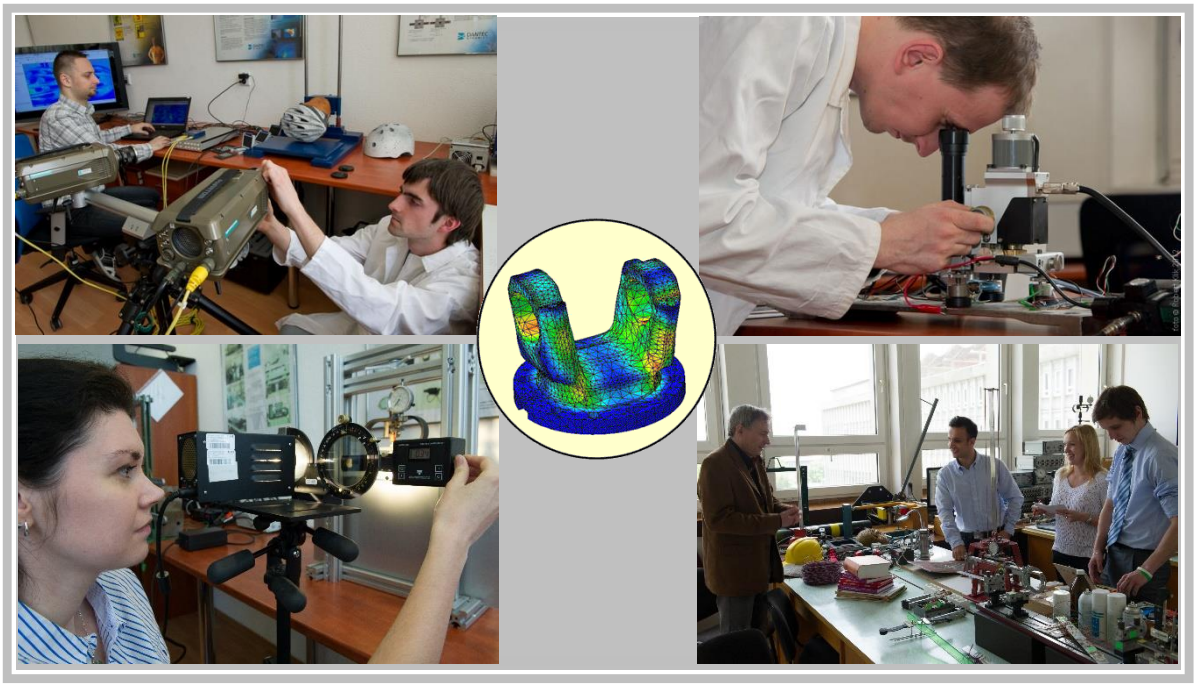

Staff

- Professors: **4**
- Assoc. Professors: **3**
- Assist. Professors: **4**
- Researchers: **1**
- PhD. Students: **4 internal, 5 external**

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2015
4/2015	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 30.10.2015) on the study programs guaranteed by the department:
first year of bachelor study:
– 46 internal form of study
second year of bachelor study:
– 60 internal form of study
third year of bachelor study:
– 43 internal form of study
– 14 external form of study

first year of engineer study:
– 63 internal form of study
second year of engineer study:
– 19 internal form of study
– 24 external form of study

first year of PhD. study:
– 2 internal form of study
– 1 external form of study
second year of PhD. study:
– 1 internal form of study
third year of PhD. study:
– 1 internal form of study
fourth year of PhD. study:
– 3 external form of study
fifth year of PhD. study:
– 1 external form of study

Number of the graduates (2014/2015)

on the study programs guaranteed by the department:

- 46 students in the internal form of bachelor study
- 19 students in the internal form of engineering study
- 8 students in the external form of engineering study
- 1 PhD. students in the external 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 know 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 their skills improve 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 from working in area of construction and making of document 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, mesh less 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)

- ✓ Statics
- ✓ Elasticity and strenght I.
- ✓ Elasticity and strenght II.
- ✓ Kinematics
- ✓ Dynamics
- ✓ Computer mechanics
- ✓ Modelling of technical objects
- ✓ Bachelor project
- ✓ Final work
- ✓ Basic engineering experiment
- ✓ Monitoring and data analysis in the experiment

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

- ✓ Elasticity and strength
- ✓ Mechanics I.
- ✓ Mechanics II.

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

- ✓ Elasticity and strength
- ✓ Mechanics I.
- ✓ Mechanics II.

Automotive Production (Bachelor study)

- ✓ Elasticity and strength
- ✓ Mechanics I.
- ✓ Mechanics II.

Prosthetics and Orthotics (Bachelor study)

- ✓ Statics
- ✓ Elasticity and strenght I.
- ✓ Elasticity and strenght II.
- ✓ Kinematics
- ✓ Dynamics

Applied mechanics (Master study)

- ✓ Vibrations of mechanical systems
- ✓ Term project
- ✓ Diploma 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
- ✓ 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
- ✓ Thinwalled supporting elements
- ✓ Theory of mechatronical systems, modeling, design, optimalization

Mechanical engineering (Master study)

- ✓ Applied mechanics
- ✓ Term project
- ✓ Diploma project
- ✓ Diploma work
- ✓ 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)

- ✓ Vibrations control
- ✓ Numerical methods in mechanics I.
- ✓ Numerical methods in mechanics II.
- ✓ Computer aided design of mechatronic systems
- ✓ Training education
- ✓ Dynamics of rotors
- ✓ Theory of engineering experiment
- ✓ Mechanics of composite materials
- ✓ Theory of modeling and design 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

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:

Andrássy Eduard	Using of FEM to distortion analysis of machines for high pressure casting
Bakši Jaroslav	Analysis of vibration of the beam using strain gages
Bendíková Barbora	Mathematical and physical analysis of the suspension seat
Brnčal Michal	Creation of mathematical model of ping-pong ball
Bruchánek Mojmír	Modeling of mechanical systems described by linear differential equations
Cocuľa Jakub	Transmission and processing of data using microcomputer
Danko Tomáš	Design and carrying capacity analysis of manipulator for immobile patients
Diabelková Patrícia	Preventive maintanance - increasing of reliability of equipment in machinery enterprises
Dovala Igor	Design of motorcycle holder
Fabian Michal	Internal optics design of the front car headlights
Fedor Samuel	The design and strength calculation of gantry crane with capacity of 2 tons
Gallik Norbert	Shape optimization solutions of joints using FEM
Grejták Branislav	Analysis of usability of methods used for the determination of residual stresses in structural elements of machines and equipment
Hrabovská Michaela	Analysis of stresses in the thread of bolted joint
Hrindová Anna	The use of optical methods by investigation of strain fields
Hudák Šimon	Design and strength analysis of cantilever crane
Hvizdoš Michal	Analysis of fatigue strength of gearbox shaft
Jacko Jakub	Modification of non driven rear axle of passenger car on the drive axle
Jakubkovič Eduard	Correction of the temperature effect in the strain-gauge measurements
Jenča Radovan	Design of equipment for bikes transport

Jurčišin Ľuboš	Motion analysis performed using high-speed digital image correlation
Kačmár Lukáš	Logical circuits and their applications
Kaľavský Adam	The using of experimental modal analysis in determination of acoustic properties of a musical instrument
Kicko Michal	Application of selected parts of the dynamics of the drive mechanism lathe
Kipikaša Dávid	Using of finite element method to simulation of cooling of solid body
Kostelník Jozef	Production of mechanical parts by Rapid Prototyping Technology
Kovács Ladislav	Optimal random pattern for digital image correlation
Kovaľ Juraj	Design and strength analysis of arm extension of a working platform
Kučinský Martin	The design and strength calculations of trailer for transporting motorcycles
Lavčák Matúš	Starting dynamics of the drive mechanism of passenger lift
Leštach Lukáš	Motion control of pneumatic actuator
Petrušová Anna	Analysis of design of the dies for their strength
Pidanič Štefan	Optimization of static balancing of a parallelogram manipulator
Podracký Michal	Calculation of selected kinematic variables of the drive machine tool
Polónyová Zuzana	Kinematic analysis of drive passenger lift
Rásso Filip	Analysis of the residual stresses near the weld by the experimental methods
Sabol Eduard	Dynamics startup of main drive lathes
Sauer Július	Static and dynamic analysis and kinematic optimization of a loader mechanism
Sekerák Daniel	Control of stepper motor
Sekerák Ján	Kinematics main drive of lathes
Staroňová Michaela	Information security in relation with mechatronic systems
Stöhr Róbert	Design of loading equipment for dynamic stress analysis by means of PhotoStress method
Štochová Lenka	Stress analysis of the one-wall and multiple-wall pressing tool
Tomko Marián	The use of numerical methods for stress identification in locations of concentrators
Toporcer Peter	Engineering design of segway
Torma Anton	The use of digital image correlation by the supporting members deformation analysis

MASTER'S THESES:

Hudáková Ľubica	Numerical analysis of fiber orientation influence to mechanical properties of investigated object
Jabczun Jakub	Strength analysis of discs made of Elektron in dependency of their shapes and given material characteristics
Janík Peter	Design of parking house for bicycles
Marton Michal	Possibilities od PhotoStress method for stress analysis of structural elements made of non-metallic materials
Packa Ján	The influence of correlation parameters on the results of deformation analysis
Pavelka Peter	Determination of the damping ratio of a mechanical system by experimental modal analysis
Sabol Michal	The issue of light aluminum alloy wheel development - Analysis of a loading and stress/strain formation of wheels
Sedláčik Daniel	Analysis of plastic behaviour of the pin – hole connection
Slejzák Marián	The issue of light aluminum alloy wheel development - Impact test simulation of the wheel
Štibora Marek	Optimatization of stress state in the screw joint using photoelasticity
Beck Štefan	Proposal of bending beam load testing equipment for measuring system MTS - 3000 Ring-Core
Beliško Martin	The design and strength analysis of sprung frame of a mountain bike
Dronzeková Zuzana	Using of available software means to kinematic analysis of industrial robot
Javorský Eduard	Design and computation of carriole for the small single-axle tractor
Jurovská Beáta	Computation of stress and deformation states in bolt joints by the finite element method
Kačmarik Peter	Strength and stiffness analysis of load-bearing elements of gantry crane

Krenželák Tomáš	Creation of parametric CAD model of car cowl and optimization of air flow in engine bay
Mitz Marek	Design of disc brake holder in standard and special designed chassis Y25
Vančo Lukáš	The analysis of strain and stress field using of modern optical methods
Andrejko Marek	Proposal of the sensor used for control of opening of chambers for optical fibers
Čerňan Daniel	Using of FEM to strength analysis of heater of truck changing
Kišš Otto	Strength analysis of support structure of tank for the truck
Kováč Matej	Verification of BVS sensor in process of quality evaluation of production in automotive industry
Kyseľ Peter	Analysis of strength and stiffness properties of the sleepers of the railway superstructure
Marton Vladimír	Possibilities of PhotoStress methods in the analysis of stress structural components of metallic materials
Plachetka Henrich	Using of finite element method to simulation of forming
Seman Jozef	Increase of reliability of the sewing equipment of plastic coating line

PhD. THESES:

Gabáni Ľubomír	Methods of experimental mechanics and their application in failure prediction of mechanical systems

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 sytems
- ✓ 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	**Using of methods of experimental and numerical modelling for increasing of competitiveness and innovation of mechanical and mechatronics systems**
Type of the project	APVV – applied research and development
Number of the project	APVV - 0091 - 11
Principal investigator	Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.
Time period of the project	07/2012 - 12/2015
Annotation of the project	Methods of experimental and numerical modelling of mechatronic systems are significant part of acceleration of product design with substantially

shorter time of introduction of product into production and on market. They support reduction of errors, more powerful and sophisticated products with high added value. They have now days important position not only in research and development, but also in technology of their production.
With respect to current equipment of solution workplace by devices, hardware and software as well as personal, it is possible to transform all important results gained in laboratories into applications in specific individual products and accordingly support sector with high added value.
In Slovakia and all around the world the big attention is devoted to questions of numerical modelling. The workplace of applicants has all knowledge resulting from base research and increase competitiveness of machine production and products. There will use methods of experimental modelling, especially interferential methods based on image correlation, Photostress method, method ESPI, methods of modal analysis.
In the frame of project solution these methods will be used in design of metamorphic robots and robotic systems that will have ability of flexible reconfiguration of its own kinematical and functional structure and they are designed on workplace of applicants.

Title of the project	**Numerical modelling of mechatronic systems**
Type of the project	VEGA
Number of the project	VEGA 1/1205/12
Principal investigator	prof. Ing. Jozef Bocko, CSc.
Time period of the project	2012 - 2015
Annotation of the project	The aim of the project is creation of numerical models of mechatronics systems with a specific application. This is concerned to simulation of snake - like robot locomotion when it moves through narrow unstructured passages for purpose to perform a task such as maintenance inside pipes. The snake - like robot utilize concertina snake gait which is the most suitable for this activity in both horizontal concertina motion and vertical concertina motion. The mathematical model for numerical simulation is based on the framework of non - smooth dynamics. Moreover, the mathematical and simulation model of the snake - like robot for concertina gait is created for purpose of controller design described by an ordinary differential equation. In terms of project experimental function model of snake - like robot on the basis of theoretical knowledge for purpose comparison with numerical model will be created.

Title of the project	**Development of non - traditional experimental methods for mechanical and mechatronic systems**
Type of the project	VEGA
Number of the project	VEGA 1/0937/12
Principal investigator	Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.
Time period of the project	2012 - 2015
Annotation of the project	Development of non - traditional experimental treatments of deformation and stress analysis in supporting elements of mechanical and mechatronic systems with privileged orientation to optical methods – digital image correlation (DIC), electronic speckle interferometry (ESPI) and reflection photoelasticimetry (Photostress). Precising and enhancement of residual stress measurement and evaluation. Application of optical methods of stress fields determination in vicinity of measured point. Verification of new - developed methods of lifespan and reliability evaluation of machine and equipment design as well as design of mechanical and mechatronic systems.

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	**Influence of imperfections on resistance of structural members and load - bearing structures of machines.**
Type of the project	VEGA
Number of the project	VEGA 1/0090/12
Principal investigator	doc. Ing. Vladimír Ivančo, CSc.
Time period of the project	2012 - 2015
Annotation of the project	The project is focused on study of influence of imperfections on resistance of structural members of thin - walled structures. Various methods of modelling of imperfections are examined and the measure of imperfection effect is determined.

Title of the project	**Modelling of stress state during nanoindentation and mechanical loading in composite systems(MONACO)**
Type of the project	VEGA
Number of the project	VEGA 2/0098/14
Principal investigator	doc. Ing. Vladimír Ivančo, CSc.
Time period of the project	2014 - 2016
Annotation of the project	Project deals with the mathematical and experimental modelling of stress states during instrumented indentation and scratch testing under uniaxial - and multiaxial loading of fixed beam in composite systems by means of finite element modeling and experimental testing in model systems. The aim of the project is to create a knowledge basis for the optimization of the conditions for the measurement of nanohardness and scratch resistance of thin hard coatings on hard and soft substrates using instrumented indentation and scratch testing and on the increase of mechanical bonding of beams under loading mimicking bicortical dental implants.

Title of the project	**Using of modern optical methods of experimental mechanics for development of knowledge basis of students of second and third level of university education.**
Type of the project	KEGA
Number of the project	021TUKE-4/2013
Principal investigator	Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.
Time period of the project	2013 - 2015
Annotation of the project	Project is oriented to the development of modern optical methods of mechanics (procedures that use digital image correlation - DIC, electronic speckle interferometry – ESPI, transmission and reflectionphotoelasticimetry - Photostress as well as interferency of coherentlight) and their implementation into education process at the second and third level of high school education. Above-mentioned

	methods are up-to-date and they are able to detect deformations, strains and stresses on the surfaces of real structures or models. Application of suchtreatments is connected with using of non-standard computer programs for evaluation data resulting from experiments and their verification by numerical methods. Elaborated procedures will cultivate creative and innovative thinking of students mainly in the area of structural members optimization as well as in evaluation of life span and reliability of structures. The main output of the project will be two monographs, in which the theoretical basics, principles and applications of individual methods will be described.
Title of the project	**Using of modern numerical methods of mechanics as a base of scientific design to the development of knowledge base of students at the second and third level of university study**
Type of the project	KEGA
Number of the project	KEGA 054TUKE-4/2014
Principal investigator	prof. Ing. Jozef Bocko, CSc.
Time period of the project	2014 - 2016
Annotation of the project	Project is oriented to the implementation of modern numerical methods of mechanics (procedures that use the finite element methods, nonlinear continuum mechanics, plasticity, kinematics and dynamics of multibody systems) into education process in the 2nd and 3rd level of university education. These methods allow to use computer modeling and design of multibody systems – mechanisms, vehicles, robots, power systems or structures – to the phase of creation of virtual prototype. The areas of research in question are dynamically growing parts of numerical mechanics allowing simulation of behavior of continua and multibody systems. In the continuum mechanics we will concern our attention to the behavior of structures under static and dynamic loading and to determination of deformations and stresses. In the solution of problems of multibody dynamics we will determine positions, velocities and accelerations of individual parts of systems. Application of described treatments is connected with creation of new models and using scripts to the standard program products that are used in this area of mechanics. The procedures will advance creative and innovation thinking of students, especially in the area of optimization of supporting structural elements and mechanisms, i.e. in the area that significantly influences resulting parameters of products in mechanical engineering. Very important output of the project will be a monograph in which will be described theoretical basis of numerical modeling of mechanical systems and their optimization together with applications in the area of passive, semi-active and active vibroinsulation of mechanical systems, dynamics of power systems, static and dynamic balancing of mechanisms, analysis of supporting elements of structures by the finite element method in static and dynamic area. The results of project will be also published in journals and conference proceedings.
Title of the project	**Improvement of portal of scientific research platform "Acta Mechanica Slovaca"**
Type of the project	KEGA
Number of the project	KEGA 090TUKE-4/2015
Principal investigator	doc. Ing. Miroslav Pástor, PhD.
Time period of the project	2015 - 2017
Annotation of the project	Project is oriented to modernization of portal system for the scientific and development platform of journal "Acta Mechanica Slovaca" that was created in the frame of KEGA project on the Faculty of Mechanical

	Engineering, Technical University of Košice in past time. At the present the system offers information about results gained in the frame of research and development of inland and foreign organisations as well as researchers and profesionals from practice. Research and scientific activities are close joined with actual orientation of research not only in machinery, but also in other branches of national economy of Slovak Republic. The aim of the project is to incorporate of created platform to scientific journals included in prestigious international databases.
Title of the project	**University scientific park TECHNICOM for innovative applications with support of knowledge technologies**
Type of the project	EU – OP Research and development
Number of the project	ITMS 26220220182
Principal investigator	prof. Ing. Jozef Bocko, CSc.
Time period of the project	2013 - 2015
Annotation of the project	The aim of project is to create projection engineering workplace for numerical and experimental modelling of mechanical and mechatronic systems. The workplace will serve as a support point for creation of mechanical and mechatronic structures for industry.
Title of the project	**Package of element for quality improvement of education on TUKE (Package 2)**
Type of the project	EU – OP Education
Number of the project	ITMS 26110230070
Principal investigator	prof. Ing. Jozef Bocko, CSc.
Time period of the project	2013 - 2015
Annotation of the project	Innovation of study programs for labour market and development of study programs in world language.
Title of the project	**Package of quality improvement TUKE by nets (Package 3)**
Type of the project	EU – OP Education
Number of the project	ITMS 26110230086
Principal investigator	prof. Ing. Jozef Bocko, CSc.
Time period of the project	2013 - 2015
Annotation of the project	The aim of project is to ensure implementation and transfer of knowledge in education process on TUKE, to increase quality and develop human sources in research and development.
Title of the project	**Package of supplements for further reform of education on TUKE (Package 4)**
Type of the project	EU – OP Education
Number of the project	ITMS 26110230093
Principal investigator	Dr.h.c. mult. prof. Ing. František Trebuňa, CSc.
Time period of the project	2013 - 2015
Annotation of the project	Innovation of study programs for labour market and development of study programs in electronic form by using ICT.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUTIONS

Employees and students	Country
Segľa Štefan, prof. Ing., CSc.	University of Technology and Life Sciences in Bydgoszcz, Faculty of Mechanical Engineering, Poland
Segľa Štefan, prof. Ing., CSc.	The Faculty of Production Technology and Management, J. E. Purkyně University in Ústí nad Labem, Czech Republic
Lengvarský Pavol, Ing.	Technische Universität Wien, Austria
Orečný Martin, Ing.	Faculty of Mechanical Engineering, University of West Bohemia in Pilsen, Czech Republic

VISITS OF STAFF MEMBERS FROM FOREIGN INSTITUTIONS

Employees and students	Country
Dr.-Ing. Michael Wünsche	Universität Siegen, Germany
Doc. Ing. Josef Soukup, CSc.	The Faculty of Production Technology and Management, J. E. Purkyně University in Ústí nad Labem, Czech Republic
Ing. Blanka Skočilasová, PhD.	The Faculty of Production Technology and Management, J. E. Purkyně University in Ústí nad Labem, Czech Republic
Matthieu Perrusset	Institut Français de Mécanique Avancée, Clermont-Ferrand, France
Nicolas Hennache	Institut Français de Mécanique Avancée, Clermont-Ferrand, France
Huidobro Ariza Santiago	Universidad de Sevilla, Spain
Beunardeau Rémi	Institut Français de Mécanique Avancée, France
Lapeyre Médéric	Institut Français de Mécanique Avancée, France
Çelik Muhammed Yusuf	Gazi University, Turkey

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Czech and Slovak Association for Mechanics

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Association of Slovak Mechanical Engineers

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Slovak Association for Mechanics

František Trebuňa, Dr.h.c. mult. prof. Ing., CSc., František Šimčák, prof. Ing., CSc., Jozef Bocko, prof. Ing., CSc., Ingrid Delyová, Ing., PhD., Róbert Huňady, Ing., PhD., Miroslav Pástor, Ing., PhD

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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.

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Research reports:

[1] TREBUŇA, František - ŠIMČÁK, František - BURŠÁK, Marián - PÁSTOR, Miroslav - TREBUŇA, Peter: **Posúdenie technických a prevádzkových parametrov turbogenerátora, vyhodnotenie príčin kolapsu, materiálová analýza súčiastok a konzultácia budúcich technických riešení** záverečná správa ZoD č. 271030012015/ - Košice : TU - 2015. - 137 s.

[2] TREBUŇA, František - ŠIMČÁK, František - BURŠÁK, Marián - PÁSTOR, Miroslav - TREBUŇA, Peter: **Posúdenie životnosti hriadeľa vrátane záverov o príčinách porušenia hriadeľa turbíny v spaľovni odpadov** záverečná správa ZoD č. 261030012015/ - Košice : TU - 2015. - 123 s..

[3] TREBUŇA, František - BURŠÁK, Marián - ŠIMČÁK, František - PÁSTOR, Miroslav: **Odborný posudok na poškodený "Drviaci stroj" zn. Eldan Recycling typ SC 1412T-416, výr. číslo 49243-101** záverečná správa ZoD č. 451030012015/ - Košice : TU - 2015. - 29 s..

Department of Power Engineering

Contact

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Staff

- Professors: **2**
- Assoc. Professors: **1**
- Assist. Professors: **3**
- Researchers: **1**
- PhD. Students: **4 internal, 1 external**

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2014
2/2015	Lecture of a representative of Politechnika Warszawska, Poland (dr. inž. Artur Rusowicz)
3/2015	Lecture of a representative of SWEP Slovakia s.r.o. (Ing. Igor Ďurčanský)
4/2015	Lecture of a representative of VŠB TU Ostrava, FMMI (prof. Ing. Miroslav Příhoda, CSc.)
4/2015	Lecture of a representative of HEZORO s.r.o. Bratislava (Ing. Imrich Discantíny)
4/2015	Lecture of a representative of SWEP Slovakia s.r.o. (Ing. Peter Štefanko)
9/2015	Lecture of a representative University of Calabria, Italy (Ing. Angelo Algieri)
10/2015	Lecture of a representative of Nuclear Power Plant Mochovce (Ing. Peter Janko)

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. 2014) on the study programs guaranteed by the department:

first year of study:
- 6 internal form of study
- 0 external form of study

second year of study:
- 7 internal form of study
- 0 external form of study

Number of the graduates (2013/2014)

on the study programs guaranteed by the department:

- 13 students in the internal form of master's degree
- 0 students in the external form of master's degree
- 4 PhD. students in the internal form of study (defended PhD. thesis)
- 1 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 at least 3 yeas and maximum 4 years; for external students maximum 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 Chaptersof Heating Technology
- ✓ Semester Project
- ✓ Steam, Gas and Water Turbines
- ✓ Technical Equipments for Ventilation and Air Conditioning
- ✓ Water Economy

GRADUATE THESES

MASTER'S THESES:

Babejova-Kmecová Paulína	The proposal of individual ventilation with heat recovery for flat unit.
Benková Gabriela	Comparison of heating family house of using the condensing boiler and by the heat pump.
Bučková Katarína	Impact assessment of the atomization in the central heat supply system for consumption and utilization energy supplied.
Géczyová Adriána	Heat supply optimization of selected building in the area Herľany.
Chovanec Pavol	Optimization of graphite electrode cooling system installed in DC plasma reactor.
Kapustová Ľubica	Analysis of non-stationary heat transfer during metal hydride storage tanks filling.
Kerekešová Tímea	Optimization of fluid heating in the selected accumulation tank.
Liščinský Tomáš	Design of hydrogen pumping system.
Mináriková Miroslava	Proposal of experimental device for determining the coefficient of thermal conductivity of semiliquid consistency materials.

Murdžáková Erika	Possibilities of reducing the impact of pulsation on the measurement accuracy of ultrasonic flowmeter for gases.
Sobeková Jana	Possibilities of waste heat utilization at selected biogas plant.
Revák Marek	Proposal of possibility for increasing the efficiency of heating in the bivalent source's accumulation tank.
Rusinková Erika	The heating comparison of the classic fuels and alternative fuels.
Štupák Jakub	Disposal of asbestos roofing by DC plasma reactor on dependent involvement.
Šveda Mikuláš	Earth´s crust stored energy application in low temperature heating system.
Tamás Kristína	Thermal balance of selected swimming pools focusing on the use of solar panels for pool water heating.
Varga Jakub	Streamlining of air distribution system for non-productive areas of GETRAG Ford Transmissions Slovakia company.

PhD. THESES:

Korba Ján	Research and development of advanced methods for hydrogen storage
Kubík Michal	Research of the shape influence of the natural gas cooler's outer heat - exchanging area on its cooling performance
Kmeťová Ľubomíra	Research stabilization of fly ash properties from fluidized bed boilers and reducing its volume using plasma technology
Ľubica Kapustová	Research of hydrogen compressor driven by heat accumulated and generated in metal hydrides
Václav Juraj	Modelling manifestations of temperature fields on the packaging devices for the transport of spent nuclear fuel

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	**Package of innovative elements for the reform of the system of education at TUKE**
Type of the project	Package 4: The package of supplements for further education reform on TUKE, Activity 2.1 Innovation of study programs for the labor market and the creation of study programs
Project number	ITMS 26110230093
Principal investigator	prof. Ing. František Greškovič, CSc.
Time period of the project	01/2014 - 04/2015
Annotation of the project	Currently, major employers require, inter alia, to respond the changing socio-economic conditions thus they interested in highly qualified professionals. Reform of the education provides job seekers in the labor market some competitive advantage. The aim of this activity is therefore to develop new study programs and upgrade existing study programs with implementation of vocational subjects with a focus on current practical problems by parallel support to use the ICT tools.

NATIONAL PROJECTS

Title of the project	**Research of the possibilities of stabilization fly ash characteristics from selected waste types and of its volume reduction by the plasma melting technology**
Type of the project	Grant VEGA
Project number	1/0004/14
Principal investigator	prof. Ing. Mária Čarnogurská, CSc.
Time period of the project	01/2014 - 12/2016
Annotation of the project	Basic research of physical characteristics of vitrified slag arising at the plasma processing of the different types of fly ashes, verification of the supposed characteristics of arose product, particularly in term of its influence on environment, and research of the possibility of inert slag application particularly in building industry are the main target of the project. Evidence of the quality of arising product and its inertial nature should by confirmed by accredited analyses. The experiments realized by now on the developed 10 kVA plasma reactor in the department establish a perspective of fly ash disposal from coal power plants and municipal waste combustion by the mentioned technology, because the output product assures, depending on fly ash

characteristics, its stability in the form of arose glassy structure, volume reduction up to approx. 60 %, according to current information, and it does not damage environment.

Title of the project **Research on the effectiveness of new methods for adsorption and absorptionof hydrogen storage**

Type of the project Grant VEGA
Project number 1/0686/13
Principal investigator doc. Ing. Tomáš Brestovič, CSc.
Time period of the project 01/2013 - 12/2015
Annotation of the project

Purpose of project is research of hydrogen adsorption storage on active surfaces of substances as well as absorption hydrogen storage in order to obtain the highest possible mass ratio of gas and storage substance.

For optimal storage properties is necessary research for formation of the surfaces with the high absorption area with the option of used powder catalysts, and basic research of the composition and metal alloys processing for absorption storage of hydrogen.

Major part of project is the creation of mathematical and physical model for determination of adsorption curves of individual types of storage materials, which will be serve to description and simplification of storage cryogenic tanks. Those should assure sufficient kinetics of supplying fuel cells by stored hydrogen. The part of the project result is verification of those procedures, which are expressed by appropriate mathematical and graphical interpretations on the functional laboratory tank.

Title of the project **Hydrogen and hydrogen technologies**

Type of the project Grant KEGA
Project number 1041TUKE-4/2013
Principal investigator Ing. Natália Jasminská, PhD.
Time period of the project 01/2013 - 12/2015
Annotation of the project

Summary of the present research project is based on the research of production process of hydrogen by electrolysis of water through solar energy with its subsequent storage in the adsorbent materials at cryogenic temperatures. Thus obtained and stored hydrogen can be used to generate electricity in the fuel cell.

Hydrogen research is focused on the development and application of target findings, in which knowledge and ability will be implemented in the preparation of innovative educational programs in applied energy systems through education in specialized laboratories.

Comprehensive research and development will be dedicated to hydrogen economy and the use of hydrogen in fuel cells for transportation, or in the area of decentralized energy. Within the project is planned to complete the laboratory of "Hydrogen Technologies", where will be realized experimental measurements of hydrogen technologies, the results of which will be summarized in a scientific monograph entitled "Hydrogen and hydrogen technologies".

MEMBERSHIP IN SLOVAK PROFESSIONAL ORGANISATIONS

The Slovak Chamber of Auditors
Peter Horbaj, prof. Ing., CSc.

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.

Journal of TECHNIC (CZ)
Mária Čarnogurská, prof. Ing. CSc

PUBLICATIONS

Journals

Books

[1] JASMINSKÁ, N., BRESTOVIČ, T., LÁZÁR, M.: *Výroba a uskladnenie vodíka*. Košice: TU 2015. 141 s. ISBN 978-80-553-2378-7.

Textbooks

[1] BRESTOVIČ, T., JASMINSKÁ, N.: *Využitie numerických metód v energetike*. Košice : TU 2015. 101 s.. ISBN 978-80-553-2067-0.

[2] BRESTOVIČ, T., ČARNOGURSKÁ, M.: *Zdroje a premeny energie*. Košice: SjF TU 2015. 117 s. ISBN 978-80-553-21-71-4.

[3] BRESTOVIČ, T., JASMINSKÁ, N.: *Aplikácia numerických metód v energetike*. Košice: SjF TU 2015. 117 s. ISBN 978-80-553-2379-4.

[4] ČARNOGURSKÁ, M., LÁZÁR, M.: *Termomechanika. Košice*: SjF TU 2015. 265 s. ISBN 978-80-553-2036-6.

[5] ČARNOGURSKÁ, M., LÁZÁR, M.: *Selected chapters of hydro and thermodynamics*. Košice: TU 2015. 139 s. ISBN 978-80-553-2348-0.

[6] ČARNOGURSKÁ, M., BRESTOVIČ, T.*: Hydrodynamics and Termodynamics*. Košice : TU 2015. 127 s. ISBN 9788055320380.

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[8] JASMINSKÁ, N., BRESTOVIČ, T.: *Konvenčné a alternatívne pohony*. Košice: SjF TU 2015. 157 s. ISBN 978-80-553-2380-0.

[9] HORBAJ, P.: *The foundations of gasification and technologies for formation of biofuels*. Košice: TU 2015. 115 s. ISBN 978-80-553-2250-6.

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Journals

[1] BRESTOVIČ, T., JASMINSKÁ, N., PYSZKO, R., LÁZÁR, M., PUŠKÁR, M.: *Measurement of boundary conditions for numerical solution of temperature fields of metal hydride containers.* In: Measurement. Vol. 72 (2015), p. 52-60. - ISSN 0263-2241

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[13] LÁZÁR, M., KMEŤOVÁ, Ľ.: *Teoretický výpočet maximálneho objemu vznikajúceho syntézneho plynu na základe bilancie uhlíka.* In: Seminár z energetických procesov. Košice: TU, 2015 S. 96-101. ISBN 978-80-553-2354-1

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Department of Construction, Automotive and Transport Engineering

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Fax.:	+421 55 602 2507

Staff

- Professors: **2**
- Assoc. Professors: **7**
- Assist. Professors **4**
- Researchers: **2**
- PhD. Students: **6 internal, 1 external**

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Bachelor's degree:

PhD. degree:

- **Transport Machines and Machinery**
- **Parts of Machines and Mechanisms**

Master's degree:

- **Transport Engineering and Logistics**
- **Machines and Machinery for Building Industry, Agriculture and Dressing**

Number of the students
(till 30. 10. 2015)
on the study programs guaranteed by the department:
first year of study:
– 12 internal form of study
second year of study:
– 17 internal form of study

Number of the graduates (2014/2015)
on the study programs guaranteed by the department:
– 17 students in the internal form of engineering study
– 0 students in the external form of engineering study
– 3 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.

Machines and Machinery for Building Industry, Agriculture and Dressing

The study program "Machines and Machinery for Building Industry, Agriculture and Dressing" 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 mobile working machines (i.e. machines for building industry and agriculture) and dressing machines. From the area of building machines there are described earthmoving machines (e.g.

wheel loaders, excavators dozers, graders, scrapers, dumpers), as well as other building machinery. Agricultural machines are represented by machines for plant production (e.g. harvesters, mowing machines) and machines for animal production. Crushers and mills are examples of dressing machinery.

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.

Parts of Machines and Mechanisms

The graduate obtains wide and deep theoretical knowledge in the field of parts of machines and mechanisms. He masters scientific methods of research and development in the area of machine design and machine parts. 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
- ✓ Public Transport Systems and Conveyances
- ✓ Diploma Project
- ✓ 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

Tuch, Tomáš	The design of inlet air system of combustion engine
Kóóš, Krisztián	Engineering design of trailers for transporting boats and personal watercraft
Junka, Martin	Engineering design of integrated loading ramps for building machines
Chalaničová, Frederika	Improving of efficiency and packaging economy in the given company
Jakab, Matej	Engineering design of roll conveyor
Sendrei, Tomáš	Single girder bridge crane 5 000 kg x 11 m
Firmentová, Hilda	Double girder bridge crane 8 000 kg x 13 m
Puzderová, Anna	Double girder bridge crane 12 500 kg x 24 m
Jančár, Marian	Engineering design of pulley block with electric drive of hook rotation
Gönczi, Zoltán	Demountable crane with lifting capacity 1,5t
Frič, Mário	Dynamic protection of floodgate
Glod, Matúš	Engineering design of pillar jib crane
Krempaský, Marcel	Engineering design of special fixing equipment
Molnár, Marek	Engineering design of cantilever crane
Szívos, Gabriel	Engineering design and analysis of special handling equipment
Olexa, Andrej	Engineering design of segmental platform
Blaško, Filip	Engineering design of gearboxes for application in transport and handling machines

PhD. THESES:

Transport Machines and Machinery

Petróci Ján	Increasing the output characteristics and reliability of the one-wheeled vehicle power unit
Tonhajzer Roman	Optimization of construction and management systems of one-wheeled transport vehicles power unit
Šima Martin	New methods for efficience increasing of driving units for transport vehicles
Boslai Róbert	Creating parametric 3D model of the car and its treatment using selected parameters
Tomáš Tomko	Research of new methods and innovative design solutions for combustion engines

Parts of Machines and Mechanisms

Moravič Marek	Control of dangerous vibration of mechanical systems drives
Baran Peter	Research and development of dual mass flywheel

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

Section of 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:

Section of 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

Section of 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 application of universal regulation system in order to master the Source of mechanical systems excitation**
Type of the project	Grant project VEGA
Number of the project	1/0688/12
Principal investigator	prof. Ing. Jaroslav Homišin, CSc.
Time period of the project	01/2010 - 12/2015
Annotation of the project	In general terms the mechanical systems (MS) means the system of driving and driven machines arranged to perform the required work. We divide them into MS operating with constant speed and MS working with a range of speed. In terms of dynamics we understand MS as a system of masses connected with flexible links, it means systems that are able to oscillate. Especially piston machines bring heavy torsional excitation into the system, which causes oscillation, vibration, and hence their noise. Governing of the torsional vibration, as a source of MS excitation, on a basis of results of our research, can be achieved by applying a pneumatic coupling tuned by the proposed universal control system. On this basis, it can be concluded that with given connection a new continuous tuning method in steady state a connection of MS is created. Therefore, the aim of project will be the research, application and analysis of the function of universal control system for governing the MS excitation source with proposed method.

Title of the project	**Research of the new methods and innovative design solutions to increase efficiency and to reduce emissions of a vehicle drive unit with an assessment of the potential operational risks**
Type of the project	Grant project VEGA
Number of the project	1/0197/14
Principal investigator	doc. Ing. Michal Puškár, PhD.
Time period of the project	01/2014 - 12/2016
Annotation of the project	The research project is focused on the research of new methods and innovative solutions to increase efficiency and to reduce emissions of vehicle drive unit. In the first phase there will be to develop the new designs of the individual parts for a drive unit, which will be also used with some

positives of destructive phenomena such as detonation combustion maintained to the required level. The research will be based on in-depth analysis and theoretical modelling of detonations. The theoretical basis will be an empirical model for time estimation required to ignite the fuel-air mixture and a detonation model based on chemical kinetics. Trend towards domination of detonation combustion are concentrated predominately on HCCI (Homogeneous Charge Compression Ignition) technology that enables combustion of very lean mixture with a high burning rate. Using the generated model of detonations in the second phase the HCCI engine model will be designed. It will be optimized and assessed in terms of operational risks.

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	prof. Ing. Peter Bigoš, CSc.
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.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUCIONS

Employees and students	Country
Tomko Tomáš, Ing.	Czech Republic (9. 9. 2015 - 12. 10. 2015)

PUBLICATIONS

Books

[1] MANTIČ, Martin - KOPAS, Melichar: Transport and Handling Machines and Equipment / 1. vyd - Košice : Technická univerzita - 2015. - 122 s.. - ISBN 978-80-553-2357-2.

[2] KUĽKA, Jozef - KOPAS, Melichar: Základy projektovania logistických tokov v automobilovej výrobe / 1. vyd - Košice : TU - 2015. - 123 s.. - ISBN 978-80-553-2356-5.

[3] MANTIČ, Martin - GREGA, Robert: Základy teórie vozidiel / 1. vyd - Košice : TU - 2015. - 121 s.. - ISBN 978-80-553-2420-3.

[4] GREGA, Robert - KAŠŠAY, Peter: Technical Design / 1. vyd - Košice : TU - 2015. - 126 s.. - ISBN 978-80-553-2443-2.

Journals

[1] ČARNOGURSKÁ, Mária - LÁZÁR, Marián - PUŠKÁR, Michal - LÁZÁROVÁ, Marta - ŠIRILLOVÁ, Ľubomíra - VÁCLAV, Juraj: Measurement and evaluation of properties of MSW fly ash treated by plasma / 2015.In: Measurement. Vol. 62 (2015), p. 155-161. - ISSN 0263-2241

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Patents

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Department of Production Systems

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042 00 Košice
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Staff

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

Activities at the department

Date	Title of the event, activity characterizing the life at the Institute in 2015
9/2015	Participation in the meeting of departments and institutes of production machines in 2015. Peter DEMEČ, prof., Ing., CSc., Jozef SVETLÍK, doc., Ing., PhD., ZČU v Plzni, Fakulta strojní, Katedra konstruování strojů, Česká republika, Železná Ruda - Špičák
9/2015	Active lecture: “Design of tool changing system for modular systems”. The scientific conference MMS 2015 – Jozef SVETLÍK, doc., Ing., PhD., 23. September, 2015, FVT Prešov , MTF STU Trnava, Starý Smokovec
10/2015	Active lecture: “Design of universal rotary module”. The scientific conference Deterioration. Dependability, diagnostics – Jozef SVETLÍK, doc., Ing., PhD., Miroslav ŠTOFA, Ing., 6. October, 2015, University of defence, Brno
12/2015	FLL - First Lego League Competition – Jozef SVETLÍK, doc., Ing., PhD., Miroslav ŠTOFA, Ing., Adam ŽILINSKÝ, Ing., Ľuboslava ŠIDLOVSKÁ, Ing., Dominika PALAŠČÁKOVÁ, Ing., PhD., Aula Maxima, SjF, TU Košice

EDUCATION AT THE DEPARTMENT
STUDY PROGRAMMES

Bachelor's degree:

- **Control and diagnostics of production, robotic and transport technology**

Number of the students (till 25. 08. 2015)
on the study programmes guaranteed by the institute:

third year of studies:
– 4 internal form of study

Number of the graduates (2014/2015)
on the study programs guaranteed by the institute:

- 4 students in the internal form of bachelor study

Master's degree:

- **Production machinery and equipment**

Number of the students
on the study programmes guaranteed by the institute:
first year of studies:
– 11 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
– 1 external form of study

GRADUATE PROFILE

BACHELOR PROGRAMMES (Bc.)

Control and diagnostics of production, robotic and transport technics

Study program Control and diagnostics of production, transport and robotic technics is an innovation of the study program The operation and maintenance of machines of bachelor's degree in Mechanical

Engineering Faculty. The program continues to support the fields of the practice of industrial profile, quality and productivity. It provides high theoretical and practical experience with technology in the field of profiling. It focuses on the acquisition of management skills, innovation and renewal of machinery and equipment, namely, manufacturing, transport and robotic techniques.

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 maschines' 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

BACHELOR THESES:

Control and diagnostics of production, robotic and transport technology

Alexandra Araňošová	Assessing the cost of downtime
Petra Marcinášková	Designing of robotic systems by using data glove
Peter Novotný	Maintenance of automatic lubricating device
Tomáš Šimkovič	Possibilities of measurement instrument position in Production Engineering

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	**Multifunctional design studio for teaching**
Type of the project	KEGA
Number of the project	**052TUKE-4/2015**
Main solutionist	Jozef Svetlík, doc., Ing., PhD.
Time period of the project	**2015 - 2016**
Annotation of the project	The aim of the project is to design and build such a specialized classrooms (design studio) that would ensure efficient use and improvement of the educational process. Studio is currently used to teach subjects: "industrial design", "design machine", "modeling of engineering structures", "history of design techniques", "design of manufacturing systems", and "presentation photography". Those specific objects require different conditions of classrooms and equipment compared to other laboratories in the field of engineering. Absence of suitable indoor furniture, desks, shelves for displaying models, tool boxes, equipment for the extraction of dangerous fumes while working with paints and other, photo box with lighting and other equipment. Also for photo processing, virtual modeling missing hardware and software.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUCIONS

Employees and students	State
Demeč Peter, prof. Ing., CSc.	Czech Republic
Svetlík Jozef, doc., Ing., PhD.	Czech Republic
Štofa Miroslav, Ing.	Czech Republic

MEMBERSHIP IN SLOVAK PROFESSIONAL ORGANISATIONS

SASI – Slovak Association of Mechanical Engineers
Peter Demeč, prof. Ing., CSc.

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

Society for the machines of the Czech Republic (CZ)
Peter Demeč**,** prof. Ing., CSc.

PUBLICATIONS

Books

[1] VALENČÍK, Štefan - STEJSKAL, Tomáš: **Údržba, diagnostika a opravy strojov**, 1. vyd. - Košice: TU, SjF - 2015. - 229 s. - ISBN 978-80-553-2249-0

[2] DEMEČ, Peter - SVETLÍK, Jozef: **Výrobné stroje a zariadenia**, 1. vyd. - Košice: TU - 2015. - 131 s. - ISBN 978-80-553-2098-4

Journals

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[7] PALAŠČÁKOVÁ, Dominika - ŠIDLOVSKÁ, Ľuboslava: **Reliability of the production system in engineering production**, In: MONOGRAPH: Deterioration, Dependabillity, Diagnostics. - Brno: University of Defence, 2015 P. 141-148. - ISBN 978-80-7231-431-7

[8] SVETLÍK, Jozef: **Design of universal rotary module**, In: MONOGRAPH: Deterioration, Dependability, Diagnostics. - Brno: University of Defence, 2015 P. 69-75. - ISBN 987-80-7231-431-7

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Department of Process and Environmental Engineering

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Staff

- Professors: **2**
- Assoc. Professors: **2**
- Assist. Professors: **3**
- Researchers: **3**
- PhD. Students: **6 internal, 9 external**

Activities at the department

Date	Title of the event, activity characterizing the life at the Institute in 2015
05/2015	Reaccreditation of the Laboratory for objectivisation physical environmental factors
11/2015	Coorganization 5th International Conference “To Protect our Global Environment for Future Generation “ICEEE 2015, Budapest, Hungary
12/2015	Organisation of the 6th conference “Assesment of quality environment”, Herlany

EDUCATION AT THE DEPARTMENT
STUDY PROGRAMMES

Bachelor's degree:

- **Technology of Environmental Protection**

Number of the students (2014/2015)
on the study programmes guaranteed by the institute - third year of studies:
– 6 internal form of study

- **Environmental Management**

– 4 internal form of study

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

– 18 internal form of study
– 0 external form of study

Master's degree:

- **Technology of Environmental Protection**

Number of the students (till 31. 01. 2015)
on the study programs guaranteed by the department:
– 38 internal form of engineering study
– 19 external form of engineering study

PhD. degree:

- **Technology of Environmental Protection**

Number of the students (till 31. 01. 2015)
6 PhD students in the internal and 9 in external form of study (defended PhD. thesis)

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.

Environmental Management

The study is designed so that graduates could work with information sources, they knew they evaluate and effectively use and master the different communication tools. Students get knowledge of computer technology and its application possibilities in environmental protection. Graduates of the Department of

process and environmental engineering have knowledge of the variability of the operation of the man - environment. They can define the environmental problems, prioritize their problems and to the efficient operation and saving people in the environment. They are qualified to work with all age groups of the population in order to shape their environmental awareness. 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
- ✓ Recyclation and a recycling technologies I.
- ✓ Environment and industrial production
- ✓ Machines and machinery to environmental protection I.
- ✓ Separate processes
- ✓ Techniques of working environment
- ✓ Waste management
- ✓ Environmental engineering
- ✓ Semester project
- ✓ Theory of environmental control
- ✓ 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.
- ✓ Environmental management systems
- ✓ Noise and vibrations
- ✓ Engineering of protection of water and soil
- ✓ Legislative aspects of environmental productions
- ✓ Ecologization of products and production
- ✓ Methodology of environmental impacts assessment
- ✓ Constantly sustained progress
- ✓ Semester project
- ✓ Environmental legislation
- ✓ Objectivization of environmental factors
- ✓ Planning of environmental production
- ✓ Environmental safety of workplaces
- ✓ Ergonomics
- ✓ Diploma project
- ✓ Recyclating oriented construction
- ✓ Diploma thesis
- ✓ Monitoring and diagnostics of environment
- ✓ Planning of environmental suitable production
- ✓ Final thesis

Environmental Management

- ✓ Applied chemics and biochemics
- ✓ Environmental measurements monitoring
- ✓ Basics of environmentalist
- ✓ Theory of control in environmentalist
- ✓ Computer applications II.
- ✓ Environmental engineering
- ✓ Environment and industrial production
- ✓ Intelligent production systems
- ✓ Semester project
- ✓ Environmental politics and legislation
- ✓ Computer applications I.
- ✓ Environmental toxicology
- ✓ Theory and proceedings of control in environmentalist
- ✓ Computer networks and database systems for environmentalist
- ✓ Basics of toxicology
- ✓ Environment and engineering production
- ✓ Environmental legislation
- ✓ Programming systems
- ✓ Technologies of environmental protection
- ✓ Assessment of impact on population health
- ✓ Semester project
- ✓ Environmental education and management
- ✓ Systems of environmental management
- ✓ Management of risk of chemicals
- ✓ Computer networks for environmentalistics
- ✓ Waste engineering and recycling management
- ✓ Waste engineering
- ✓ Semester project
- ✓ Ecologization for products and production
- ✓ Economical efficiency of environmental management
- ✓ Semester project
- ✓ Ecodesign
- ✓ Planning of environmental production
- ✓ Integrated management of environment
- ✓ Recyclating oriented construction
- ✓ Planning of environmental production
- ✓ Assessment of activities impact on environment
- ✓ Diploma project
- ✓ Computer support for control of environmental protection
- ✓ Accreditation and certification in environmentalistics
- ✓ Ergonomics
- ✓ Diploma thesis

- ✓ Systems of environmental protection and control
- ✓ Methodology of assessment of impact on environment
- ✓ Monitoring and diagnostics of environment
- ✓ Constantly sustained progress
- ✓ Environmental management systems
- ✓ Environment and industrial production
- ✓ Prevention and correction of environmental damage
- ✓ Assessment and marking of environmental suitable products
- ✓ Final project
- ✓ 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 simmulation I.
- ✓ Modelling and simmulation II.
- ✓ Final project
- ✓ Final thesis

GRADUATE THESES

BACHELOR THESES:

Technology of Environmental Protection

Rímsky Daniel	The issue of removal of environmental loads in Europe and in Slovakia
Patakyová Patrícia	Effect environs on ageing process of plastic materials
Kmecová Miroslava	Ultrasounds effect on environment
Anna Ballová	Valuation chemical risk in the area of small and middle undertaking
Koczurová Gyöngyi	Methods of monitorings and valuations water source deterinated for humanical usage in Slovak republic

Environmental Management

Bazyľáková Lucia	Analyse of possibilities and recycling textile waste in condition Slovakia
Dudičová Mária	Comparison of different types of filters used in personal sampling solid aerosols
Hricková Michaela	Analysis of potential impacts on the spread of particulates in ambient air
Harvanová Nikola	Analysis and assessment of risks in the environment

Management of Technical and Environmental Risks in Mechanical Engineering

Auer Jakub	Hazardous substances in selected areas, their impact on the environment and the health and safety of employees
Demčáková Adriana	Analysis and evaluation of the impact of noise on the health of employees in forestry
Straka Lukáš	Health and safety in operation, operation and maintenance of wastewater treatment plants
Tkáčová Dominika	Maintenance of endurance areas of Slovakia
Žipaj Pavol	Analyse of effect atmospheric effetcs on transmission of sound
Brezina Martin	Modelling the influence of atmospheric conditions on noise propagation in the program Cadna A
Mráz Jozef	Possibilities of utilization of hydropower in the Kosice region.

MASTER'S THESES:

Technology of Environmental Protection

Matyiová Barbara	Signal processing from measuring devices to measure sound pressure and particle velocity
Širilová Edina	Comparison of visualization techniques for the identification of noise sources
Vevericová Adriana	Analysis of the different welding methods and their impact on the quality and quantity properties of emerging solid aerosols
Eperjesiová Nikola	The project proposal for the treatment of biodegradable waste in selected location
Šamudovská Jana	Impact of biomass combustion in power plants on greenhouse gas emissions
Teperová Andrea	Effect research of illumination on performance and human health
Onderčín Pavol	Modelling and simulation of luminosity – technicals parametres of lighting workplaces
Vantová Ingrida	Valuation effects of thermic – moisture parametres on humans performance and comfort on specific wrokplaces
Bemberáková Dagmara	Proposal on realisation collecting court for choises country
Bachledová Judita	Ecodesign realisation by inovation existing machinery product
Bangová Martina	Comparator analyse like tool of valuation for measures of importance physicals factors environs of human
Bendzsuch Tomáš	Proposal station of manure gas in choices workplace
Tarbaj Roman	Effect environs on joining metals materials
Maršíková Michaela	New trends in environmentally appropriate cleaning of metal surfaces
Vyšňová Lenka	Ways of aplications extractions in environmental analyse
Goliaš Richard	Environmental monitoring of soils in using fractionating analyse
Uličná Ivana	Application ultrasounds extraction in fractionating sediments analyse
Boháčová Bernadett	The possibility of reducing noise of washing machine
Beganič Tomáš	Assessment acoustic properties of vacuum cleaners under the influence of changes in the European legislation
Fecenková Miroslava	Research on materials for shielding of electromagnetic fields
Krzánová Andrea	Application of the optical system of separate waste in the process of municipal waste management in Slovakia
Sabovčíková Katarína	The proposal elimination the spread of solid aerosols in the selected operation
Sabolová Jana	Determine the concentration of solid aerosols in the workplace welding shop
Gulyas Gergö	Analysis of the effectiveness of hybrid vehicles and their assessment of the environment
Dvorská Diana	Assessment of the quality of working environment based on existing legislation
Blašková Andrea	Methods design for assessing of physical activity in the workplace
Katrincová Eva	The use of mobile phones and the impact of electromagnetic radiation on the human body
Kis-Gézciová Kinga	Evaluation of bio-accessibility of selected heavy metals in soils polluted mining and smelting activities
Rosoľanka Ján	Design and verification methodology for measuring the effectiveness of anti-vibration gloves
Matiová Kristína	Assessment of options to reduce of railway noise
Trojčáková Barbora	Raising psychoacoustic quality of engineering products
Kulínová Lenka	Design methodology determination and optimization of psychoacoustic parameters selected of electrical appliance
Bucková Katarína	The proposal for the stand needs measurement stability control devices of electromagnetic fields
Višňovský Peter	Assess the efficiency of photovoltaic power plants and their use in the Kosice
Pustaiová Katarína	The analysis noise sources for of industrial wood processing companies
Levsteková Viera	Proposal of operation for processing and subsequent use of biomass in the Kosice region.

Čerkalová Antónia	Proposal for a method of assessing the combined effects of risk factors in selected working environment
Rodaničová Mária	Proposal of heat exchanger station with respect of the environment
Chálka Ivan	Acoustic analysis of psychoacoustic parameters for selected electrical appliances
Šütö Miroslav	Propose options for reducing of vibrations emitted by automatic washing machine
Šütőová Marcela	The questionnaire research of evaluation of the microclimate conditions
Senderáková Elena	Life cycle analysis of the selected product
Fiľková Monika	Proposal of the system illuminations regulation of factor hall
Plevková Jana	Potential of renewable resource energy with focusing on biomass and using waste raw materials in choices working again
Kempecová Katarína	Using ergonomics by projecting choices workplace within engineering corporation
Spielmann Silvia	Hierarchization and analyse factors in workplaces and proposal methodics for matching individual factors wroking environment
Róth Vladimír	Analyse of factor workplaces and proposal icons for concrete workplace in choice working
Kolesár Ján	New knowledge by the degrease of metal materials
Vavreková Denisa	New posibilities of cleaning area metals materials in prax
Klimová Zuzana	Laser marking of non-ferrous metals and their effect on environment
Dimunová Ľubomíra	Analysis and design of an anechoic chamber for the purposes of measuring acoustic parameters of the products
Riňak Daniel	A new approach to evaluating the impact of noise and vibration on the health of employees in industrial plants
Prigancová Slavomíra	Design methodology of noise reduction in industrial plants

PhD. THESES:

Technology of Environmental Protection

Dzuro Tibor	Development and verification catamaran devices to collect contaminants from standing water
Karková Monika	Waste reduction potential in water jet technology applying
Borošová Lenka	The acoustic parameters research of selected materials and systems applicable for industrial noise protection
Fedák Gabriel	Optimization of degradation of phosphorus and nitrogen in wastewater

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
- ✓ Recyclating 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 expertises:

- ✓ 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 knowlledge 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 participants 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 informatio 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 univrsity 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 efficienty 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-0432-12**
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 fullfilment 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	**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	**2014 – 2015 – I.etapa** **2016 - II.etapa**
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.

INTERNATIONAL PROJECTS

Title of the project	**Revitalization of eutrophic watersfor different degree of polution and size of water areas**
Type of the project	**Danube region project found**
Number of the project	**10-PA04-CI REWATER**
Principal investigator	Dr.h.c. mult. prof. Ing. Miroslav BADIDA, PhD.
Time period of the project	**2015-2016**
Annotation of the project	The project is aimed solving of environmental burdens of environmental surounding in the area of waters that are polluted by agricultural and industrial activities and there are adverse changes in water quality and micro-life in water, which is generally called as water eutrophication. The high content of

nutrients and undesirable elements in the water causes excessive growht of microorganism, maily algae and cyanobacteria that causes the loss of oxygen and limiting of higher forms of acuatic life, especially fishes in thoughout the food chain.The main objective of the project is the extention and modification of patented technology for reducing of the occurrence of algae and cyanobacteria in stagnant waters throught cooperation of the Departments of the Technical University of Košice, through verification of the effectivness of the newly established technology for reducing the occurrence of cyanobacteria in stagnant waters with the aim to dissemination of the results into practice.
Project methodology is based on a knowledge base of the project participants, concerning with the using of graphic manuals, software and knowledge of the norms, and solutions of environmental problems. Methodolically will be processed the technical documentation, by graphics and design means shall be documented the necessary changes for the application in practice of existing facilities, and will be used the present and the past know-how of the participant collective from the previous research project.

VISITS OF STAFF MEMBERS TO FOREIGN INSTITUCIONS

Employees and students	State
Badida Miroslav, Dr.h.c. mult., prof., Ing., PhD.	Hungary, Czech, Germany, Spain, Italia, Ukraine
Lumnitzer Ervin, prof. Ing. PhD.	Poland, Serbia, Ireland
Králiková Ružena, doc., Ing.,PhD.	Hungary, Poland
Sobotová Lýdia, doc., Ing., PhD.	Hungary, Italia, Ukrajine, Spain
Hricová Beáta, Ing., PhD.	Serbia, Hungary, Poland
Moravec Marek, Ing., PhD.	Serbia, Hungary, Italia, Spain
Lukáčová Katarína, Ing., PhD.	Serbia, Hungary
Liptai Pavol, Ing., PhD.	Serbia, Hungary, Italia, Spain
Piňosová Miriam, Ing., PhD.	Serbia, Hungary
Lazarová Petra, Ing.	Czech, Poland
Karková Monika, Ing.	Czech, Poland
Dzuro Tibor , Ing.	Hungary, Poland
Bek Zdenka, Ing.	Poland, Ireland
Goga Bodnárová Alexandra, Ing.	Poland, Serbia,
Jezný Tomáš, Ing.	Croatia, Czech
Hurajt Marián, Ing.	Croatia, Czech, Poland

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

Czech Illumination Association (ČSO)
Králiková Ružena, doc., 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.

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.
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Journal The Holistic Approach to Environment, Croatia
Králiková Ružena, doc., Ing., PhD.

Acta Technica Corviniensis : Bulletin of Engineering, Romania
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Other almanac

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INSTITUTE OF SAFETY AND BIOMEDICAL ENGINEERING

- 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: **3**
- Researchers: **4**
- PhD. Students: **3 internal, 3 external**

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2015
5/2015	National Forum on Maintenance 2015
10/2015	Conference: MachineDiagnostics DIS
11/2015	Conference: Current Issues of Occupational Safety and Health

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Bachelor's degree:

- **Occupational Safety and Health**
- **Quality of Production**

Master's degree:

- **Safety of Technical Systems**
- **Production Quality Engineering**

PhD. degree:

- **Safety of Technical Systems**

Number of the graduates (2014/2015)
on the study programs guaranteed by the department:

- 22 students in the internal form of bachelor study
- 55 students in the internal form of engineering study
- 21 students in the external form of engineering study
- 1 PhD. students in the internal form of study (defended PhD. thesis)

GRADUATE PROFILE

BACHELOR'S PROGRAMS (Bc.)

Occupational Safety and Health

The study programme prepares students for the profession of safety technicians in enterprises. Graduates are able to analyse and solve issues of prevention, identify hazards and evaluate risks at work in various industries and sectors. Students of this programme obtain an overview of European and national OSH legislation and its application in practice. The study programme also focuses on design and implementation of safety management systems and their integration with other systems, (e.g. quality and environmental management systems), as well as their incorporation in other comprehensive systems – e.g. prevention of major industrial accidents, fire protection. Graduates of this study programme can find employment as safety managers or OSH coordinators.

Quality of Production

The study programme provides an overview of production procedures of industrial technologies, process solutions, basic 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.

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

BACHELOR'S THESES:

Occupational Safety and Health

Babej, Tomáš	Characteristics of substances and materials in foundry
Bráz, Patrik	Coordination of OSH in construction
Ferenc, Jozef	Personal protective means and their impact on health and safety at work in a chosen profession
Kička, Oliver	Technical safety of vehicle for the Shell Eco-marathon
Kupčo, Patrik	Magnetometry and its possibilities in technical safety
Repčáková, Martina	Analysis of estimation errors of the human factor using integrated methods HTA - PHEA
Stieranková, Michaela	System of coordination of voluntary fire brigades with the Fire and Rescue Service
Ščerbák, Tomáš	Safety of drivers at the Shell Eco-marathon
Šindler, Marek	Acoustics risk assessment of machinery for non-auditory effects
Vojtanovská, Viktória	The risk assessment of low-frequency sound in the selected operation

Quality of Production

Benka - Rybár, Jakub	Comparison of ISO 13485 and ISO 9001 requirements and proposal of ISO 13485 implementation in selected organization
Čornej, Martin	Integration resulting from the requirements of quality and safety management system
Eštok, Martin	Design of efective control of QMS documentation
Germanová-Sobeková, Andrea	Market surveys and their use in practice
Gombita, Damián	Proposal of using quality tools in process control
Jurušová, Zuzana	Kamishibai as a lean production tool
Kalis, Ján	Analyses of organization state before QMS implementation in small and middle enterprise
Novotná, Slavomíra	Using cycles improve the performance process
Olejník, Jozef	Failure Mode and Effects Analysis within throughout the organisation
Palko, Peter	New opportunities for increasing the efficiency of logistics warehouse
Pristaš, Maroš	Control of nonconforming product in conveyer manufacture
Rožič, Ľuboš	Design model for improving the quality of the implementation process through appropriately set goals
Volochová, Štefánia	Economical analyses of quality management system implementation

MASTER'S THESES:

Safety of Technical Systems

Baranová, Eva	Effectiveness of the OSH elements in the selected operation
Bálint, Tomáš	Safe practices when working in confined spaces
Bogačiková, Michaela	Safety in the operation of listed equipment-lifts
Britan, Peter	Proposal for the implementation of comprehensive security in organization
Fehér, Maroš	Experimental verification of smoke spreading in road tunels
Gajdošová, Andrea	Drafting of management documentation for the reconstruction of production facilities in order to reduce the time
Hrabčák, Tomáš	Safety of Hydrogen Fuel
Hrčka, Martin	Assessing the performance of the work environment on employee performance
Hurtuková, Silvia	PRIMA-management of psychosocial risks in organization
Chochol, Marcel	Vendor management in the automotive industry
Jurkovský, Jakub	Technical safety in extreme sports
Kaňuk, Patrik	Application of safety measures at selected technological equipment
Kašai, Ján	Information security of equipment for wireless signal transmission
Klima, Lukáš	Risk assessment in the selected operation focused on ergonomics
Klimeš, Kamil	Assessment of psychosocial risks in the selected operation
Knutelský, Ján	Use game theory to training crisis staffs
Kováčová, Katarína	Generic model of integrated safety
Kuta, Viktor	The safety of the selected work activities
Labanc, Lukáš	Risk assessment in the selected operation
Lukáč, Peter	Optimizing switching element for sprinkler based on Currie temperature
Marčáková, Katarína	Documentation for the population protection plan in a chosen company
Matuška, Martin	Risk assessment in Bel company
Mihalovič, Radovan	Safety and health at selected work
Miňová, Nikoleta	OSH improvement in the conditions of SMEs
Mišković, Marin	Application of intelligent materials in technical safety
Oláhová, Tímea	Application of the generic model of risk analysis at the interface between the Safety and Security
Olšiaková, Alena	Assessment processes of production for human use according to HACCP standards
Pacinda, Peter	Occupational safety and hazardous substances in selected activities
Palenčár, Martin	Safety and Security as part of the architectural design of the buildings
Podolinská, Petra	Application of chromogenic materials in technical safety
Rákoczy, Peter	Risk analysis of gas boiler equipment
Sopková, Mária	Risk assessment on selected technological aquipment
Sovák, Štefan	Requirements for personal protective equipment and provide staff
Šipoš, Vladimír	Integrated rescue system and its adaptation in practice
Škvarlová, Dana	Application of safety measures in selected chemical laboratory
Trusková, Alena	Risk analysis of revision and verification of safety for electrical equipment and wiring
Varga, Dávid	Risk analysis for the identification of hazardous substances in an accident
Vidíš, Radoslav	Use of unnamed aerial vehicles for emergency units
Zavadská, Marianna	Management of risks in the framework of city infrastructures

Production Quality Engineering

Beláková, Lucia	The system of internal audits realization in engineering organization
Bene, Peter	Identifying the causes of wastage of resources in organization
Betáková, Soňa	Using statistical quality management tools in analyzing and evaluating in the selected production process
Čarná, Lucia	Confusion in the welding process - analysis, causes and suggested remedies
Čierny, Dominik	CTQ Project implementation to ensure stability of quality parameters from the customer view in the selected organization
Dziaková, Petra	Improvement performance the measurement systems
Dzurenda, Matúš	Proposal rationalization of material flow in manufacturing organization
Ecker, Matej	Optimalization of the counting process in selected organization
Eszenyi, Ottó	Application of quality improvement tools in selected manufacturing process
Faith, Gabriel	Application of 5S methodology in TUKE
Gamráthová, Monika	The implementation method Conjoint analysis to identify customer requirements
Havasi, Gabriel	Application of SMED method in the automobile industry
Hoššo, Stanislav	Crimping process optimization with using statistical quality management tools
Ivánová, Soňa	Increase of quality production due implementation of new measurement procedure
Jacko, Peter	Development of quality parameters for the assessment of selected parts of generic model for risk management
Janošková, Ivana	Proposal to streamline internal communications in a selected organization
Jureková, Terézia	Analysis of the value chain in work processes
Kandravá, Martina	Modern management methods of companies leadrship in the metallurgical operation
Kelíšek, Viktor	TPS tools and their use in each phase of production
Kožár, Matúš	Use of advanced technologies with respect to enhancing the reliability of the human factor
Kramarčík, Martin	Measuring, monitoring and improving the selected manufacturing process
Krešňak, Marek	Implementation of selected moduls of software (Palstat CAQ) in new manufacturing project
Kundratová, Vlasta	The application process approach in production management
Kutý, Tomáš	The effective tolerancing as a base for successful impelemntation of product design
Maštalská, Petra	Value chain in production processes
Mésarošová, Katarína	Control of nonconforming product in a selected organization
Minarčik, Tomáš	Identification of human risk with TX Jack
Nagyová, Veronika	Control of nonconforming product and its impact on the cost of quality in terms of DZ Oceliaren (USSK)
Petrík, Daniel	Asset mangement with the aim of quality production improvement
Potančoková, Anna	Control of nonconforming product and its impact on the cost of quality in terms of DZ Oceliaren (USSK)
Ručová, Nikola	Cylinder impact on the quality of the strip surface during cold rolling in U.S.Steel Košice, s.r.o.
Sokáčová, Katarína	Process optimization expedition material for rail
Stašová, Anita	Use of the TRIZ method for problem solving in product development
Šoltésová, Veronika	Implementation of 5S method in the metallurgical operation
Takáčová, Miroslava	Proposal for obtaining feedback for improving the quality of education at TUKE
Tomko, Tomáš	Application of mathematical statistical model for the purpose of multicriteria decision-making multiparameter diagnostics
Verčimáková, Martina	Increasing efectiveness of measurement processes in the line G & S (Gears andcShafts)

PhD. THESES:

Safety of Technical Systems

Kamenický, Lukáš	Quantification and classification management processes integrated management system in terms of safety and quality

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 BESOFT 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.

PROJECTS OF THE DEPARTMENT

Title of the project	**University Science Park TECHNICOM for Innovation Application Supported by Knowledge Technology**
Number of the project	ITMS26220220182
Principal Investigator	Dr.h.c. mult. prof. Ing. Juraj Sinay, DrSc.
Years of implementation:	2013 - 2015
Annotation of the project:	The aim of this activity is to establish a sustainable training activities, advisory and certification center for risk management in machine safety, health and safety at work and environmental risks throughout the life cycle of machines, mechanical systems, vehicles and motorcycles final products as well as within renewable energy.

NATIONAL PROJECTS

Title of the project	**Research into new and newly emerging risks related to industrial technologies within integrated safety as a precondition for the management of sustainable development**
Number of the project	APVV - 0337 - 11
Principal Investigator	Dr.h.c. mult. prof. Ing. Juraj Sinay, DrSc.
Years of implementation:	2012 - 2015
Annotation of the project	Model based on integrated risk analysis will be developed to support the management of sustainable development of industrial technologies of mechanical engineering products. The model will focus on risks related to new technologies and products in particular phases of their life cycle. Its aim will be to define particular phases of causal dependence in the occurrence of negative phenomena. Methods of qualification and quantification will be developed, aiming at risk minimization.
Title of the project	**Research into the processof management of risks related to machines and technical systems in the safety & security interface – safety of technical systems, occupational safety and civil security**
Number of the project	1/0107/12
Principal Investigator	Dr.h.c. mult. prof. Ing. Juraj Sinay, DrSc.
Years of implementation:	2012 - 2015
Annotation of the project:	Effective risk management process covering the safety of machines and technical systems as well as civil security is one of current priorities in enterprises. It is substantially dependent on the relevance of risk identification and quantification. Due to the overlap between safety and security risk management, there is a need to develop

methods of the application of technical solutions which take human factors into consideration. The risk minimization precautions utilize modern ICT, maintenance technologies, and methods of technical diagnostics. KPI parameters are designed to assess the effectiveness of the proposed measures.

Title of the project	**VEGA Development of implementation and verification of integrated systems for safety 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
Annotation of the project:	

Title of the project	**Designing a Model for E-learning Support of the Education in the Production Quality Bachelor Study Program**
Number of the project	KEGA 049TUKE-4/2014
Principal Investigator	prof. Ing. Hana Pačaiová, PhD.
Years of implementation:	2014 - 2016
Annotation of the project:	The project will focus on designing a new model of education based on the utilization of e-learning support. The aim of the project will be to create comprehensive (and concentrated) course material substituting commonly used reading material related to the selected subject. The Bachelor's degree students will be able to actively use the proposed course material available via a web application and the course contents will be divided into two coherent and independent modules. Mastering a selected course will be verified by tests available via the web application. The project activities will include creating supplementary reading material.

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
Oravec Milan, prof. Ing., PhD.	Czech Republic
Hovanec Michal, Ing., PhD.	Germany
Dulebová Martina, Ing.	Czech Republic

MEMBERSHIP IN SLOVAK PROFESSIONAL ORGANISATIONS

Juraj Sinay, prof. Ing., DrSc.

- ✓ 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.
- ✓ Chairman of the Joint Commission for the PhD. defence in the fields of transport and handling equipment, machinery and safety of technical systems.
- ✓ 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.

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.

Milan Oravec, prof. Ing., PhD.
- ✓ Member of Editorial Board Safety of Work, ASPOS

MEMBERSHIP IN INTERNATIONAL PROFESSIONAL ORGANISATIONS

Juraj Sinay, prof. Ing., DrSc.
- ✓ Member of the Working Group IVSS, Sektion Maschinenschutz based in Manheim, FRG.
- ✓ Member of the Gesellschaft für Sicherheitswissenschaften /security company for technology/ VDI Wuppertal, FRG. Member of the Conference of the German - speaking professor of traffic engineering in Europe, based in Berlin - FRG.
- ✓ 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 Environmen committee.

PUBLICATIONS

Journals

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Department of Biomedical Engineering and Measurement

Contact

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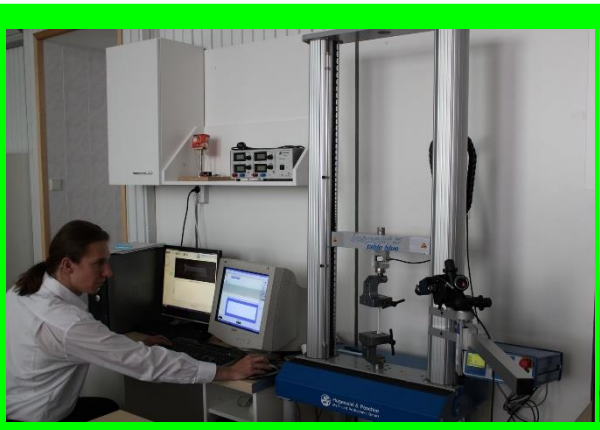

Staff

- Professors: 2
- Assoc. Professors: 3
- Assist. Professors: 2
- Researchers: 3
- PhD. Students: 9 internal

Activities at the department

Date	Title of the event, activity characterizing the life at the department in 2015
-	-

EDUCATION AT THE DEPARTMENT

STUDY PROGRAMS

Bachelor's degree:

- **Prosthetics and Orthotics**

Number of the students (till 31.12.2015), on the study programs guaranteed by department 0.

Number of the graduates (2014/2015), on the study programs guaranteed by the department:

- 0 students in the internal form of bachelor study

Master's degree:

- **Biomedical engineering**

Number of the students (till 31.12.2015), on the study programs guaranteed by department 22:

Number of the graduates (2014/2015), on the study programs guaranteed by the department:

- 22 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.

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

- ✓ Architecture of prosthetic and orthotic aids
- ✓ Assistive Technology for Persons with Disabilities
- ✓ Basics of anatomy and physiology
- ✓ Basics of biomedical engineering
- ✓ Basics of information and computer systems
- ✓ Basics of technical prosthetics and orthotics
- ✓ Biocybernetics
- ✓ Biomeasurement
- ✓ Biomedical Engineering
- ✓ Biomechanics in prosthetics and orthotics
- ✓ Biomechanisms
- ✓ Biophysics
- ✓ Components and Modules of Medical Devices
- ✓ Design of Experiment
- ✓ Diagnostics and Treatment in Orthopedics
- ✓ Diploma project
- ✓ Diploma work
- ✓ Ergonomic and Kinesiology Measurements
- ✓ Ergonomic Measurements
- ✓ Final Project
- ✓ Final work
- ✓ Functional anatomy
- ✓ Fundamentals of Rehabilitation Engineering
- ✓ Goniometry of human locomotion system
- ✓ Human biomechanics
- ✓ Human Engineering
- ✓ Human Motion Analysis
- ✓ Intelligent Measuring Systems for Biomedical Engineering
- ✓ Introduction to biophysics
- ✓ Introduction to prosthetics and orthotics
- ✓ Medical devices
- ✓ Metrology in mechanical engineering
- ✓ Prosthetics and orthotics
- ✓ Proteomics
- ✓ Rehabilitation technology
- ✓ Semestral project
- ✓ Surgical tecnology
- ✓ Technics of clinical examination

GRADUATE THESES

BACHELOR'S THESES:

Prosthetics and Orthotics (- 2014/15)

Mário Balla	Possibilities of objectivisation and automation of functional muscle test
Barbora Delejová	Possibilities of a diagnostic for dysphagia in children
Matej Dilý	Using statistical methods for processing data from measuring systems
Patrícia Glajcová	Morphometric parameters of human head
Gabriel Gledura	Design of an application for scanning systems
Patrik Kendereš	Testing of orthopedical surgery planing software
Michaela Miklušová	Possibilities of a diagnostic for lumbar joints in children
Jozef Molnár	Analysis of input parameters of support material for implant fabrication
Jakub Poláček	Laboratory of ergonomical parameters
Martin Szöke	Utilization of surface-adaptabile pressure sensors in prosthetics and orthotics
Branko Štefanovič	Utilisation of 3D printers of plastic for production of finger prosthesis

MASTER'S THESES:

Biomedical engineering (- 2014/15)

Simona Bodnárová	Analysis and testing of biodegradable materials for medical applications
Mariana Brosová	Design of a fitness aid for proper support of the upper limbs
Helena Budzáková	Assistive technology designed to affect tremor upper limb
Marek Čontošfalský	Thermo visual monitoring of the acclimatization of a person
Eugen Fialka	Construction design of a suspension system for a UEU (universal exercise unit)
Anna Gajdošová	Recent possibilitities of additive manufacturing of intraoseal dental implants
Maroš Hajduk	Bionic design for production using additive technologies
Miloš Horňák	Comparison of quality outputs between cooled and nucooled termographic systems in medical application
Zuzana Hovancová	Technical and construction solutions options of dynamic orthosis for cerebral palsy patients
Ivana Huňadyová	The measuring and monitoring of physiological phenomena during rehabilitation
Žofia Kalináčová	Design of a control for imaging of intra-abdominal pressure
Filip Kecer	Verification of dental products manufacture using the laser sintering technology
Patrik Kölbel	Design of a software application for the development of a gentle motor functions
Svetlana Králová	Analysis and production of ceramic coatings applied to dental replacements
Pavol Langer	Using taping and its influence on biomechanics of animals movement
Jozef Majerniček	Construction configuration for tracking systems of the upper limbs
Margita Markovičová	Measuring of free shapes and application in biomedical engineering
Marianna Maťašová	Aplikation of the microsensors to measure of the humans physiologic parameters
Zuzana Matejčeková	The use of rehabilitation aids with the Therasuit method
Jakub Miakyš	The Monte Carlo method and its application in biomedical engineering
Denisa Mišľanová	Production of anatomical CAD models of skulls and 3D printing for research and educational purposes
Ján Naď	A comparison of touch and non-touch methods of position measuring and their aplication for biomedical engineering
Maroš Olejár	Utilization of low-cost 3D printers for production of plastic referential medicinal models
Jozef Savina	Construction design for a prosthetic foot
Peter Sedlačko	Testing of selected parameters of Tactilus sensoric system for measurement of contact pressure in prosthetics and orthotics
Eva Schvarzbacherová	Manufacturing of dental products made of titanium by laser sintering technology
Branislav Sojka	Design of a database of implemented implants and biomechanical systems of a human being
Martin Soták	Diagnosis and prevention of laser sintering process failure via vibration measurement
Viktória Stanová	Transcatether aortic valve implants
Valéria Sztéhliková	Validation of cranial implants manufactured by additive technologies
Katarína Šromovská	The possibilities of Spina Bifida orthotic treatment
Gabriel Tegdeš	Design of a motorized splint for the lower limbs
Eva Tomková	Utilisation of 3D printing for production of orthoses

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	**Design of the construction configuration and architecture of intelligent implants.**
Type of the project	VEGA
Number of the project	1/0515/13
Principal investigator	Jozef Živčák, Dr.h.c. prof. Ing., PhD.
Annotation of the project	The most common way in compensation of lost tissues is their implantation, during which is possible to replace lost tissues from own resources. (Autoimplant) or in case of hard tissues (bones) are used in significant rate implants from CoCrMo steels and titanium materials. Regarding to the fact that these areas are often very exposed in terms of strain is this resulting repeatedly to reimplantation of implant because of its mechanical demage or inflammatory processes. Elements of the intelligence applied in design of implants have to provide the information about the implant condition, current status of implant as a complex or selected part of the implant. Given the fact that it is a new technology the research of properties and range of their utilization in selected types of material is needed. The advantage of selected sensors is noninvasive and contactless way of measurement of expected parameters after implantation in human body, which will secure the prediction of implant collapse and reduction of the health risk.

Time period of the project	2013 - 2016

Title of the project	**Medical university science park in Kosice (Medipark Kosice)**
Type of the project	OPVaV
Number of the project	26220220185
Principal investigator	Jozef Živčák, Dr.h.c. prof. Ing., PhD.
Time period of the project	2013 - 2015

Title of the project	**Implementation of new technologies in design and fabricationofimplants in biomedicalengineering and relatedscientificfields**
Type of the project	KEGA
Number of the project	036TUKE-4/2013
Principal investigator	Hudák Radovan, doc., Ing., PhD.
Annotation of the project	Recently, in the production of implants, new technologies using „additive manufacturing“ , i.e. adding material layer by layer, have been setting the trends. These technologies are more economical, environmentally friendly and they enable to create implants with shape variability, implants with porous structure but also tailor-made implants for different parts of human body. One of the first materials used for the additive manufacturing (AM) were plastics processed by various technological processes, e.g. stereolitography (SLA), fused deposition modeling technology (FDM), 3D printing, selective laser sintering (SLS) and the like. There are new possibilities of AM being introduced by using the technologies which enable to process metal powder. Mostly, it is direct metal laser sintering (DMLS), known since 1994, electron beam melting technology (EBM) that was also developed in the nineties of the last century and LENS technology (Laser Engineered Net Shaping). These technologies use an entry graphic format (especially STL) that requires a precise software preparation (CAD/CAM). The objective of the proposed project is creation of multi-media materials and e-learning course that will contain information about the new technologies and software support in the creation of implants in a form of video and photo documentation, animations and written educational materials. The presented multi-media content will be used in teaching of various subjects within Biomedical engineering and also within other departments at various faculties and science interdisciplines that integrate technical and medical science.
Time period of the project	2013 - 2015

Type of the project	KEGA
Number of the project	031TUKE-4/2013
Principal investigator	Michalíková Monika, Ing., PhD.
Annotation of the project	The primary aim of this project is to prepare and publish educative orthotics and prosthetics handbook in the study program prosthetics and orthotics, for students in bachelor-degree study in FME TUKE in Kosice.

	Educational handbook is built on the analysis of the latest knowledge in the field of prosthetic and orthotic. The same knowledge base will be the used for training DVD containing multimedia courses. The secondary aim is speciazed laboratory completion, with a focus on teaching the correct understanding of thermal - technologiacal processes in manufacturing, construction and application of prosthetic and orthotic devices, optimization of working with materials used in this areas.
Time period of the project	2013 - 2015
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	2015 – 2017
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. Reseacrh 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 2015 – 2017

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 – Europen 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 – „Inžineria ortopedično protetična“ (Poland).
Jozef Živčák, Dr.h.c. prof. Ing., PhD.

PUBLICATIONS

BOOKS:

[1] Miroslav Dovica, Jozef Živčák, Tatiana Kelemenová **Geometrické špecifikácie výrobkov Geometrické tolerancie**/ - 1. vyd. - Košice : TU - 2015. - 215 s.. - ISBN 978-80-553-2245-2.

[2] Marianna Trebuňová, Jozef Živčák **Biofyzika pre biomedicínske inžinierstvo** - 1. vyd. - Prešov : TU - 2015. - 175 s.. - ISBN 978-80-89040-42-1.

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[1] Radovan Hudák ... [et al.] **Influence of Fixation on Magnetic Properties of Glass-Coated Magnetic Microwires for Biomedical Applications** - 2015. In: IEEE Transactions on Magnetics. Vol. 51, no. 1 (2015), p. 104-104. - ISSN 0018-9464 Spôsob prístupu: http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=7029216...

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[3] Michal Kelemen, Tatiana Kelemenová ... [et al.] **Embedded systems via using microcontroller** - 2015. In: Applied Mechanics and Materials. Vol. 816 (2015), p. 248-254. - ISSN 1660-9336

[4] Erik Prada, Michal Kelemen, Tatiana Kelemenová ... [et al.] **Friction force identification for machine locomotion** - 2015. In: Applied Mechanics and Materials : Applied Mechanics and Mechatronics 2. - 978-3-03835-602-8 Vol. 816 (2015), p. 276-281. - ISSN 1662-7482 Spôsob prístupu: www.ttp.net...

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[6] Alexander Gmiterko, Tatiana Kelemenová ... [et al.] **Machines for in-pipe inspection** - 2015. In: Journal of Automation and Control. Vol. 3, no. 3 (2015), p. 79-82. - ISSN 2372-3033

[7] Tatiana Kelemenová ... [et al.] **Experimental verification of hall effect sensor properties** - 2015. In: Journal of Automation and Control. Vol. 3, no. 3 (2015), p. 75-78. - ISSN 2372-3033

[8] Michal Kelemen, Tatiana Kelemenová ... [et al.] Distance measurement via using of ultrasonic sensor - 2015. In: Journal of Automation and Control. Vol. 3, no. 3 (2015), p. 71-74. - ISSN 2372-3033

[9] Peter Sedlačko ... [et al.] **The Application of the Matrix Tactile Sensor (MTS) for Measuring Contact Pressures between the Trunk Orthosis and a Patient Body and a Mechanical Testing of the Measuring System** - 2015. In: Journal of Automation and Control. Vol. 3, no. 3 (2015), p. 1-5. - ISSN 2372-3041 Spôsob prístupu: http://pubs.sciepub.com/automation/3/3/21/...

[10] Radovan Hudák ... [et al.] **Addition of a Molybdenum into amorphous glass coated microwires usable as a temperature sensors in biomedical application** - 2015. In: Physica Status Solidi (a). Vol. (2015), p. 1-7. - ISSN 1862-6319 Spôsob prístupu: http://onlinelibrary.wiley.com/doi/10.1002/pssa.201532574/abstract...

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[12] Radovan Hudák ... [et al.] **Usage of industrial computed tomography for evaluation of custom-made implants** - 2015. In: Studies in Computational Intelligence. Vol. 606 (2015), p. 29-45. - ISSN 1860-949X

[13] Jaroslav Majerník, Jozef Živčák **Evaluation of postural stability using motion analysis techniques** - 2015. In: Studies in Computational Intelligence. Vol. 606 (2015), p. 175-184. - ISSN 1860-949X

[14] Radovan Hudák, Viktória Rajťúková, Jozef Živčák **Automatization of contact pressure measurement between trunk orthosis and patient's body using a matrix tactile sensor** - 2015. In: Acta Mechanica et Automatica. Vol. 9, no. 1 (2015), p. 38-43. - ISSN 1898-4088 Spôsob prístupu: http://www.degruyter.com/view/j/ama.2015.9.issue-1/ama-2015-0008/ama-2015-0008.xml...

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DEAN'S OFFICE OF THE FACULTY OF MECHANICAL ENGINEERING

- Computer and Editorial Centre

Computer and Editorial Centre

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- Secretary: **1**
- PhD. Students: **2 external**

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- ✓ CA Methods in Mechanical Design II.
- ✓ CA Methods in Mechanical Design III.
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- ✓ CAD Methods in Mechanical Design
- ✓ CAD - Introduction to Solid Modeling
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- ✓ Computer Aided Design
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- ✓ Construction and CAD
- ✓ Informatics and PC I.
- ✓ Informatics and PC II.
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- ✓ Programming techniques
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The main fields of research of the Computer Centre is optimizing of machinining of complex shape surfaces and development of application for CAD systems focused on mechanical problems.

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Projects of the Department:

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.

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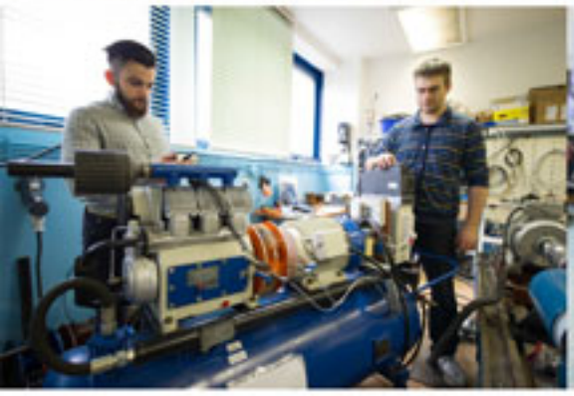

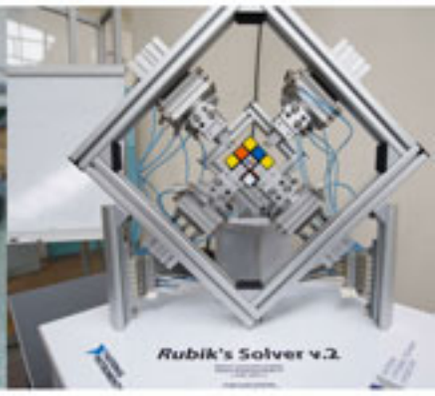
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