Tomas Bata University in Zlín

# Science Activity Annual Report

## 2017

**CONTENT**

# 1 DEFENDED DOCTORAL THESES

In 2017, a total of 36 theses were defended:10 at the Faculty of Technology, 11 at the Faculty of Management and Economics, 11 at the Faculty of Applied Informatics and 4 at the Faculty of Multimedia Communications.

## 1.1 Faculty of Technology

## Degree Programme: CHEMISTRY AND MATERIALS TECHNOLOGY

## Degree Course: Technology of Macromolecular Compounds

Ing. **Ondřej Kratina**, Ph. D.

Date of defence: 27. 10. 2017

Supervisor: doc. Ing. Roman Čermák, Ph.D.

### Structure and fracture behaviour of rubber

**Abstract**

The thesis deals with fracture behaviour of rubber and methodology associated with its characterization. Understanding particular mechanisms of fracture is important in prediction of rubber compound performance under real loading conditions and increase of rubber products service life. The theoretical part summarizes published approaches used to characterize fracture behaviour of rubber. In addition, a part of theoretical background is devoted to the analysis of fatigue crack growth (FCG) and describes the effect of the structure and test conditions. The experimental part focuses on the preparation of rubber compounds based on natural rubber (NR), butadiene rubber (BR) and styrene butadiene rubber (SBR) as well as combinations of them. Subsequently, rubber test specimens are prepared for characterizing the fracture behaviour throughout their service life under cyclic and static loading. Last but not least, functional prototype of device for characterization of the fracture behaviour of stressed rubber in tension simultaneously being penetrated by sharp object is introduced.

Ing. **Lenka Kutějová**, Ph.D.

Date of defence: 9. 11. 2017

Supervisor: doc. Ing. Jarmila Vilčáková, Ph.D.

## Epoxy-silicone filled nanocomposites:Study of mechanical and electrical properties


### Abstract

The work is focused on the modification of the brittle epoxy matrix by silicone elastomer with a view to improve the toughness characteristics without significant reduction of modulus, glass transition temperature and interfacial adhesion, and, to obtain conductive nanocomposites. The emphasis has been put on the preparation technology of epoxy-silicone polymer system with controlled morphology and mechanical properties. To this end, epoxy resins based on diglycidyl ether bisfenol A and different types and content of polydimethylsiloxanes were mixed. Curing was carried out using diethylentriamine hardener and dicumyl peroxides as compatibilizator. These polymer blends were subsequently filled with carbon black or carbon nanotubes to obtain electroconductive systems. It has been established that mechanical properties of such nanocomposites are influenced by the microstructure of the multiphase epoxy-silicone polymer system, which in turn is determined by the presence or absence of interphase compatibility between two polymer phases. The electrical properties of nanocomposites heavily depend on filler aspect ratio, filler content, and, to some extent, on polymer matrix composition. Aforementioned types of conductive materials can be used as conductive adhesives, electromagnetic interference (EMI) isolation materials, antistatic coatings, etc.


Ing. **Hana Dostálková, nee Marušincová** , Ph.D.

Date of defence: 5. 5 2017

Supervisor: doc. RNDr. Jan Růžička, Ph.D.

## Microbial removal of synthetic polymers from wastewater


### Abstract

This doctoral thesis was focused on the evaluation of the polyvinyl alcohol (PVA) biodegradation under aerobic, anaerobic and especially denitrifying conditions, with the use of sludge inoculums originated from the common wastewater treatment plant. Denitrifying

conditions were ensured by an oxygen absence and by nitrates addition at the beginning of the tests; the nitrates served as electron acceptors for anoxic respiration of present micro-organisms. The main reason for this doctoral study was very poor scientific knowledge concerning PVA biodegradation under denitrifying conditions. Biodegradation kinetic under denitrifying conditions was compared with the processes proceeding under aerobic and anaerobic conditions. The degree of PVA biodegradation in the tests was evaluated by the direct spectrophotometric measurement of PVA concentration, determination of dissolved organic carbon and changes in nitrate ions concentration. The values of redox potentials were checked in all the tests. The important part of the doctoral thesis was focused on the observation of composition of the microbial community degrading polyvinyl alcohol under denitrifying conditions and on the many attempts to isolation of key bacterial degrader.

Ing. **David Pištěk**, Ph.D.

Date of defence: 25 10. 2017

Supervisor: doc. Ing. Dagmar Měřínská, Ph.D.

## The study of a possible technology for a recycling of recuperated

### Abstract

The main use of PVB is in safety glass laminates, especially in automotive, aerospace and architecture glass. While the glass is recycled PVB is not, because it has poor properties and it is disposal in landfill. An alternative to disposal in landfill and wasting of this expensive material is to find of possible way recycling of PVB. Presented work deals with safety glass laminates recycling by wet way which could be an alternative to recycle by mechanical means. This work shows very important knowledge about impact of recycling conditions on the final properties, compare to the re-worked material obtained by different forms of recycling and evaluates the effect of additional PVB and plasticizers to re-worked PVB. Furthermore, this thesis deals with the conditions of reprocessing of plasticizers PVB. In order to find the way for the improvement of properties of recycled PVB, the possibility of an adding of nanofilers into PVB was researched. There are compared various technologies for preparing composites, filling volume and the effect of the modification agent of filler. The dispersion of fillers in the polymer matrix was evaluated, along with mechanical and optical properties.

Ing. **Pavol Šuly**, Ph.D.

Date of defence: 14. 9. 2017

Supervisor: doc. Ing. et Ing. Ivo Kuřitka, Ph.D. et Ph.D.

## Study of poly(vinyl alcohol) solution for inkjet printing

### Abstract

The thesis is focused on the preparation and characterization of water-soluble polymer-based ink. The poly(vinyl alcohol) (PVA) was chosen for preparation of the suitable polymer inks for a Dimatix material printer DMP-2800 Series working in the drop-on-demand mode. Drop-on-demand mode is one of the two most frequently used ways in inkjet printing technology, which represents a promising technique for simultaneously patterning and material deposition without a need of any master form or masks. The work is divided into theoretical background and experimental part. In theory, a brief introduction to inkjet printing technology is provided, and followed by a description of the main ways of drops generation together with the device arrangement. The next section of the theoretical part is focused on a description of the basic groups of inkjet inks as well as on their crucial parameters, for example, viscosity and surface tension. Further, the interpretational framework based on dimensionless criteria for ink property evaluation is discussed including viscoelasticity assessment. A brief description of the polyvinyl alcohol is provided in the last section of theoretical part. The main aim and goals of this work are defined in accordance with hitherto achieved results of research conducted in the laboratories at our institution and with the aid of information gathered from a literature review summarized in previous sections. The experimental part is arranged in accord once the sequence of the performed experiments. The core section of the work contains 10 chapters discussing obtained results. At the beginning of this section, a selection of polymer-solvent system is discussed. The rheological and viscosity studies of the prepared solutions are shown and discussed including the stability and aging issue. In the next step, discussion of surface tension measurements follows. According to the obtained results, the suitability of prepared solution for inkjet printing was performed by calculating and evaluating of dimensionless criteria to find optimum solution properties correlating with a processing window. It was shown that the analytical apparatus does not fully cover the studied case, in spite of its improvement. Therefore, the next section is dedicated to study drop formation and analysis of this process resulting in a study of viscoelastic properties and their analysis with respect to ink

drop formation. In the last step, other parameters (waveform, drop velocity) were optimized with respect to the used digital printing cartridge and modified polyethylene terephthalate. Consequently, the prepared demonstration patterns are characterised and presented mainly in the form of images captured by optical microscopy and data obtained by AFM and mechanical profilometry. Gathered knowledge and experience were summarized in the concluding summary section and in a short advice for practical ink development procedure.

## Degree Programme: CHEMISTRY AND MATERIALS TECHNOLOGY

## Degree Course: Chemistry and materials technology

Ing. **Ivo Krásný,** Ph.D.

Date of defence: 27. 10. 2017

Supervisor: prof. Ing. Lubomír Lapčík, Ph.D.

## Preparation, modification and application of kaolinite in composites

### Abstract

This thesis deals with the preparation, modification and application of mineral filler kaolin content on the physico-mechanical properties of polyethylene composites. Basic structure and properties of layered clay minerals is described in the first theoretical part. Especially, kaolin's ability to absorb foreign molecules to its layer space is discussed precisely. This fact can real affect properties itself and also properties of all composite system. Improvement in polymer/filler interaction was supported by chemical intercalated mechanism performed with silane coupling agent addition. Influence of low temperature air plasma treatment on surface energy was studied, reflected in decreasing wetting values was observed, as well as flow properties of kaolin powders is also mentioned. Experimental section starts with kaolin characterization from the particle point of view and its distribution into polyethylene matrix. The final properties of kaolin-polyethylene composite and the effect of modification were evaluated by mechanical properties measurement, especially strength characteristics, tensile, fracture toughness measurement and thermal stability test. Observed results were detailed discussed and compared with existing facts in the literature.

Ing. **Ivana Kupská**, Ph.D.

Date of defence: 27. 10. 2017

Supervisor: prof. Ing. Lubomír Lapčík, Ph.D.

## Synthesis and modification of physico-chemical properties of gel systems for therapeutic applications


### Abstract

This thesis is divided into 4 theoretical basic parts. Gels systems in general are described into first part followed by main part regarding hyaluronic acid as significant biopolymers with wide range of use in biology and also in therapeutic fields in biomedical applications. There is a chemistry description and its structure in solution study, but also approach of polymeric coil behaviour with respect to polyelectrolytical and rheological behaviour aspects. Next part deals with basic HA derivates, syntehesis description and physico-chemical characterization. Last theoretical part is mainly focused HA polymeric solution, by studying of viscosimetric measurement. Submitted thesis is deeply focused on rheological properties of studied sodium hyaluronate solution. The main body of practical part is solved by polymer concentration dependence to rheological sodium hyaluronate solution study from methodical point of view with respect to physico-chemical characterization. Therefore, a viscometric measurement is also discussed as a basic of polymer solution study. Influence of increasing temperature and effect of pH change to viscosity solution is described further due to thermodynamic parameters of flow. Ionic composition of solvents and chemical modification by acid and alkaline substances are also mentioned. Based on viscosimetric measurement data of polymeric coil and conformation changes, intrinsic viscosity and Huggin's constant were calculated. Surface energy characterization by inverse gas chromatography (SEA) approach is also mentioned. HA topography study by scanning electron microscophy and structure processes by thermogravimetry are described as well.


Ing. **Veronika Mikulcová**, Ph.D.

Date of defence: 8. 11. 2017

Supervisor: doc. Ing. Věra Kašpárková, CSc.

## Dispersion systems as carriers of active substances

**Abstract**

The doctoral thesis is focused on the formulation, preparation and characterization of the dispersion systems with the ability to carry, effectively encapsulate and release active substances in the cosmetics, pharmaceutical or food industry. The thesis is divided into two main sections. In the theoretical part, a brief description of encapsulation process and most common encapsulation systems is provided, with emphasis on the emulsion-based systems. The next chapter deals with challenges associated with encapsulation of lipophilic active ingredients. The center theme of the thesis is focused on particle-stabilized emulsions, primarily on those stabilized by nanocellulose particles. Following this, a comparison of properties of prepared systems is presented. Finally, the last section provides an overview of laboratory techniques used for characterization of discussed systems. The second part of the thesis presents results conducted during the doctoral study in form of short summaries on four research papers. The full-length versions of the papers are available at the end of the publication.

## Degree Programme: FOOD CHEMISTRY AND TECHNOLOGY

## Degree Course: Food Technology

Ing. **Pavel Pleva**, Ph.D.

Date of defence: 23. 10. 2017

Supervisor: doc. RNDr. Leona Buňková, Ph.D.

## Factors influencing biogenic amines production by selected strains of genera Enterococcus and Staphylococcus

**Abstract**

Biogenic amines are produced by the decarboxylase activity of microorganisms in food. Their high amounts can adversely affect human health. Therefore, the aim of this thesis was to determine the influence of factors on the decarboxylase activity of selected strains of enterococci and staphylococci, which were isolated from selected food. In this work, the potencial to produce 8 biogenic amines (phenylethylamine, histamine, cadaverine, putrescine, tryptamine, tyramine, spermidine and spermine) by Enterococcus and Staphylo-

coccus strains was investigated. The Enterococcus strains (a total of 33 strains) were isolated from rabbit meat (Oryctolagus cuniculus) and a total of 21 Staphylococcus strains were isolated from the intestinal content of a trout (Salmo trutta). In addition, the effect of selected environmental factors; such as temperature, pH, and salt concentration; on decarboxylase activity of the studied microorganisms was tested. The kinetics of biogenic amines formation were monitored during cultivation of bacteria prepared by derivatization with dansyl chloride and analysed by HPLC equipped with UV detection. The obtained results showed that all studied enterococci produced predominantly tyramine and putrescin. Also, putrescin in excess of 100 mg.l-1 was produced by two strains of Enterococcus faecium. Further, each of 12 strains of enterococci produced more than 1000 mg.l-1of tyramine. Therefore, the sum of all observed biogenic amines was dependent on the amount of produced tyramine. The obtained results indicate that staphylococci were more important biogenic amine producers (tyramine, putrescin and cadaverine) than enterococci (tyramine, sometimes putrescine). In accordance with obtained results it can be concluded that, the most significant influence on biogenic amines production had temperature. At lower cultivation temperatures, tyramine production by the selected microorganisms was lower than at temperature of 30 °C after 24 hours (Enterococcus faecium 2201 mg.l-1, Enterococcus sp., 1700 mg.l-1, Staphylococcus pasteuri 1866 mg.l-1, Staphylococcus hominis 1260 mg.l-1; Staphylococcus epidermidis 1319 mg.l-1). Enterococci produced a substantial amount of tyramine and phenylethylamine at pH 5 - 6, with highest production of mentioned amines at 30 °C and pH 6. The influence of pH on tyramine production by enterococci at 30 °C was negligible. Furthermore, staphylococci produced 2.5 times more tyramine at pH 7 than at pH 5. Also, the influence of the addition of NaCl was apparent and the most of the tested biogenic amines were produced when applied NaCl below 3% (w/v). In conclusion, enterococci and staphylococci are significant producers of tyramine.

Ing. **Richardos Nikolaos Salek**, Ph.D.

Date of defence: 21. 2. 2017

Supervisor: doc. Ing. František Buňka, Ph.D.

## Selected properties of dairy model systems containing ternary mixtures of phosphate and citrate salts

**Abstract**

The main aim of the current thesis was to evaluate the combined effect of the composition of ternary mixtures of emulsifying salts [consisting of disodium hydrogen phosphate (Na2HPO4; DSP), tetrasodium diphosphate (Na4P2O7; TSPP), sodium salt of polyphosphate with a mean length n=20 (P20) and trisodium citrate (C2H5Na3O7; TSC)] on selected functional properties (textural and rheological) of model processed cheese samples manufactured from different cheese matrices and with different degrees of maturity during storage. The above-mentioned emulsifying salts were applied into four types of ternary mixtures (DSP:TSC:P20, DSP:TSPP:TSC, TSC:TSPP:P20 and DSP:TSPP:P20). The total concentration of the ternary mixtures was 3 % (w/w) of the total weight of the melt. Moreover, the selected cheese matrices (applied as the basic raw material) with/without different degrees of maturity were: Edam (7 weeks of ripening at 10 +- 2 °C), Swiss-type (4, 8, 12, 15 weeks ripening of at 10 +- 2 °C), Mozzarella-type (0, 2, 4 weeks of storage at 6 +- 2 °C) cheeses, respectively. Furthermore, the production of the samples was designed to achieve final products with 40 % (w/w) dry matter content and 50 % (w/w) fat in dry matter content (in cases of Edam, Swiss-type cheeses, respectively). In case of Mozzarella cheese, the production of the samples was designed to achieve end-products with 35 % (w/w) dry matter content and 50 % (w/w) fat in dry matter contnet. Moreover, a secondary objective of the study was the evaluation of the casein micelles dispersion in model milk samples, composed of skimmed milk powder and teranry mixtures of phosphate and citrates salts. The study was subdivided into four experimental stages. During the firstexperimental stage, model milk samples (consisting skimmed milk powder and ternarymixtures of phosphate/citrate emulsifying salts) were developed and their optical density was evaluated. Furthermore, during the second stage, model processed cheese samples were manufactured from Edam cheese with adjusted (target values within the interval of 5.60 - 5.80) and non-adjusted pH values. The developer samples were evaluated in terms of texture profile analysis (hardness, relative adhesiveness, cohesiveness) during a 30-day storage period. Each combination of ternary mixtures resulted in 26 variants in straggered proportions in steps of 20 % and with some selected 50:50 ratios (26 variants × 4 types of ternary mixtures of emulsifying salts × 2 batches = 208 lots). In addition, during the third stage, Swiss-type cheese was applied for the production of the samples. From the results obtained from the second stage, 12 reciprocal percentage ratios of ternary mixtures were selected (12 ratios × 4 types of ternary mixtures emuslifying salts × 2 batches = 96 lots). The pH of the samples

was adjusted (target values within the interval of 5.60 - 5.80) and the samples were evaluated (textural and rheological analyses) during a 60-day storage period. Moreover, during the fourth experimental stage, model processed cheese samples from Mozzarella-type cheese were manufactured and analysed in simiral way as the samples manufactured from Swiss-type cheese. Finally, for all the processed cheese samples basic chemical analysis (dry matter content and pH value determination), texture profile analysis and rheological measurments (except samples made from Edam cheese) were performed (after 2, 9, 30 days after the production day - Edam cheese; after 2, 9, 30, 60 days after the production day - Swiss-type, Mozzarella-type cheeses, respectively).

## 1.2 Faculty of Management and Economics

## Degree Programme: ECONOMICS AND MANAGEMENT

## Degree Course: Management and Economics

Ing. **Petra Barešová**, BA (Hons), MSc.

Date of defence: 14. 12. 2017

Supervisor: doc. Ing. Pavla Staňková, Ph.D.

## Effective and Ethical Marketing Communications Focused on the Target Group over 55 Years Old

**Abstract**

This doctoral thesis is focused on one of the current discussions in the 21st century, it is population aging. The aim of this work is suggestion of ethical and effective model of marketing communication tools focused on target group over 55 years old. The leisure market was chosen as a key market for this target group. The reason is following: leisure activities significantly influenced elderly people and their quality of life. The main findings of this work are marketing communication tools which are the most preferred by the target group. From the ethical glance target group puts strong importance on truth information and politeness in the marketing communication. The contribution of this work is: identifi-

cation of effective marketing communication tools and ethical glance of marketing communication by target group over 55 years old.

Ing. **Lukáš Danko**, Ph.D.

Date of defence: 20. 11. 2017

Supervisor: doc. Ing. Jozef Habánik, Ph.D.

## Creative cluster development as a tool to increase competitiveness of cities


### Abstract

The concept of cluster development and cluster policies, are topics of recent of both academic and industry debates. Furthemore, there are target of various international initiatives of regional development and increasing competitiveness (European Commision and OECD). Simultaneously, the cultural and creative industries (CCI) represent a progressive economic area that accounts for about 3% of the EU GDP, and is a part of the Europe 2020 strategy. Thus, there is an opportunity to identify their natural clusters and assess the development of cluster organizations, in order to increase competitiveness of cities and regions, along with the EU initiatives for economic growth. Therefore, a methodology is proposed to deliver recommendations for identifying natural clusters in the CCI, and to assess conditions for the creative cluster organizations development, at the urban level in Slovakia. Proposal is focused on case study of first creative cluster organization in Slovakia within Bratislava metropolitan region in order to increase its competitiveness, due to the lack of creative cluster organizations in the study area. A mixed methods approach is used in to meet aformentioned objectives. The methods consists of Exploratory spatial data analysis (ESDA), and the grounded theory in order to discover and evaluate mechanisms for development of the CCI cluster organizations.


Ing. **Martin Hrabal**, Ph.D.

Date of defence: 19. 6. 2017

Supervisor: doc. Ing. David Tuček, Ph.D.

## The Role of Human Factor in the Context of Business Process Management


### Abstract

Submitted thesis of dissertation represents basic ideas of dissertation which is focused on human factor in a context of business process management, i.e. on the identification of competencies suitable for increasing probability of successful implementation and continuous improvement of process management on organizations. The first part of the thesis forms the current state of knowledge in the field of business process management, roles and management by competencies. Next part describes goals and methodology of the quantitative and qualitative research which results are given in further chapters. The last part of the thesis presents outputs in form of competence models for the most important roles in process management and methodology for their utilization within projects of process management and improvement.



Ing. **Zuzana Jurigová**, Ph.D.



Date of defence: 23. 11. 2017

Supervisor: doc. Ing. Zuzana Tučková, Ph.D.


## Creating a System of Indicators for the Assessment of Economic Sustainability of Businesses in Tourism


### Abstract

The given dissertation thesis focuses on the use of indicators in economic sustainability and the subsequent creation of a system of indicators for the assessment of businesses in tourism. The type of tourism business according to the CZ NACE classification will be further specified within the research. The first part of this thesis focuses on the description of theoretical knowledge in tourism, as well as the measuring the sustainability within foreign and domestic conditions. The next part deals with a description of the objectives, processes and hypotheses of the work that resulted from the literary research and subsequent characteristics of the applied methods. The key part is the final section of the theses that maps the results of own qualitative and quantitative research which leads to the subsequent fulfilling of the main goal. The main goal is to determine the extent to which economic

sustainability indicators are used in tourism businesses and extract enough information to create a system of indicators for the assessment of economic sustainability.

Mgr. **Vladimír Kruliš**, Ph.D.

Date of defence: 17. 3. 2017

Supervisor: doc. Ing. František Lipták, DrSc.

## Effectiveness of Business Support Instruments in Media

### Abstract

In my doctoral thesis, I deal with the theme of effectiveness of business support instruments in mass media channels. The theme is important because mass media strongly influence the life of current society. This is substantiated also by the creation of the Centre against Terrorism and Hybrid Threads at the Ministry of Interior of the Czech Republic. One of the missions of this Centre is to fight against foreign and domestic disinformation in media. The term effectiveness of business support instrument is understood with respect to the 3E concept in public administration. Respecting the Law on Financial Control, the term effectiveness is defined as the use of public funds which secure optimal achievement of goals when meeting defined tasks.

Mgr. **Stephen Nabareseh**, Ph.D.

Date of defence: 25. 4. 2017

Supervisor: doc. Ing. Petr Klímek, Ph.D.

## Predictive analytics: a data mining technique in customer churn management for decision making

### Abstract

Decision making is a key feature of every organization. The quality of decisions made are dependent on some amount of knowledge generated from existing or researched information. The use of modern analytical tools to generate such knowledge is prudent for any profit driven firm. Taking decisions on customers is one of the area's most companies, especially companies in the service sector in developing economies, grapple with. The ability of these

companies to predict customer churn is gravely insufficient. Telecommunication companies in some developing countries, for example Ghana, suffer a lot from this canker. The ability to identify potential churn customers, cluster customers with similar consumption behaviour and identify solid points for customer loyalty are grey areas Telecommunication companies in Ghana contend with. Data mining algorithms therefore offer modern tools for model creation in prediction, clustering and association rule mining for decision making.

Ing. **Anusua Saha**, Ph.D.

Date of defence: 14. 12. 2017

Supervisor: doc. Ing. Petr Briš, CSc.

## A Framework For Studying Consumer Intention Towards Green Consumerism In India

### Abstract

Over the last years, research about sustainability has been interesting due to growing importance of green orientation in the consumer purchasing process around the world. People are changing their trends and way of lifestyle in a more conscious way paying more attention towards green oriented behavior worldwide compared to in the past. Understanding consumer expectations and new purchasing trends related to green purchasing behavioral trends within the Indian consumers by means of identifying by Theory of Planned Behavior (TBP) constructs. The present research attempts to understand the consumers' intention towards buying green consumerism in a developing nation, India. The study uses Theory of Planned Behaviour (TPB) as its theoretical framework and further attempted to extend the TPB model by incorporating additional constructs such as (social value, environmental knowledge, environmental concern and value for money) in it. Data was collected using survey based method using structured questionnaire among 339 consumers and was analyzed using Structural Equation Modeling (SEM) for testing the hypothesized model. The finding reported the utility of using TPB framework with additional constructs in predicting the consumers' intention that will lead to purchase intention. The framework not only studies the independent relationship but also the relationship between all the constructs that might lead to change of consumers' perception towards green purchase behavior. The author tested three models to testify the direct effects of the constructs with the

purchase intention, then studied the mediating effects and lastly the relationship with all the constructs in the hypothesized model. The results of each constructed model have shown interesting outcomes. At the end, the implications for businesses and marketers and the policy makers has been discussed with further scope of research in this field.

Ing. **Martina Sasínková**, Ph.D.

Date of defence: 14. 12. 2017

Supervisor: doc. Ing. Michal Pilík, Ph.D.

## Building a Brand of Universities

### Abstract

The dissertation thesis "Building a Brand of Universities" deals with the issue of building a brand of universities with a focus on Faculty of Economics in the Czech Republic. This slim concentration is mainly due to demographic development when college students decline at all levels of study and the largest drop (decrease?) in the number of students is recorded especially by the faculty of economics. The first part of the thesis explains the current situation in the area of branding, the emphasis is put on the evaluation of universities. Further on, the goals are defined in the thesis, the hypotheses are defined and the methodology of the dissertation is described. The main part of the thesis is dedicated to the quantitative survey of target groups of economic faculties in the Czech Republic. Furthermore, there is a methodical procedure for analysis and building a brand of universities with a focus on the faculties of economics.

Ing. **Jiří Seidler**, Ph.D.

Date of defence: 20. 11. 2017

Supervisor: doc. PhDr. Ing. Aleš Gregar, CSc.

## Implemantation of the corporate social responsibility concept into the strategic management of small to medium sized enterprises managed by the BSC method

### Abstract

This dissertation deals with the topic of corporate social responsibility, its implementation into the strategic management of a company, and its impact on the company's economic performance. The author approaches the issue of corporate social responsibility not only with regard to the original basic theoretical definition but also in relation to its significance in today's world, particularly in terms of forming positive relationships with customers, suppliers and other stakeholders, increasing the value of an enterprise itself and building up the "goodwill" of a company. The objective of the dissertation is to examine the situation in small and medium-sized enterprises operating on the Czech market in terms of the knowledge and skills required to implement the principles of socially-responsible business into strategic management, and then, based on the results of qualitative and quantitative research, to provide a specific methodology for this implementation. Concerning the strategic management method, the dissertation makes use the Balanced Scorecard management strategy, which the author has further developing by supplementing it with "soft" social factors, so as to present a functional strategic approach to the implementation of social responsibility principles into company management with a long-term positive economic effect.

Bc. Ing. **Iva Vendolská**, Ph.D.

Date of defence: 24. 4. 2017

Supervisor: doc. Ing. Jena Švarcová, Ph.D.

## Factors influencing demand for university graduates in the Czech labour market

### Abstract

In the last few years, the position of the university graduates on the job market has changed dramatically. Due to this reason, a wide range of institutions and studies have been focusing on the graduates´ unemployment development. However, a detailed study is still missing which would concentrate on the requirements of the employers when hiring university graduates for employment. The objective of this dissertation is to propose a flexible model for companies for the hiring process concerning positions suitable for university graduates. A suitable applicant will be defined by the set of qualities, knowledge and capabilities required by the employers (according to the findings of the research performed).

This model parameterization may be then used as a benchmarking form, i.e. determination of the desired state which the students should target during their preparation while studying. The findings of this dissertation may be used by the employers, university students or as the background for further scientific work.

## Degree Programme: ECONOMIC POLICY AND ADMINISTRATION

## Degree Course: Finance

Ing. **Jiří Macháček**, Ph.D.

Date of defence: 23. 11. 2017

Supervisor: prof. RNDr. René Wokoun, CSc.

### Promoting entrepreneurship by municipalities in the Czech Republic

**Abstract**

Research problem to be solved within the framework of this dissertation is a mismatch between the capabilities of currently offered business support for small and medium-sized enterprises (SMEs) by local governments and their practical use by individual companies. The main objective is to devise a system of effective tools of business support at various levels of local government, which will be accepted by the business community and will be usable even under the current legislative conditions. To achieve this goal, techniques of both quantitative and qualitative research will be utilized. First, a critical literature review of available relevant resources will be made. Furthermore, the survey among a sample of the numerous companies in various branches of business will be conducted and guided interviews with representatives of local governments and institutions engaged in promoting entrepreneurship will be done. The results will be processed with appropriate statistical methods.

## 1.3 Faculty of Multimedia Communications

## Degree Programme: VISUAL ARTS

## Degree Course: Multimedia and Design

MgA. **Naveed Anwar**, Ph.D.

Date of defence: 23. 6. 2017

Supervisor: doc. MgA. Petr Stanický, MFA

# An Investigation into Shoe Style for Prevention of Heel Pain

### Abstract

a digitally changing world, where the boundaries between traditional commerce and ecommerce are merging, the need for cutting edge technologies and innovations is essential. The shoes we wear are very important for the health of our feet. In particular, the choice of shoes and the materials has a significant influence on the protection of feet according to multiple experimental studies. Use of appropriate footwear among diabetics and those with foot problems has been well documented to play a vital role in the prevention and treatment of established foot diseases. The incidence and prevalence rates of heel pain problems in the world are increasing and foot complications are rising parallel. This is related to the lifestyle of the people which is changing including diet. There is however lack of adequate knowledge about the role of footwear in the management of foot related problems among heel pain patients in the world. This study is the first of its kind to be done with an aim to develop a framework that would help to identify appropriate footwear material and design for people suffering with heel pain. The studies are experimental studies with repeated measures data. A total of 25 individual participants? heel pain patients were involved. To achieve this, data were collected through questionnaire and interview surveys, shoe upper style, materials, foot analysis and foot measurements included foot pressure measurements through Classic MatScan by Tekscan software and hardware. However, several systems for measuring plantar pressure in the foot are currently available. Among those are the E-med, Pedobarographs, F-Scan/Mat-Scan*, and Piezoelectric insoles. For this study, the Mat-Scan was utilized to perform pressure analysis of the foot. For evaluation, a study was conducted collecting barefoot Mat-Scan data of 25 individual participants? heel pain patients while standing and walking positions to be assessed in order to provide them with the most appropriate footwear design for their condition to reduce the heel pain. Pressure sensors within the mat can detect increased foot pressure and whether this pressure is even-

ly distributed, or concentrated in certain anatomical areas of the foot. Contact pressure on the plantar aspect of the foot generates forces in the subsurface tissue, and causes it to deform. The breakdown develops when the contact pressure load leads to a permanent distortion of the tissue and to the formation of localized tissue damage.

MgA. **Karolina Garguláková**, PhD.

Date of defence: 4. 12. 2017

Supervisor: doc. MgA. Jana Janíková, ArtD.

## Implementation of fiction into a documentary genre:Doc-fi in contemporary Czech and Slovak cinematography.

**Abstract**

The dissertation thesis Implementation of the fiction into to the genre of the documentary film: Docufiction in nowadays Czech and Slovak cinematography aims to examine the phenomena of the blending of the fiction and non-fiction audiovisual works both from classic cinematography and also the television production. I express the statement that the involvement of fictional practices in documentary work enhances the attractiveness of the film both from the point of view of the audience and also the potential producer and distributor. As my professional work consists of the development, production and the dramaturgy of the films and the tv projects in this thesis is also included the qualitative research that brings the point of view of the particular directors, screenwriters and also producers Thanks to the support of the Tomas Bata University in Zlín I could apply all the gained knowledge to the production of the feature film that is the main topic of the second part of the thesis.

Mg**A**. **Michal Kupilík**, Ph.D.

Date of defence: 4. 12. 2017

Supervisor: doc. ak. mal. Jan Meisner

## Artwork in a new Media Transfer

**Abstract**

The dissertation deals with the conversion of a traditional Artwork into the animated form. The theoretical part examines topics such as the definition of the term Artwork, the history of cultural institutions and the capabilities of recipients. It also describes the historical development of the Art Museums and shows its shortcomings and challenges in the upcoming digital age. Attention is also paid to the topic of new media, its categorization as well as to cultural transfer. The practical part of the thesis presents a new category of multimedia outputs from different authors, within a single theme ? the transformation of the famous Artwork into animated form. The conclusions drawn from the multimedia research are used in the project part of the thesis. It presents the trinity of the author's own projects, including the long-awaited movie Anima Artis, which chronicles the history of art from the Paleolithic to the present. The main concept of the film is followed by a pair of Projection Mappings, which combine the use of animated Artwork with the genius loci of the chosen locality.

Mg**A**. **Bohumil Stránský**, Ph.D.

Date of defence: 23. 6. 2017

Supervisor: doc. PhDr. Zdeno Kolesár, Ph.D.

### Action in Design. Interactive digital media design - principles, approaches

**Abstract**

This thesis defines digital design as a complex new field whose specific method of creativity sets it apart from the graphic design of mostly printed media. It explores the nature of digital media, their underlying principles, the unique design process as well as the entire approach to designing digital products. Attached you will find a study of the author's own projects, containing descriptions of the knowledge and experience that went into creating them, entirely in keeping with the points the author makes in the thesis.

## 1.4 Faculty of Applied Informatics

## Degree Programme: ENGINEERING INFORMATICS

## Degree Course: Automatic Control and Informatics

Ing. **Jiří Křenek**, Ph.D.

Date of defence: 4. 12. 2017

Supervisor: prof. Ing. Dagmar Janáčová, CSc.

## Design and modeling of ecological processing of printed circuit boards

### Abstract

The content of the thesis is design and modeling of ecological processing of printed circuit boards (PCB). The study deals with problems associated with the design and recycling solutions of PCB and with regards to approach of legislation. At the beginning of the thesis attention is paid to the current methods of PCBs separation, composition, production of PCBs and recent usage in PCB´s binders. The mathematical modeling tools are used to design a mathematical description of temperature fields in PCBs. Large part of the dissertation deals with simulation experiments of nonstationary PCB heating, cyclic loading and other processes that occur with thermal or mechanical load simulation. These simulations are carried out in the Pro/ENGINEER and COMSOL Multiphysics? software environments, due to the possibility of multiple physical processes being used at the same time. Outputs from computer simulations are the starting point for designing of a new eco-friendly way of recycling PCBs. The end of my dissertation thesis quantifies the cost of the proposed separation process, discusses findings and their experimental verification in laboratory environment.

Ing. **Stanislav Talaš**, Ph.D.

Date of defence: 16. 11. 2017

Supervisor: prof. Ing. Vladimír Bobál, CSc.

## Identification and digital control of processes with time-delay

### Abstract

The work addresses the option of using current knowledge in the identification and synthesis to suppress time-delay effects. It assumes general control principles using numeric algorithms and including of time-delay compensation, which is closely connected with overall quality of the whole control process. Part of the work is a design of an approach to a more precise determination of a delayed system response. It also deals with an addition of

the current predictive control procedures with an extension of the spectrum of the processed values. The bases of these suggestions are the current numeric methods founded on the predictive control principles. In order to validate the functionality, individual designs are tested in a simulation environment and on a laboratory model. Furthermore, an option of their combination was tested with aim to achieve an adaptation of variable time-delay in predictive control algorithms.

## Degree Programme: ENGINEERING INFORMATICS

## Degree Course: Engineering Informatics

Ing. **Tomáš Gavenda**, Ph.D.

Date of defence: 22. 6. 2017

Supervisor: doc. RNDr. Vojtěch Křesálek, CSc.

### Spectroscopy of materials in the range of mm and sub-millimeter waves

**Abstract**

Use of terahertz radiation is one of the modern trends in today's science focused on electromagnetic spectrum. Areas of interest contain interactions of the radiation with matter (solid, liquid and/or gas). This concludes to two described applications terahertz spectroscopy and terahertz imaging. This doctoral thesis deals with research of polymer material and research of security industry. Polymer material is material, which is currently used in the most of human doing; thus it is desirable to have multiple methods for describing properties of polymers and for finding ways how to utilize them. Security industry draws considerable amount of attention nowadays. Terahertz spectroscopy and terahertz imaging are more than suitable for using in security applications due to advantages of terahertz radiation (such as penetration through packaging materials and non-harmful character). This is the reason why the thesis has also been focused on this topic.

Ing. **Michal Gerža**, PhD.

Date of defence: 4. 12. 2017

## SUPERVISOR: PROF. ING. FRANTIŠEK SCHAUER, DRSC.

## Intelligent Measureserver for Controlling Remote Real Experiments with Embedded Simulations and Advanced Diagnostics


### Abstract

People are developing various technologies, using laws of physics behind real-world phenomena. This process is continuous and is presently getting faster and more intensive. Achieved technological advances affect all areas of every day?s life, including the field of education. Contemporary society requires more complex tools providing more accessible and effective educational methods. Information and communication technologies offer many tools to meet the requirements on which rest teaching and learning, especially in natural sciences and engineering fields. Studying these fields is based on real experimental work in laboratories with specific equipment and devices for a better understanding the given phenomenon. This form of study, when the user must regularly attend laboratories to perform necessary measurements, is not always acceptable for many reasons. Most of laboratories cannot provide a wide range of the real experiments, where expensive devices, needed for the elucidating and analysis of desired phenomena, are involved. Development in this direction of these requirements led to the design and implementation of the concept of the remote laboratories to deliver physical experiments via the Internet. The connected users are provided with the different tools as, for example, corresponding theory of the studied phenomenon. In our case, the concept is called Intelligent School Experimental System (ISES) operated as an open system platform. The doctoral thesis focuses on the design and implementation of software components related to the ISES Measureserver, finite-state machine in principle that is a core unit of this platform. The activities within the thesis are aimed at five tasks, defined as the goals of the thesis. These goals were solved as the independent project works, integrating progressive concepts, approaches and technologies, which bring new features contributing to better teaching outcomes, reliability and maintenance of the ISES remote laboratories.



Ing. **Michal Krbeček**, PhD.



Date of defence: 23. 11. 2017

Supervisor: doc. RNDr. Miroslava Ožvoldová, CSc.

## Creation and administration of research remote laboratories at EU level

**Abstract**

The contemporary society is characterized by sharing of resources and assets through the Internet and growing virtualization in Information and Communication Technology (ICT). This approach saves the cost of expensive shared devices, available through the network. This trend can be found in a wide range of sectors of human activities in general and in science and teaching processes in particular. The recent emergence of appropriate ICT enables physical laboratory equipment to be monitored and manipulated through the Internet and has therefore facilitated the development of online or remote laboratories. It is important to note that remote laboratories are those that can be accessed and manipulated online; they differ from their virtual counterparts as they deal with real physical equipment rather than simulations. Though such laboratories are being created all over the world; however, there is no unified specification or approach to their construction. Therefore, there is a trend to merge these laboratories into large grids and offset their differences with unification of their communication interface. These grids are operated by remote laboratories management systems. The thesis is focused on the design and creation of a complex software solution for the remote laboratories. Such complex solution should cover not only the administration but the creation and flawless operating of remote laboratories as well.

Ing. **Dora Lapková**, Ph.D.

Date of defence: 26. 10 2017
Supervisor: doc. Mgr. Milan Adámek, Ph.D.

## An analysis and a draft of technical elements of defense using an information technology

**Abstract**

The Doctoral Thesis is focused on an analysis and a draft of technical elements of a defense using an information technology. The aim is to find a measurement method, which helps us to find out basic characteristics of technical elements of the defense. The next aim is to analyze the measured data from the view of their dependence on input parameters. The benefit of the work will be a creation of methods for evaluating people and for sorting

them into categories. The thesis has the ambition to improve the training of people in a professional defense, which is a necessary part in physical security in the commercial security industry.

Ing. **Luboš Nečesal**, Ph.D.

Date of defence: 6. 4. 2017
Supervisor: doc. Ing. Luděk Lukáš, CSc.

## Information Support Evaluation of Security Forces Employees

### Abstract

The main aim of this dissertation is formation of The Evaluation Methodology of Information Support of Security Forces Employee, which provides a scope for evaluation of employee's information support in security forces. Methodology is based on multi-criterial evaluation of three groups of attributes (fields) - Employee, Information system and Organization. The methodology includes mathematical tool, which enables to express in semiquantitative approach a level of employee's information support. Based on methodology application and from employee's information support point of view it's possible to achieve an understanding of current state, identification of weaknesses, proposing of improvements and their application.

Ing. **Jakub Rak**, Ph.D.

Date of defence: 13. 4. 2017
Supervisor: prof. Ing. Dušan Vičar, CSc.

## Information support of population sheltering

### Abstract

The thesis solves the information support problematics of the population sheltering. It is focused on the possibilities of the geographic information systems utilization as a key tool for information support in the selected area. The current state and theoretical fundamentals of population sheltering and information support problematics are described in the first part of the thesis. The experimental part describes the selection process of the key parameters in

population sheltering and the transformation of them to data model for geographic information systems application. The thesis describes the realization of data model testing and verification in terms of laboratory and practical application.

Ing. **David Šaur**, Ph.D.

Date of defence: 11. 12. 2017
Supervisor: doc. Ing. Luděk Lukáš, CSc.

## Information Support for Crisis Management of the Region in Terms of Evaluation of Flood Events


### Abstract

The dissertation is focused on the proposal of information support of the crisis management of the region in terms of evaluation of flood events. Part of the information support is mainly the "Algorithm of Storm Prediction ", the output of which is a set of predictive information on the occurrence of convective precipitation and dangerous accompanying phenomena. The purpose of the Algorithm is to refine the forecast at the level of the territorial unit of the municipality with extended powers, including their regions, with sufficient time in advance for the possibility of implementing preventive flood control measures. Algorithm of Storm Prediction is based on the analysis and targeted evaluation of output meteorological parameters and parameters from numerical weather prediction models, including evaluating the impact of the relief on the formation and development of convective precipitation in the territory. The evaluation is also based on an analysis of historical weather events and selected floods caused by torrential rainfall in order to create additional refined forecasts for warning information from the Czech Hydrometeorological Institute.


Ing. **Jaromír Švejda**, Ph.D.

Date of defence: 6. 9. 2017
Supervisor: doc. Ing. Roman Šenkeřík, Ph.D.

## Design of biometric person identification algorithm using EEG signal analysis

**Abstract**

Identifications based on unique biological characteristics are subject of number of researches. Currently, the usage of electrical activity of the brain in biometrical systems is more and more often discussed. This thesis is focused on electroencephalographic (EEG) records, which are obtained by non-invasive method. Further, it contains a description of original unconventional approach to EEG identification, which is then tested on chosen real measured data. Introduction summarizes existing approaches to solve subject identification based on EEG. Further, current state of art reveals issues with mentioned task. The following chapter describe goals of dissertation thesis. The main goal is to design an algorithm, which could be used in biometrical identification task. The theoretical chapter focuses on description of EEG technology, BCI systems, biometry and neural networks. Further chapter briefly describes selected processing methods which is followed by detailed description of the algorithm. The results of algorithm testing are the topic of another chapter. Individual tests are aimed at limits revelation of both algorithm and EEG record. Then the chapter of contribution to both science and practice is included. Finally, conclusion summarizes key findings from algorithm testing and individual goals of dissertation thesis are discussed.

Ing. **Roman Žák**, Ph.D.

Date of defence: 6. 9. 2017
Supervisor: doc. Ing. Roman Jašek, Ph.D.

## Control Systems by Means of Activation of Brain Centers

**Abstract**

To capture electrical signals from the brain there exists a device that is using the latest reults of neuro-technology scientific research. Communication itself is secured by wireless signal transfer from this device to the computer, where it can be further processed and eventually used to manage other systems connected with computer technology and to control the software. The communication interface between the brain and the computer is a main focus of this work.

# 2 DEFENDED HABILITATION THESES

In 2017, 7 habilitation theses were defended: 2 at the Faculty of Technology, 1 at the Faculty of Management and Economics, 2 at the Faculty of Multimedia Communications and 2 at the Faculty of Applied Informatics.

## 2.1 Faculty of Technology

## Course: Tools and Processes

doc. Ing. **Michal Staněk**, Ph.D.

Appointed with effect from: 1st November 2017

### Influence of technological parameters on polymer fluidity

**Abstract**

Injection molding is currently the most widely used polymer processing technology. Generally, it allows the production of finished parts, which in most cases do not require subsequent operations. Injection mold (tool) is a very complex assembly consisting of many differently large and variously complex parts. The greatest demands are placed on the production of shaped cavities, including both the cavity of the mold giving the shape and dimensions of the future product, as well as the runner system (runners providing the polymer melt to the individual cavities). The runner system can be very complex and in many cases occupy up to 50 % of the material volume be processed. In current practice, the requirement for high quality (polishing) of all surfaces that come into contact with the melt is still very often applied due to better flow conditions.

Habilitation thesis deals with study of influence of mold cavity surface quality and technological parameters influence of on polymer flow. The results of the experiments carried out with selected types of polymers (thermoplastics, thermoplastic elastomers and elastomers) showed an effect of the test plates surface roughness on the melt flow. This finding allows us to withdraw from existing ideas about the influence of surface quality on the flow properties and to exclude the technological process of the expensive finishing operation (if the terms allow it).

The use of the measurement results can have a major effect on the production of molded parts of injection molds, in particular in the modification of the processes used so far, and their replacement by production processes with less expensive and time-consuming ones.

## Course: Food Technology

doc. Ing. **Daniela Sumczynski**, Ph.D.

Appointed with effect from: 1st June 2017

### Quality of Non-Traditional Raw Materials and their Application in the Technology of Ceral Mixtures

**Abstract**

Habilitation thesis deals with the quality parameters of non-traditional raw materials and their usefulness for the production of the cereal mixtures, with an emphasis on the production of flakes and muesli from non-traditional cereals. The first part summarizes the current knowledge about the production and chemical composition of cereal grains from which flakes are commonly prepared. Subsequently, the thesis describes optimization and validation methods for the determination of individual quality parameters, on that basis non-traditional cereals were selected. Part of this work is to outline the pathway of technological difficulties of the developing new muesli mixtures with non-traditional ingredients with regard to their quality characteristics and preparation of model muesli mixtures.

## 2.2 Faculty of Management and Economics

## Course: Enterprise Management and Economics

doc. Ing. **Aleksandr Ključnikov**, Ph.D.

Appointed with effect from: 1st November 2017

### Financial management in the segment of SMEs

**Abstract**

This study examines the important factors of financial and credit risks of SMEs, including such important areas as payment behavior of business partners (counterparty default risk), field of export financing and differences in approach to financial risk management by groups of the entrepreneurs defined by the selected factors (gender, level of education and age). The main objective of the study is to present new theoretical insights and define the relevant factors for the financial risk management in the SMEs segment.

The Habilitation Thesis brings new scientific knowledge based on a comprehensive analysis of the attitudes of entrepreneurs in defined areas and according to defined criteria. Quantification of the relationships of the various constructs in the researched areas of financial risk were also a part of the results. This scientific study has defined significant attitudes of the entrepreneurs in the field of financial risk, quantified their impact on the business environment, and explored the interconnections between the defined structures. A significant finding is the fact that poor access to external finance for SMEs can be improved by the modification of several major barriers in the field of financial risk. Despite of the significance of the need of credit sources for SME enterprises the level of knowledge about the loan terms and conditions is relatively low. Another partial scientific knowledge may be the fact that the assessment of the attitudes of entrepreneurs in the segment of SMEs in terms of gender loses its significance in terms of the modern society. An important theoretical finding in the context of its quantification is a relatively low intensity of the export potential of these firms in the context of the low knowledge of the offered forms of minimizing of the financial risk on the part of the state. Another significant theoretical knowledge is a finding that, despite the significant degree of ignorance of the principles or rules for the activities of the relevant institutions, the measure of the optimism of entrepreneurs in relation to their knowledge and capabilities in the field of financial risk management is quite high.

The results of the presented research imply that it is needed to innovate and upgrade many of the activities, that state and/or the commercial banks are focusing on the entrepreneurs in the SMEs segment in order to optimize their implementation into economic and banking practice. The research results point to the need to standardize and organize a system for financial risk management in the activities of SMEs. Company owners or top executives in companies should hold the responsibility for the establishment of a functional system for financial risk management in the company (processes, methods and tools) and operational

work of the system, which would be carried out by people with the necessary theoretical knowledge and practical experience.

## 2.3 Faculty of Multimedia Communications

## Course: Multimedia and Design

doc. Mgr. art. **Patrik Illo**

Appointed with effect from: 1st October 2017

### Space on the borderline /own artwork - between design and art/

**Abstract**

Who is a designer? What is their mission, what is their place in the society - in time and space...

And who is an artist? In what are these two creative professions similar, in what they differ?

Is - can be a designer an artist? - and an artist a designer?

Where do these two areas of human creative activity meet? ...can we define that space? ...do they meet at all?

In my own creation I work with both of these areas - from industrial design of products which are produced in hundreds of thousands pieces, through experimental design, to so called conceptual fine art.

Exactly the investigation of distinctions between design and fine art, view from one area to another and other way round, merry searching for "borderline" situations is interesting for me and professionally necessary. This is exactly what my creation is about - some kind of a space "on the borderline".

doc. Ing. Arch. **Michael Klang**, CSc.

Appointed with effect from: 1st October 2017

## Television Confessions

**Abstract**

The Habilitation Works is devoted to television scenography as the dominant media of the last decades.

The author of more than a thousand realizations presents the technical and visual development of this discipline in the Czech and foreign environment over the course of three decades as well as the intentional and targeted impact of aesthetics on the consumer environment. The direct dependence of design on its viewing and vice versa is an example of the measurability of the influence of art on the viewer and his cultural claims.

The distinctive picture accompanies the author's wide typological footprint in the whole spectrum of television disciplines and projects; Apart from scenography, he is also involved in the design and realization of television studios.

# 2.4 Faculty of Applied Informatics

## Course: Machine and Process Control

doc. Ing. **Petr Doležel**, Ph.D.

Appointed with effect from: 1st June 2017

## Picewise-Linear Artifical Neural Network as Tool for Dynamic Systém Linearization

**Abstract**

The contribution deals with a special topology of a feedforward neural network, which can be advantageously used in system modelling and process control. The topology is especially suitable for highly nonlinear system modelling, since it is able to divide the system into a set of linear subsystems. Each of these subsystems is then valid in some region of the whole state space. In the first chapter, the main idea of this approach is described. Then, the approach is analysed and discussed. In further chapters, the particular algorithms of the approach are described and, eventually, the approach is demonstrated by the modelling and controlling of several nonlinear systems.

doc. Ing. **Jan Mareš**, Ph.D.

Appointed with effect from: 1st June 2017

## Real-time Biological Signal Processing for Monitoring and Control

### Abstract

The habilitation thesis deals with methodological aspects of signal and image processing and applications of proposed methods for analysis of multichannel signals acquired from bioprocesses and human-machine systems. The purpose of the study is to show that similar mathematical background can be used in different areas including processing of biomedical signals and images.

The thesis can be divided into two main streams, (i) mathematical analysis and expert systems in bioprocess control and (ii) signal and image processing in biomedicine. The first part is devoted to modeling and analysis of bioprosesses.. With some exceptions it is possible to say that measurement corresponds to data acquisition and control is equal to data (signal) processing. The research in this field originated as a result of cooperation with the Department of process control at Faculty of Electrical Engineering and Informatics, University of Pardubice, where the modeling, simulation and advanced process control techniques form important part of the work.

The second part is the signal (image can be taken as an multidimensional signal) processing in biomedicine and robotics. Application of computational technologies in biomedicine is modern field with many possibilities where the research can be done. Signal and image processing in biomedicine is a crucial idea which is applied for ages. EEG signal is base for neurologists, ECG signal for cardiologists, CT, NMR are bases for radiologists. Unfortunately, signals and images are very often processed only visually by an expert and there are almost no objective criterions. Therefore there is a chance to improve standards by semi-automatic or fully automatic signal and image processing tools. This research is a result of cooperation with Faculty Teaching Hospitals in Prague and Hradec Králové, Department of Neurology and Department of Nephrology of the Charles University.

Each part represents independent research project where crucial benefits or novelty can be found. The most important are (i) the confirmation of the hypothesis that the number of receptors, and thereby the number of connections between the neurons decreases with age (this analysis was the first one applied to EEG signal), (ii) development of a new software

which is able to analyze the CT image semi-automatically and (iii) absolutely new bioprocess control strategy based on advanced signal analysis.

# 3 QUALIFYING LECTURES FOR PROFESSORSHIP

## 3.1 Faculty of Applied Informatics

## Course: Machine and Process Control

prof. Ing. **Ján Piteľ,** PhD.

Qualifying Lecture for Professorship in front of the Scientific Board of TBU in Zlín: 20th September 2016
Appointed with effect from: 19st June 2017

## Modeling and control of machines and prosesses using computational intelligence techniques


### Abstract

Actuators based on pneumatic artificial muscles and biomass combustion processes from point of view of their modeling and control belong to relatively complicated machines and processes which require new approaches to design their dynamic models and control algorithms. Using computational intelligence techniques is the appropriate way to refine the analytical models of the actuators based on artificial muscles, to improve their control algorithms, to optimize the combustion processes of biomass. The result of applying these techniques for modeling and control of the drives with pneumatic artificial muscles is unconventional actuator capable of adapting to changes of parameters in controlled process for use in manipulators and rehabilitation equipments. The result of the application of advanced methods for modeling and control of combustion processes is a control system of woodchips combustion in the medium-scale boilers allowing efficient combustion also in changing of the fuel properties in order to achieve optimal value of the excess air ratio. Then carbon monoxide emissions in the flue gas will be minimal and conditions will be met to achieve high combustion efficiency.

# 4 IMPORTANT SCIENTIFIC AND SPECIALIZED ASSIGNMENTS

## 4.1 Projectst financed by the Czech Science Foundation (GACR)

In 2017, 17 projects financed by the Czech Science Foundation were implemented at the TBU in Zlín. Total eligible costs amounted CZK 17,591 thousand for TBU in Zlín in 2017.

### 4.1.1 Faculty of Technology

Standard projects

**GA16-05886S Investigation the effect of polymer melt shear and elongational rheology on production stability of meltblown nanofibers and films**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Martin Zatloukal, Ph.D. DSc.
Implementation period: 2016 - 2018

| | |
|---|---|
| Total project cost (CZK thous.): | 4 358 |
| Total project cost – TBU (CZK thous.): | 4 358 |
| Project cost of TBU in 2017 (CZK thous.): | 1 424 |

**GA17-09594S Reduction of biogenic amines content in model systems**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. RNDr. Vlastimil Kubáň DrSc.
Implementation period: 2017 - 2019

| | |
|---|---|
| Total project cost (CZK thous.): | 7 103 |
| Total project cost – TBU (CZK thous.): | 5 230 |
| Project cost of TBU in 2017 (CZK thous.): | 1 720 |

### 4.1.2 Faculty of Management and Economics

Postdocs grants

**GP14-18597P Creating Strategic Performance Model Framework Based on Utilization of Synergy Effects of Selected Management Systems**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Michaela Blahová, Ph.D.
Implementation period: 2014 - 2017

| | |
|---|---|
| Total project cost (CZK thous.): | 623 |
| Total project cost – TBU (CZK thous.): | 623 |
| Project cost of TBU in 2017 (CZK thous.): | 219 |

Standard projects

**GA16-25536S Methodology of Developing a Predictive Model of Sector and Company Performance in the Macroeconomic Context**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Dr.Ing. Drahomíra Pavelková
Implementation period: 2016 – 2018

Total project cost (CZK thous.): 2 940
Total project cost – TBU (CZK thous.): 2 940
Project cost of TBU in 2017 (CZK thous.): 1 050

**GA16-22141S Determinants of Spatial Allocation of EU Cohesion Policy Expenditures in the Context of Territorial Impact Assessment**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. RNDr.PhDr. Oldřich Hájek, Ph.D.
Implementation period: 2016 – 2017
Total project cost (CZK thous.): 1 124
Total project cost – TBU (CZK thous.): 1 124
Project cost of TBU in 2017 (CZK thous.): 538

**GA17-13518S Determinants of budgeting and performance measurement systems design and impact of these systems on organizational behavior and organizational perform**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Boris Popesko, Ph.D.
Implementation period: 2017 – 2019
Total project cost (CZK thous.): 3 354
Total project cost – TBU (CZK thous.): 1 716
Project cost of TBU in 2017 (CZK thous.): 572

### 4.1.3 Faculty of Applied Informatics

***Projects where TBU acts as a co-investigator***

Standard projects

**GA15-06700S Unconventional control of complex systems**
Principal investigator: VŠB – Technical University of Ostrava
Project investigator on behalf of TBU: doc. Ing. Roman Šenkeřík Ph.D.
Implementation period: 2015 - 2017
Total project cost (CZK thous.): 4 777
Total project cost – TBU (CZK thous.): 1 450
Project cost of TBU in 2017 (CZK thous.): 490

### 4.1.4 Faculty of Humanities

Standard projects

**GA16-11983S German Literature and Culture in Moravian Wallachia: the European Dimension of the Regional Cultural Discourse**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Mgr. Libor Marek, Ph.D.
Implementation period: 2016 - 2018
Total project cost (CZK thous.): 1 218
Total project cost – TBU (CZK thous.): 1 218

Project cost of TBU in 2017 (CZK thous.): 360

**GA17-04816S The Dynamics of Self-Regulation in Socially Excluded Pupils**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Mgr. Karla Hrbáčková, Ph.D.
Implementation period: 2017 - 2019
Total project cost (CZK thous.): 1 872
Total project cost – TBU (CZK thous.): 1 872
Project cost of TBU in 2017 (CZK thous.): 608

### 4.1.5 University Institute

Junior grants

**GJ15-08287Y Immobilization of specific bioactive substances in functionalized biodegradable polymer matrices**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Vladimír Sedlařík, Ph.D.
Implementation period: 2015 - 2017
Total project cost (CZK thous.): 5 765
Total project cost – TBU (CZK thous.): 5 765
Project cost of TBU in 2017 (CZK thous.): 1 934

**GJ16-20361Y Smart systems based on modified graphene oxide particles**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Miroslav Mrlík, Ph.D.
Implementation period: 2016 - 2018
Total project cost (CZK thous.): 5 590
Total project cost – TBU (CZK thous.): 5 590
Project cost of TBU in 2017 (CZK thous.): 2 000

**GJ17-16928Y Modification of degradation behaviour of biodegradable polyester - polylactide through addition of specifically functionalized additives**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Pavel Kucharczyk, Ph.D.
Implementation period: 2017 - 2019
Total project cost (CZK thous.): 4 795
Total project cost – TBU (CZK thous.): 4 795
Project cost of TBU in 2017 (CZK thous.): 1 548

Standard projects

**GA17-24730S Novel Magnetorheological Elastomers Based on Modified Magnetic Fillers**

Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Michal Sedlačík, Ph.D.
Implementation period: 2017 - 2019
Total project cost (CZK thous.): 3 873

Total project cost – TBU (CZK thous.): 3 873
Project cost of TBU in 2017 (CZK thous.): 1 118

**GA17-05095S Biomimetic materials based on conducting polymers**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Petr Humpolíček, Ph.D.
Implementation period: 2017 - 2019
Total project cost (CZK thous.): 7 611
Total project cost – TBU (CZK thous.): 3 879
Project cost of TBU in 2017 (CZK thous.): 1 293

***Projects where TBU acts as a co-investigator***

**GA16-05961S Advanced Carriers for Platinum Drugs**
Principal investigator: Masaryk University
Project investigator on behalf of TBU: Mgr. Jan Vícha Ph.D.
Implementation period: 2016 - 2018
Total project cost (CZK thous.): 9 763
Total project cost – TBU (CZK thous.): 1 983
Project cost of TBU in 2017 (CZK thous.): 661

**GA17-05318S Conjugated polymers based materials as luminescence chemosensors**
Principal investigator: Charles University in Prague
Project investigator on behalf of TBU: prof. Ing. Vladimír Sedlařík, Ph.D.
Implementation period: 2017 - 2019
Total project cost (CZK thous.): 6 285
Total project cost – TBU (CZK thous.): 3 060
Project cost of TBU in 2017 (CZK thous.): 1 020

**GA17-10813S Novel plasma polymers with tunable stability and permeability**
Principal investigator: Charles University in Prague
Project investigator on behalf of TBU: doc. Ing. Marián Lehocký, Ph.D.
Implementation period: 2017 - 2019
Total project cost (CZK thous.): 7 608
Total project cost – TBU (CZK thous.): 3 144
Project cost of TBU in 2017 (CZK thous.): 1 036

## 4.2 Projects financed by the Ministry of Industry and Trade of the Czech Republic

In 2017, 12 projects financed by the Ministry of Industry and Trade of the Czech Republic were implemented at the TBU in Zlín. Total eligible costs amounted CZK 5,529 thousand for TBU in Zlín in 2017.

### 4.2.1 Faculty of Applied Informatics

The Operational Programme Enterprise and Innovations for Competitiveness (OP PIK)

**CZ.01.1.02/0.0/0.0/15_013/0005019 Knowledge transfer in mobile applications development**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Tomáš Dulík, Ph.D.
Implementation period: 2016 - 2018
Total project cost (CZK thous.): 1 958
Total project cost – TBU (CZK thous.): 1 958
Project cost of TBU in 2017 (CZK thous.): 653

**CZ.01.1.02/0.0/0.0/15_013/0004918 Knowledge transfer for application of computer vision methods in Dudr Tools company**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Tomáš Dulík, Ph.D.
Implementation period: 2016 - 2018
Total project cost (CZK thous.): 1 958
Total project cost – TBU (CZK thous.): 1 958
Project cost of TBU in 2017 (CZK thous.): 653

***Projects where TBU acts as a co-investigator***

**CZ.01.1.02/0.0/0.0/15_019/0004635 E-Line Fuel Dispenser**
Principal investigator: Adast Systems, a. s.
Project investigator on behalf of TBU: Ing. Tomáš Dulík, Ph.D.
Implementation period: 2016 - 2018
Total project cost (CZK thous.): 20 497
Total project cost – TBU (CZK thous.): 2 070
Project cost of TBU in 2017 (CZK thous.): 653

**CZ.01.1.02/0.0/0.0/15_015/0004580 INFOS Platform**
Principal investigator: Cominfo
Project investigator on behalf of TBU: doc. Mgr. Milan Adámek, Ph.D.
Implementation period: 2017 – 2019
Total project cost (CZK thous.): 34 727
Total project cost – TBU (CZK thous.): 2 106
Project cost of TBU in 2017 (CZK thous.): 0

**CZ.01.1.02/0.0/0.0/15_019/0004581**
**EG15_019/0004581 ENTER Modular System**
Principal investigator: Cominfo
Project investigator on behalf of TBU: doc. Mgr. Milan Adámek, Ph.D.
Implementation period: 2017 – 2019
Total project cost (CZK thous.): 25 958
Total project cost – TBU (CZK thous.): 3 501
Project cost of TBU in 2017 (CZK thous.): 0

**CZ.01.1.02/0.0/0.0/16_084/0008839**
**EG16_084/0008839 Application of Research Results Focused on the Introduction of New Technologies and Procedures into the Production of Large Workpieces**
Principal investigator: Slovácké strojírny, a. s.
Project investigator on behalf of TBU: prof. Ing. Vladidír Vašek, CSc.
Implementation period: 2017 – 2019

| | |
|---|---|
| Total project cost (CZK thous.): | 35 700 |
| Total project cost – TBU (CZK thous.): | 7 200 |
| Project cost of TBU in 2017 (CZK thous.): | 0 |

**CZ.01.1.02/0.0/0.0/16_084/0010327**
**EG16_084/0010327 Security System for Navigation and Communication of Airport Vehicles**
Principal investigator: Masaryk University, TECHNISERV, spol. s r.o.
Project investigator on behalf of TBU: doc. RNDr. Vojtěch Křesálek, CSc.
Implementation period: 2017 – 2020

| | |
|---|---|
| Total project cost (CZK thous.): | 35 515 |
| Total project cost – TBU (CZK thous.): | 3 697 |
| Project cost of TBU in 2017 (CZK thous.): | 0 |

TRIO Programme

**FV20419 Intelligent System For Advanced Sorting of Forest Plants**
Principal investigator: DENESA s. r. o.
Project investigator on behalf of TBU: prof. Ing. Vladimír Vašek, CSc.
Implementation period: 2017 – 2020

| | |
|---|---|
| Total project cost (CZK thous.): | 18 044 |
| Total project cost – TBU (CZK thous.): | 7 132 |
| Project cost of TBU in 2017 (CZK thous.): | 1 426 |

### 4.2.2 University Institute

The Operational Programme Enterprise and Innovations for Competitiveness (OP PIK)

***Projects where TBU acts as a co-investigator***

**CZ.01.1.02/0.0/0.0/15_019/0004549** Imflamable systems according to EN 45545 for composite fabrication
Principal investigator: 5M s. r. o.
Project investigator on behalf of TBU: Ing. Miroslav Mrlík, Ph.D.
Implementation period: 2016 - 2019

| | |
|---|---|
| Total project cost (CZK thous.): | 8 609 |
| Total project cost – TBU (CZK thous.): | 1 375 |
| Project cost of TBU in 2017 (CZK thous.): | 344 |

**CZ.01.1.02/0.0/0.0/15_019/0005090 Stenopeic opening for correction of presbyopia**
Principal investigator: GEMINI oční klinika, a. s.
Project investigator on behalf of TBU: doc. Ing. et Ing. Ivo Kuřitka Ph.D. et Ph.D.

Implementation period: 2016 - 2019
Total project cost (CZK thous.): 3 600
Total project cost – TBU (CZK thous.): 2 464
Project cost of TBU in 2017 (CZK thous.): 828

TRIO Programme

***Projects where TBU acts as a co-investigator***

**FV10756 Development of polymer carriers in sub-micro and nano-forms**
Principal investigator: MVDr. Jiří Pantůček
Project investigator on behalf of TBU: prof. Ing. Vladimír Sedlařík, Ph.D.
Implementation period: 2016 - 2020
Total project cost (CZK thous.): 3 818
Total project cost – TBU (CZK thous.): 1 909
Project cost of TBU in 2017 (CZK thous.): 500

**FV20088 Development of novel formulations for modification of asphalt mixtures using recycled polyvinylbutyral**
Principal investigator: SKLOPAN LIBEREC, a. s.
Project investigator on behalf of TBU: doc. Ing. Tomáš Sedláček, Ph.D.
Implementation period: 2017 - 2020
Total project cost (CZK thous.): 2 929
Total project cost – TBU (CZK thous.): 1 852
Project cost of TBU in 2017 (CZK thous.): 472

## 4.3 Projects financed by the Ministry of Education, Youth and Sports of the Czech Republic

In 2017, 14 projects financed by the Ministry of Education, Youth and Sports of the Czech Republic were implemented at the TBU in Zlín. Total eligible costs amounted CZK 92,657 thousand for TBU in Zlín in 2017.

### 4.3.1 Faculty of Technology

VES 15 EUREKA CZ Programe

***Projects where TBU acts as a co-investigator***

**LF15016 Research and development of a system for acquiring data to predict the speed of growth of children's feet**
Principal investigator: ISSA CZECH s. r. o.
Project investigator on behalf of TBU: Ing. Jitka Baďurová, Ph.D.
Implementation period: 2015 - 2018
Total project cost (CZK thous.): 9 846
Total project cost – TBU (CZK thous.): 1 664

Project cost of TBU in 2017 (CZK thous.): 590

INTER-EXCELLENCE Programme (2016 – 2024)

**LTACH17015 Fabrication and electrochemical properties of hierarchical polyaniline /bimetallic oxides electrodes**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Natalia Kazantseva, CSc.
Implementation period: 2017 - 2019
Total project cost (CZK thous.): 5 970
Total project cost – TBU (CZK thous.): 5 970
Project cost of TBU in 2017 (CZK thous.): 1 990

### 4.3.2 Faculty of Management and Economics

Horizon 2020 Programe

***Projects where TBU acts as a co-investigator***

**731264 SHAPE-ENERGY: Social Sciences and Humanities for Advancing Policy in European Energy**
Principal investigator: Anglia Ruskin University (United Kingdom)
Project investigator on behalf of TBU: Ing. Přemysl Pálka, Ph.D.
Implementation period: 2017 - 2019
Total project cost (CZK thous.): 53 947
Total project cost – TBU (CZK thous.): 1 500
Project cost of TBU in 2017 (CZK thous.): 374

### 4.3.3 Faculty of Multimedia Communications

Educational Policy Fund

**Support of R&D and Creative Activities by Purchasing of Mobile Equipment, Hard-ware and Software Aimed at Improving the Quality of R&D and Creative Activities of Students of FMC of TBU in Zlín**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Martina Juříková, Ph.D.
Implementation period: 2017
Total project cost (CZK thous.): 1 407
Total project cost – TBU (CZK thous.): 1 407
Project cost of TBU in 2017 (CZK thous.): 1 407

Strategic Development Fund of TBU

**Water for all 2017**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Mgr. Irena Armutidisová
Implementation period: 2017

Total project cost (CZK thous.): 1 960
Total project cost – TBU (CZK thous.): 1 960
Project cost of TBU in 2017 (CZK thous.): 1 960

### 4.3.4 Faculty of Applied Informatics

National Programme for Sustainability

**LO1303 Promoting sustainability and development of the Centre for Security, Information and Advanced Technologies (CEBIA-Tech)**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Vladimír Vašek, CSc.
Implementation period: 2014 – 2019
Total project cost (CZK thous.): 98 710
Total project cost – TBU (CZK thous.): 98 710
Project cost of TBU in 2017 (CZK thous.): 17 324

### 4.3.5 Faculty of Humanities

Educational Policy Fund

**Preventing Shock in Future Nursery and Primary School Teachers When Confronting Reality in the Period of the Commencement of Their Career**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. PaeDr. Adriana Wiegerová, PhD.
Implementation period: 2017 – 2020
Total project cost (CZK thous.): 8 253
Total project cost – TBU (CZK thous.): 8 253
Project cost of TBU in 2017 (CZK thous.): 2 669

### 4.3.6 Faculty of Logistics and Crisis Management

Czech – Norway Grants CZ09

**7F16040 The creation and support of the research team in the logistics industry as the base for bilateral cooperation**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Zuzana Tučková, PhD.
Implementation period: 2017
Total project cost (CZK thous.): 715
Total project cost – TBU (CZK thous.): 400
Project cost of TBU in 2017 (CZK thous.): 400

COST Programme

**Geographical aspects of Citizen Science: mapping trends, scientific potential and societal impacts in the Czech Republic**
Principal investigator: AV ČR
Project investigator on behalf of TBU: RNDr. Jakub Trojan MSc Ph.D.
Implementation period: 2016 - 2020

Total project cost (CZK thous.): This project was accepted without right to be financed

### 4.3.7 University Institute

National Programme for Sustainability

**LO1504 Centre of Polymer Systems Plus**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Vladimír Sedlařík, Ph.D.
Implementation period: 2015 - 2020
Total project cost (CZK thous.): 325 648
Total project cost – TBU (CZK thous.): 325 648
Project cost of TBU in 2017 (CZK thous.): 65 400

6th FP of the European Community for Research, Technological Development and Demonstration Activities

**7AMB16AT033 Fiber Reinforced Polymers with Integrated Carbon Nanotubes Networks**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Petr Slobodian Ph.D.
Implementation period: 2016 - 2017
Total project cost (CZK thous.): 148
Total project cost – TBU (CZK thous.): 148
Project cost of TBU in 2017 (CZK thous.): 74

Czech-Polish Projects

**7AMB16PL070 Novel processing techniques of biodegradable polymers for biomedical applications**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Vladimír Sedlařík, Ph.D.
Implementation period: 2016 - 2017
Total project cost (CZK thous.): 170
Total project cost – TBU (CZK thous.): 170
Project cost of TBU in 2017 (CZK thous.): 75

Czech-Bavarian Cooperation

**8E15B007 Experimental investigation on rubbers mechanical behaviour under fatigue loading conditions including chemo-chemothermomechanical**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Dr. Ing. Radek Stoček
Implementation period: 2016 - 2017
Total project cost (CZK thous.): 332
Total project cost – TBU (CZK thous.): 332
Project cost of TBU in 2017 (CZK thous.): 274

Danube region cooperation Programme (2017 – 2018)

**8X17021 Antibacterial polymeric nanocomposites on the base of carbon nanomaterials**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Marián Lehocký, Ph.D.
Implementation period: 2017 - 2018
Total project cost (CZK thous.): 240
Total project cost – TBU (CZK thous.): 240
Project cost of TBU in 2017 (CZK thous.): 120

## 4.4 Projects financed by the Ministry of the Interior of the Czech Republic

In 2017, 3 project financed by the Ministry of the Interior of the Czech Republic was implemented at the TBU in Zlín. Total eligible costs amounted CZK 5,990 thousand for TBU in Zlín in 2017.

### 4.4.1 Faculty of Applied Informatics

***Projects where TBU acts as a co-investigator***

Security Research Programme in the Czech Republic

**VI20152019049 RESILIENCE 2015: Dynamic Resilience Evaluation of Interrelated Critical Infrastructure Subsystems**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Martin Hromada, Ph.D.
Implementation period: 2015 - 2019
Total project cost (CZK thous.): 38 076
Total project cost – TBU (CZK thous.): 9 686
Project cost of TBU in 2017 (CZK thous.): 3 053

**VI20172019073 Identification and methods of protection of Czech soft targets against violent acts with elaboration of a warning system**
Principal investigator: Soft Targets Protection Institute, z.ú.
Project investigator on behalf of TBU: Ing. Martin Hromada, Ph.D.
Implementation period: 2017 - 2019
Total project cost (CZK thous.): 9 664
Total project cost – TBU (CZK thous.): 3 103
Project cost of TBU in 2017 (CZK thous.): 1 068

**VI20172019054 An analytical software module for the real-time resilience evaluation from point of the converged security**
Principal investigator: TTC MARCONI s. r. o.
Project investigator on behalf of TBU: Ing. Jan Valouch, Ph.D.
Implementation period: 2017 - 2019
Total project cost (CZK thous.): 19 431

Total project cost – TBU (CZK thous.): 5 648
Project cost of TBU in 2017 (CZK thous.): 1 869

## 4.5 Projects financed by the Ministry of Agriculture of the Czech Republic

In 2017, 2 projects financed by the Ministry of Agriculture of the Czech Republic were implemented at the TBU in Zlín. Total eligible costs amounted CZK 2,142 thousand for TBU in Zlín in 2017.

### 4.5.1 Faculty of Technology

***Projects where TBU acts as a co-investigator***

ZEMĚ Programme

**QK1710156 New approaches and methods of analysis to ensure the quality, safety and health perfection of cheeses, the optimization of their manufacturing and the perfection of hygiene and sanitation together with the lowering of environmental load by waste water**
Principal investigator: Výzkumný ústav mlékárenský s. r.o.
Project investigator on behalf of TBU: doc. Ing. František Buňka, Ph.D.
Implementation period: 2017 - 2021
Total project cost (CZK thous.): 18 838
Total project cost – TBU (CZK thous.): 3 252
Project cost of TBU in 2017 (CZK thous.): 640

### 4.5.2 University Institute

KUS - Comprehensive Sustainable Systems in Agriculture

**QJ1310254 Research into the use of whey as dairy industry waste product, the production of antimicrobial compounds for the modification of hydrophilic polymer systems**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Vladimír Sedlařík, Ph.D.
Implementation period: 2013 - 2017
Total project cost (CZK thous.): 16 351
Total project cost – TBU (CZK thous.): 7 289
Project cost of TBU in 2017 (CZK thous.): 1 502

## 4.6 Projects financed by the Technology Agency of the Czech Republic

In 2017, 10 projects financed by the Technology Agency of the Czech Republic were implemented at the TBU in Zlín. Total eligible costs amounted CZK 17,733 thousand for TBU in Zlín in 2017.

### 4.6.1 Faculty of Technology

***Projects where TBU acts as a co-investigator***

ALFA Programme

**TA04020258 Advanced technology of lithotrophic immobilization and anaerobic bioremediation for the remediation and prevention of environmental damage**
Principal investigator: EPS, s. r. o.
Project investigator on behalf of TBU: doc. Mgr. Marek Koutný, Ph.D.
Implementation period: 2014 - 2017

| | |
|---|---|
| Total project cost (CZK thous.): | 18 261 |
| Total project cost – TBU (CZK thous.): | 2 939 |
| Project cost of TBU in 2017 (CZK thous.): | 793 |

EPSILON Programme

**TH01030054 The possibility of PES waste shredded material and next technological waste processing**
Principal investigator: Fatra, a. s.
Project investigator on behalf of TBU: doc. Ing. Dagmar Měřínská, Ph.D.
Implementation period: 2015 - 2017

| | |
|---|---|
| Total project cost (CZK thous.): | 10 070 |
| Total project cost – TBU (CZK thous.): | 2 403 |
| Project cost of TBU in 2017 (CZK thous.): | 812 |

### 4.6.2 Faculty of Management and Economics

OMEGA Programme

**TD03000370 Supporting Methodology for Creation, Updating and Evaluation of School Education Programmes in Primary and Secondary Education Respecting Good Practice of Strategic Planning**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. RNDr. PhDr. Oldřich Hájek Ph.D.
Implementation period: 2016 - 2017

| | |
|---|---|
| Total project cost (CZK thous.): | 668 |
| Total project cost – TBU (CZK thous.): | 668 |
| Project cost of TBU in 2017 (CZK thous.): | 334 |

ZÉTA Programme

**TJ01000114 Application of smart governance approaches to organizational structures of municipalities in the Czech Republic**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Filip Kučera
Implementation period: 2017 - 2019

| | |
|---|---|
| Total project cost (CZK thous.): | 1 538 |
| Total project cost – TBU (CZK thous.): | 1 538 |
| Project cost of TBU in 2017 (CZK thous.): | 248 |

### 4.6.3 Faculty of Applied Informatics

EPSILON Programme

***Projects where TBU acts as a co-investigator***

**TH02020979 Distributed control system for regional heat and cooling supply conceived as Smart Energy Grid**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Vladimír Vašek, CSc.
Implementation period: 2017 - 2020

| | |
|---|---|
| Total project cost (CZK thous.): | 9 500 |
| Total project cost – TBU (CZK thous.): | 4 750 |
| Project cost of TBU in 2017 (CZK thous.): | 1 317 |

### 4.6.4 University Institute

Programme Competence Centre

**TE01020216 Centre of advanced polymer and composite materials**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: doc. Ing. Tomáš Sedláček, Ph. D.
Implementation period: 2012 - 2019

| | |
|---|---|
| Total project cost (CZK thous.): | 209 644 |
| Total project cost – TBU (CZK thous.): | 69 077 |
| Project cost of TBU in 2017 (CZK thous.): | 8 830 |

***Projects where TBU acts as a co-investigator***

**TE02000006 Centre for alternative environment friendly high effective polymer antimicrobial agents for industrial applications**
Principal investigator: SYNPO, akciová společnost
Project investigator on behalf of TBU: prof. Ing. Vladimír Sedlařík, Ph.D.
Implementation period: 2014 - 2019

| | |
|---|---|
| Total project cost (CZK thous.): | 126 650 |
| Total project cost – TBU (CZK thous.): | 11 300 |
| Project cost of TBU in 2017 (CZK thous.): | 2 300 |

EPSILON Programme

**TH01011438 Development of polyurethane matrices for composite production**
Principal investigator: 5M s. r. o.
Project investigator on behalf of TBU: doc. Ing. Michal Sedlačík, Ph.D.
Implementation period: 2015-2017

| | |
|---|---|
| Total project cost (CZK thous.): | 11 250 |
| Total project cost – TBU (CZK thous.): | 1 350 |
| Project cost of TBU in 2017 (CZK thous.): | 450 |

**TH02020836 Development of novel plastic based environmentally friendly food packaging materials with added value**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: prof. Ing. Vladimír Sedlařík, Ph.D.
Implementation period: 2017-2020

| | |
|---|---|
| Total project cost (CZK thous.): | 3 984 |
| Total project cost – TBU (CZK thous.): | 1584 |
| Project cost of TBU in 2017 (CZK thous.): | 396 |

GAMA Programme

**TG03010052 Commercialization at the Tomas Bata University in Zlin**
Principal investigator: TBU in Zlín
Project investigator on behalf of TBU: Ing. Ivana Bartoníková
Implementation period: 2016-2019

| | |
|---|---|
| Total project cost (CZK thous.): | 10 813 |
| Total project cost – TBU (CZK thous.): | 10 813 |
| Project cost of TBU in 2017 (CZK thous.): | 2 253 |

# 4.7 PROJECTS - SUMMARY

**Number of projects implemented in 2017**

| Component part / Provider | Czech Science Foundation | Ministry of Industry and trade of the Czech Republic | | Ministry of Education, Youth and Sports of the Czech Republic | Ministry of the Interior of the Czech Republic | Ministry of Agriculture of the Czech Republic | Technology Agency of the Czech Republic | Total |
|---|---|---|---|---|---|---|---|---|
| | | MIT total | Operational Programme projects | | | | | |
| Faculty of Technology | 2 | 0 | 0 | 2 | 0 | 1 | 2 | 7 |
| Faculty of Management and Economics | 4 | 0 | 0 | 1 | 0 | 0 | 2 | 7 |
| Faculty of Multimedia Communications | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| Faculty of Applied Informatics | 1 | 8 | 7 | 1 | 3 | 0 | 1 | 14 |
| Faculty of Humanities | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 3 |
| Faculty of Logistics and Crisis Management | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| TBU Library | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| University Institute | 8 | 4 | 2 | 5 | 0 | 1 | 5 | 23 |
| Rectorate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TBU total | 17 | 12 | 9 | 14 | 3 | 2 | 10 | 58 |

**Total costs acknowledged for TBU in Zlín in 2017 (in CZK thousands)**

| Component part / Provider | Czech Science Foundation | Ministry of Industry and trade of the Czech Republic | | Ministry of Education, Youth and Sports of the Czech Republic | Ministry of the Interior of the Czech Republic | Ministry of Agriculture of the Czech Republic | Technology Agency of the Czech Republic | Total |
|---|---|---|---|---|---|---|---|---|
| | | MIT total | Operational Programme projects | | | | | |
| Faculty of Technology | 3 144 | 0 | 0 | 2 580 | 0 | 640 | 1605 | 7 969 |
| Faculty of Management and Economics | 2 379 | 0 | 0 | 374 | 0 | 0 | 582 | 3 335 |
| Faculty of Multimedia Communications | 0 | 0 | 0 | 3 367 | 0 | 0 | 0 | 3 367 |
| Faculty of Applied Informatics | 490 | 3 385 | 1 959 | 17 324 | 5 990 | 0 | 1 317 | 28 506 |
| Faculty of Humanities | 968 | 0 | 0 | 2 669 | 0 | 0 | 0 | 3 637 |
| Faculty of Logistics and Crisis Management | 0 | 0 | 0 | 400 | 0 | 0 | 0 | 400 |
| TBU Library | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| University Institute | 10 610 | 2 144 | 1 172 | 65 943 | 0 | 1 502 | 14229 | 94 428 |
| Rectorate | 0 | 0 | 0 | 0 | 0 | 0 | | 0 |
| TBU total | 17 591 | 5 529 | 3 131 | 92 657 | 5 990 | 2 142 | 17 733 | 141 642 |

# Science Activity Annual Report

2017

The publication was not checked for language or editorial