**Faculty of Environmental and Manufacturing Technology**

technical university in zvolen



**report**

**on scientific and research activities at FEMT TU in zvolen for 2016**

Proposal for a decision:

Scientific board of FEMT TU in Zvolen

The 2016 report at FEMT was approved by:

(a) no comments,

(b) with comments

Presented by: **doc. Ing.** **Marián Kučera, PhD.**

Dean of FEMT TU in Zvolen

Processed by: **Prof. Ing. Štefan Barcík, CSc.**

from the documents of the heads of the FEMT workplaces in Zvolen

**CONTENT**

[INTRODUCTION 5](#_Toc116293593)

[1 SCIENTIFIC AND RESEARCH PROFILE OF FEMT 6](#_Toc116293594)

[1.1 Orientation and supporting directions of research 6](#_Toc116293595)

[1.2 Main areas and orientations of scientific research activity 6](#_Toc116293596)

[2 ORGANIZATIONAL, PERSONNEL, FINANCIAL AND MATERIAL – TECHNICAL PROVISION OF SCIENCE AND TECHNOLOGY 8](#_Toc116293597)

[2.1 Scientific research capacity of FEMT and its qualification structure 8](#_Toc116293598)

[2.2 Thematic concentration and financial provision of research at FEMT 9](#_Toc116293599)

[3 PUBLICATIONS 11](#_Toc116293600)

[3.1 Evaluation of publishing activity in 2016 11](#_Toc116293601)

[4 CO-WORKING IN SCIENCE AND TECHNOLOGY AT HOME AND ABROAD 17](#_Toc116293602)

[4.1 Cooperation with higher education institutions 17](#_Toc116293603)

[4.1.1 FEMT's cooperation with domestic university departments 17](#_Toc116293604)

[4.1.2 FEMT's cooperation with foreign university departments 18](#_Toc116293605)

[4.2 FEMT's cooperation with professional workplaces 19](#_Toc116293606)

[5 SCIENTIFIC AND PROFESSIONAL EVENTS OF FEMT 21](#_Toc116293607)

[6 SCIENCE AND TECHNOLOGY PROJECTIONS 24](#_Toc116293608)

[6.1 Grant projects VEGA, KEGA 24](#_Toc116293609)

[The aim of the project is to create wider opportunities for better preparation of students in all forms of study, with an emphasis on the needs of the labour market and the knowledge society. For this purpose, the project will innovate the current subject offer and create new study materials. The targets set for 2016 have been met according to the planned scope. In the second year of the project solution, a laboratory is created based on knowledge from faculty study programs. The structural design was processed and the production of a functional model of the harvester head began, which will serve as a didactic aid. 27](#_Toc116293610)

[6.2 APVV projects (Agency for the Promotion of Research and Development) 28](#_Toc116293611)

[6.3 Institutional research 29](#_Toc116293612)

[6.4 Internal Project Agency Projects 29](#_Toc116293613)

[6.4.1 Institutional projects completed 29](#_Toc116293614)

[6.5 Projects other 30](#_Toc116293615)

[7 Student scientific professional activity 31](#_Toc116293616)

[8 DOCTORAL STUDIES 32](#_Toc116293617)

[8.1. 5.2.50 Production technology 32](#_Toc116293618)

[9 CONCLUSION 34](#_Toc116293619)

[10 DRAFT MEASURES FOR 2017 35](#_Toc116293620)

# INTRODUCTION

We present to the Scientific Board of the Faculty of Environmental and Manufacturing Technology the Report on Scientific and Research Activities for 2016.

The purpose of the report is to:

* capture and document the state of play in the field of science and research, as well as in other activities in the 2016 review year;
* quantify parameters from the field of science and research and related publishing activity for some procedures for the redistribution of funds at the faculty,
* ensure continuity and comparability of endpoints,
* summarize the documents for the elaboration of materials for the periodic evaluation of the faculty by the authorities of the Ministry of Education of the Slovak Republic and ak,
* to provide the members of the Scientific Council of FEMT with the basis for obtaining a comprehensive overview of the structure of qualitative and quantitative indicators in the field of science and research management at the faculty, so that they can adjust the process of organization and direction of scientific research activity by their decision-making and at the same time to gain an overview of the state of affairs in individual departments.

The report is designed to provide a comprehensive and objective picture of what is happening in the fields of science and research, scientific education, cooperation, direction and concept of development. Thefollowing areas of science, research and foreign relations are comprehensively evaluated in law:

* Scientific and research profile of FEMT.
* Organizational, personnel, financial and material – technical provision of science and technology.
* Publishing activity of the faculty.
* Cooperation in the field of science and technology at home and abroad.
* Scientific and professional events.
* Science and technology projects.
* ŠVOČ.
* Doctoral studies.

For clarity, most of the quantitative indicators and information are compiled into tables.

The measures taken from the 201 Scientific Research Activity Report 5 have been largely fulfilled.

# SCIENTIFIC AND RESEARCH PROFILE OF FEMT

The basic platform of profiling of the Faculty of Environmental and Production Technology in Science and Research is activities in the context of its long-term intention. They represent the area of creation and protection of the working and environmental environment, as well as techniques for protecting the environment from the negative effects of production processes. Pthe other starting point for the focus of the scientific-research profile of FEMT is the know-how of the faculty, its personnel capabilities and material-technical base. In the above areas of science and research, the activity of the faculty in the submission of grant and scientific research projects is oriented. The financial envelope of scientific and research tasks is implemented mainly through grant projects VEGA, KEGA, IPA and partly APVV. Nalso a larger part of the scientific research capacity of the faculty's staff and PhD students is used to solve the projects of the above-mentioned grant agencies.

## Orientation and supporting directions of research

The scientific and research profile of the faculty is based on the professional focus and mission of the faculty, which was reflected in the main directions of science and research at FEMT. The scientific and research activities of FEMT are built on the principle of maximum interconnectedness of pedagogical and scientific activities, respecting global trends and current needs of social practice.

The content focus of the faculty's research activities is oriented to the main directions of research in the field of development and assessment of the quality of forestry and woodworking machines, reduction of material and energy intensity, use of new energy resources (permanently renewable sources, biomass), quality management of production enterprises.

The concept of FEMT's development objectives is based on the intentions of the development of science and technology in terms of world trends and the needs of society. The aim is also to ensure the uniform development of all accredited fields of study of the faculty and professional disciplines provided by individual departments.

The faculty will develop a long-term program of science and research for the modernization of the production base in the engineering and woodworking industries and in forestry and for the development and improvement of environmental facilities. This will take into account the requirements of society and be based on the needs of innovation in the teaching subjects of the faculty's fields of study. The strategy of FEMT TU in Zvolen is also oriented towards the developmentof accounts with universities in European countries in the form of bilateral agreements on scientific and research cooperation and exchange of studies. This opens up the potential and balance of research and teaching into a form of consistency between the orientation of research activity and accredited study programmes.

## Main areas and orientations of scientific research activity

The mission of the Faculty of Environmental and Production Technology is to develop creative scientific research and, on its basis, to provide higher education in all three levels in the Slovak and European research and education area.

In the field of research, it fulfils its mission by solving research projects and programmes of a national and international nature, especially in the areas of agricultural and forestry sciences, engineering and technology, environmental sciences and ecology, engineering and management, protection of persons

 and integrated security, as well as other related and application areas. Based on the end of the Long-Term Development Plan of FEMT for 2011-2016, the focus of scientific research activity is mainly concentrated on:

* techniques and technologies in the field of waste and secondary raw materials management,
* secondary and renewable energy sources,
* research into water and air protection techniques,
* machinery and mechanisms for woodworking and forestry technology,
* measuring and control systems with microcomputers and modular computer systems,
* use of traditional and special construction and tool materials,
* technological problems with an emphasis on the possibilities of implementing CA – technologies,
* production management, quality management, diagnostics and operational reliability of machines in relation to the environment,
* creation and management of production systems,
* integration of management systems and certification procedures.

# ORGANIZATIONAL, PERSONNEL, FINANCIAL AND MATERIAL – TECHNICAL PROVISION OF SCIENCE AND TECHNOLOGY

## Scientific research capacity of FEMT and its qualification structure

The scientific research capacity consists of scientific and pedagogical staff §-18 and researchers §-01. PhD students or students - diplomats are also involved in the scientific research capacity of FEMT and in solving research tasks.

It is recommended to base the planning of scientific research capacities on the following values:

|  |  |  |
| --- | --- | --- |
| pedagogical staff |  | 1000 h |
|  |  |  |
| internal PhD students | 1st year of study | 1000 h |
| 2nd year of study | 1500 h (max. 2000 h) |

The numbers and structure of the faculty staff constituting the basic scientific research capacity are shown in Table 2.1.

**Table 2.1** Qualification structure of FEMT staff by workplace (as at 31.12.2016)

|  |  |  |  |
| --- | --- | --- | --- |
| **Workplace** | **C o u n c il a t i on o f the** | **Together** | **Of the total** |
| **scientific and pedagogical staff**  |
| **Prof.** | **.doc.** | **Oa** | **DrSc., Dr.** | **CSc., PhD.** |
| CELT | 2 | 2 | 3 | **7** | 0 | 7 |
| KMSD | 0 | 4 | 4 | **8** | 0 | 8 |
| KRSAT | 1 | 2 | 3 | **6** | 0 | 6 |
| KVTMK | 0 | 6 | 3 | **9** | 0 | 9 |
| TOGETHER | **3** | **14** | **13** | **30** | **0** | **30** |

**Graph 2.1** Qualification structure of FEMT staff

The research capacity spent on solving all research tasks is presented in Table 2.2, with an average of 897 hours per 1 reported FEMT teaching staff member. PhD students are also involved in solving scientific projects, but they are not counted in the summary capacity calculations.

 **Table 2.2** Research capacity of FEMT teaching staff on grant and other scientific projects in 2016 classes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  **Workplace** | **VEGA grant projects** | **KEGA grant projects** | **Other projects**  | **Together** |
| kELT | 2 200 | 2 700 | 2 250 | **7 150** |
| KMSD | 2 800 | 4 400 | 1 000 | **8 200** |
| KRSAT | 0 | 2 300 | 970 | **3 270** |
| KVTMK | 5 700 | 1 500 | 1 100 | **8 300** |
| TOGETHER | **10 700** | **10 900** | **5 320** | **26 920** |

## Thematic concentration and financial provision of research at FEMT

In basic and applied research, the faculty focused on tasks and projects that will significantly contribute to minimizing the negative impacts of technology and technology on the living and working environment and reducing the material and energy intensity of equipment. A significant part of the research capacities are focused on research and development of new machinery and equipment for forestry and the timber industry.

The funds were obtained in the form of approved and solved grant projects, for which the main investigator of the project was fully responsible, in full respect of the Decree of the Ministry of Education of the Slovak Republic on the use of budgetary funds.

 A summary overview of the funds allocated to the solution of grant and scientific and technical projects by department is given in Tables 2.3 and 2.4, graphically shown in Figure 2.2. A more detailed overview of the allocations for individual projects is given in Chapter 6.

**Table 2.3** Departmental allocations in 2016 for VEGA and KEGA projects (in EUR)

|  |  |  |  |
| --- | --- | --- | --- |
| **Workplace** |  **VEGA** grant projects |  **KEGA** grant projects | **Together** |
| **Common** | **Capital** | **together** | **Common** | **Capital** | **together** |
| CELT | 4 426 | 0 | 4 426 | 16 880 | 0 | 16 880 | 21 308 |
| KMSD | 7 585 | 0 | 7 585 | 3 106 | 0 | 3 106 | 10 691 |
| KRSAT | 0 | 0 | 0 | 5 901 | 0 | 5 901 | 5 901 |
| KVTMK | 5 660 | 0 | 5 660 | 2 907 | 0 | 2 907 | 8 567 |
| TOGETHER | **17 671** | **0** | **17 671** | **28 794** | **0** | **28 794** | **46 467** |

 **Table 2.4** Departmental allocations in 2016 for IPA and other projects

|  |  |
| --- | --- |
|  **Workplace** | **IPA projects, instituted research and other projects** |
| **Common** | **Capital** | **together** |
| kELT | 4 865 | 0 | 4 865 |
| KMSD | 2 786 | 0 | 2 786 |
| KRSAT | 6 850 | 0 | 6 850 |
| KVTMK | 0 | 0 | 0 |
| FEMT | 6 367 | 0 | 6 367 |
| TOGETHER | **20 868** | **0** | **20 868** |

**Graph 2.2** Overview of funds allocated to project solutions by department

Table 2.5 gives an overview of the volume of allocated and spent funds from the Ministry of Education of the Slovak Republic and funds from other programs.

**Table 2.5** Overview of the volume of funds allocated and spent to deal with projects

(EUR)

|  |  |  |
| --- | --- | --- |
| **Title** | **Allocations** | **Funds drawn down together with balances from previous years** |
| VEGA | 17 671 | 20 328 |
| KEGA | 28 794 | 22 207 |
| Ipa  | 2 539 | 2201 |
| Institutional research | 6 367 | 6 367 |
| Other | 11 962 | 7 765 |
| **Together** | **67 333** | **58 868** |

Figure 2.3 below shows, for comparison, developments by volume of funding allocated to grant and scientific and technological projects in 2013, 2014, 2015 and 2016.

**Graph 2.3** Project allocations in 2013, 2014, 2015 and 2016

# PUBLICATIONS

## Evaluation of publishing activity in 2016

The basic form of outputs of scientific research and creative activity is publishing and artistic activity, which was evaluated in accordance with Directive No. 13/2008-R on bibliographic registration and categorization of publishing activity and decree of the Ministry of Education of the Slovak Republic No. 456/2012 Coll. on the central register of records of publishing activity and the central register of records of artistic activity.

In Table 3.1 and Graphs 3.1 and 3.2, publishing activity is tracked by individual departments as well as years at the faculty. The overall performance of FEMT's quality of publications is assessed through the preferred categories A1 to C shows that publishing activity in 2016 still has a relatively qualitatively increasing level, with a downward trend in quantitative terms.

Tables 3.1, 3.2 and the following graphs were drawn up from the departments' documents and according to the documents from the SLDK. The individual categories were determined according to the criteria of the Ministry of Education of the Slovak Republic and took into account the proportions of individual authors. This breakdown is important from the point of view of allocating funds for TU and FEMT, the most important being categories A1, A2, B and C. Based on the evaluation of publication activity, it can be concluded that the share of categories A1, A2 and B has decreased significantly compared to previous years. According to current criteria, it is precisely the need to continue to focus on these types of publications. A very positive phenomenon is the significant increase in publications in category C, which also have a considerable contribution either in terms of obtaining a subsidy, but also for the evaluation of projects or for the comprehensive accreditation of the faculty as well as the career growth of faculty staff. However, compared to last year, we have seen a significant increase in the number of works in category X, which is not so desirable from the point of view of further development of the faculty. From a global perspective, FEMT continues to maintain the established trend of publishing outputs per creative worker, which is to some extent due to the gradual decrease in the number of faculty staff.

 **Tab. 3.1** Evaluation of publishing activities for individual departments according to the criteria of the Ministry of Education of the Slovak Republic for the year 2016 – employees

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Department** | **A1** | **A2** | **B** | **C** | **D** | **X** | **Average for the reporting staff of the department** |
| **KELT** | 0,85 | 6,33 | 3,25 | 3,65 | 25,74 | 4,11 | **3,99** |
| **KMSD** | 0 | 2,66 | 1,09 | 5,6 | 7,78 | 2,56 | **2,46** |
| **KRSAT** | 0 | 3 | 1,03 | 4,36 | 4,48 | 3,5 | **2,73** |
| **KVTMK** | 0 | 3,3 | 0,7 | 10,83 | 18,09 | 3 | **3,27** |
| **Together** | **0,85** | **15,29** | **6,07** | **24,44** | **56,09** | **13,17** | **3,22** |
|  |  |  |  |  |  |  |  |

Note. 1:Group A1Book publications of the nature of a scientific monograph

 Group A2Other book publications

Group BPublications in peer-reviewed scientific journals and copyright certificates, patents and discoveries

Group CPublications in journals that are not peer-reviewed but are registered in WoS or Scopus databases

Group OTHER PUBLICATIONS

 Group X Notcalassed

**Graph 3.1** Evaluation of publishing activity in shares for individual departments according to the criteria of the Ministry of Education of the Slovak Republic for 2016 – employees

**Table 3.2** Submitted utility models of FEMT workers for 2016

|  |  |  |
| --- | --- | --- |
| **Application number** | **Name of utility model** | **Name of the causative agent** |
| 51-2016 | Concentration solar collector with offset parabolic mirror and conical spiral absorption body | Marián Ježo, Jozef Víglaský |
| 163-2015 | Equipment for measuring pressure ratios when air flows through window networks | Černecký Jozef, Brodnianská Zuzana, Koniar Ján, Červenýk Ľudovít |
| 164-2015 | Device for measuring the light transmittance of window networks | Černecký Jozef, Brodnianská Zuzana, Koniar Ján, Červenýk Ľudovít |
| 171-2015 | Cutout manipulator | Krajčovičová Mária, Solár Jozef, Sklenka Jozef |
| 58-2016 | Adaptive Belt Conveyor  |  Krajčovičová Mária, Lukáč Jozef |

**Graph 3.2**Comparison of the number of outputs in individual categories of publishing activity according to the criteria of the Ministry of Education of the Slovak Republic

Table 3.4 shows the assessment of the citation activity of individual faculty staff in the categories:

1 - In foreign publications registered in the Web of Science and the Scopus database

2 - In home publications registered in the Web of Science and the Scopus database

3 - In foreign publications not registered in the Web of Science and the Scopus database

4 - In domestic publications not registered in Web of Science and the Scopus database

**Tab. 3.4** Evaluation of citation activities for individual departments in 2016 – staff

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Department** | **1** | **2** | **3** | **4** | **Average for the reporting staff of the department** |
| **KELT** | 35 | 26 | 11 | 52 | **11,27** |
| **KMSD** | 10 | 2 | 4 | 26 | **5,25** |
| **KRSAT** | 20 | 8 | 8 | 32 | **11,33** |
| **KVTMK** | 111 | 8 | 35 | 130 | **25,82** |
| **Together** | **176** | **44** | **58** | **240** | **14,39** |

In particular, the publishing activity of phD students of the departments for the year 2016 was evaluated at the Faculty of Environmental and Manufacturing Technology of the Tu in Zvolen.

**Tab. 3.4** Evaluation of publishing activities for individual departments according to the criteria of the Ministry of Education of the Slovak Republic for 2016 – PhD students

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  **Department** | **A1** | **A2** | **B** | **C** | **D** | **X** | **Average per reporting PhD student** |
| **KELT** | 0,2 | 0 | 1,45 | 0,17 | 2,14 | 6,25 | **2,55** |
| **KMSD** | 0 | 0 | 0,7 | 0,74 | 2,09 | 1 | **2,27** |
| **KRSAT** | 0 | 0 | 0,1 | 0,25 | 3,05 | 0,5 | **0,56** |
| **KVTMK** | 0 | 0 | 0 | 0,4 | 2,4 | 1,5 | **1,08** |
| **Together** | **0,2** | **0** | **2,25** | **1,56** | **9,68** | **9,25** | **6,46** |

**Graph 3.3** Evaluation of the publication outputs of PhD students per department

Table 3.5 shows the assessment of the citation activity of individual PhD students in the categories:

1 - In foreign publications registered in the Web of Science and the Scopus database

2 - In home publications registered in the Web of Science and the Scopus database

3 - In foreign publications not registered in the Web of Science and the Scopus database

4 - In domestic publications not registered in Web of Science and the Scopus database

**Table 3.5** Evaluation of citation activities for individual departments in 2016 – PhD students

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Department** | **1** | **2** | **3** | **4** | **Average per reporting PhD student** |
| **KELT** | 1 | 0 | 1 | 0 | **0,50** |
| **KMSD** | 0 | 0 | 0 | 0 | **0,00** |
| **KRSAT** | 1 | 0 | 0 | 1 | **0,29** |
| **KVTMK** | 1 | 0 | 0 | 0 | **0,14** |
| **Together** | **3** | **0** | **1** | **1** | **0,29** |

The following table and graph provides an overview of the implementation, management and organisational activities of individual FEMT employees for the period 1.1.2016 – 31.12.2016 in the categories:

A. Implementation activity,

B. Management and organisational activities in the field of science and technology,

C. Assessment activity.

**Table 3.6** Scores of FEMT departments in each category for 2016

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Department** | **A** | **B** | **C** | **Together** |
|
| KELT | 7,5 | 44 | 44 | 95,5 |
| Average per reporting person | 0,68 | 4,00 | 4,00 | 8,68 |
| KMSD | 3 | 30 | 37 | 70 |
| Average per reporting person | 0,38 | 3,75 | 4,63 | 8,75 |
| KRSAT | 1 | 25 | 43 | 69 |
| Average per reporting person | 0,17 | 4,17 | 7,17 | 11,50 |
| KVTMK | 8 | 16 | 49 | 73 |
| Average per reporting person | 0,73 | 1,45 | 4,45 | 6,64 |
| **Together** | **19,5** | **115** | **173** | **307,5** |
| Average per person reported (36 workers) | 0,54 | 3,19 | 4,81 | 8,54 |

**Graph 3.4** Evaluation of the activities of FEMT departments in individual categories for 2016

# CO-WORKING IN SCIENCE AND TECHNOLOGY AT HOME AND ABROAD

## Cooperation with higher education institutions

The Faculty of Environmental and Production Technology has developed cooperation with higher education institutions throughout the Slovak Republic and also with many foreign higher education institutions and their staff.

They cooperate not only in the pedagogical field within the framework of the latest information and knowledge in pedagogy, but also scientific and research activities in solving specific grant projects. FEMT staff are also engaged in assessment and expertise activities, they are members of commissions for the improvement of scientific and pedagogical qualifications, etc.

### 4.1.1 FEMT's cooperation with domestic university departments

* **Slovak University of Agriculture in Nitra**

Faculty of Technology, Prof. Zdenko Tkáč, PhD., doc. Ing. Ivan Janoško, CSc.; .doc. Ing. Pavol Findura, PhD., Ing. Ľubomír Hujo, PhD., doc. Ing. M. Kotus, PhD.,

Faculty of Economics and Management, Prof. Dr. Elena Horská.

* **University ofŽilina**

 Faculty of Mechanical Engineering, prof. RNDr. Milan Malcho, PhD., prof. Jozef Jandačka, PhD., doc. Ing. Andrej Kapjor, PhD., doc. Štefan Papučík, PhD., doc. Radovan Nosek, PhD., Department of Materials Engineering prof. E. Tillová, PhD., Department of Industrial Engineering doc. Ľ. Dulina, PhD., Department of Machining and Production Technology prof. A. Czán, PhD.,

Faculty of Electrical Engineering, Prof. Klára Čápová, PhD., Prof. M. Dado, PhD. .;

* **Slovak University of Technology in Bratislava**

Faculty of Materials Technology, Prof. Maroš Soldán, PhD., prof. Pavol Božek, CSc. , doc. RNDr. Karol Hatiar, CSc., Kamil Trnka, Institute of Materials - doc. Ing.

Faculty of Mechanical Engineering, Prof. Marián Peciar, PhD., Doc. Lešinský, CSc.,

Faculty of Chemical and Food Technology, Bratislava, doc. V. Chovancová, CSc., prof. I. Hudec, PhD. - Director of the Institute of Polymeric Materials;

Faculty of Electrical Engineering and Informatics, Prof. Viktor Ferencey, CSc. .;

* **Technical University of Košice**

Faculty of Mechanical Engineering, Prof. Peter Horbaj, PhD., Prof. Mária Čarnogurská, CSc., Prof. Augustín Varga, CSc., doc. Ján Kizek, PhD., doc. J. Brezinová, PhD., doc. D. Jankura, PhD., Prof. E. Lumnitzer, CSc. .;

 Faculty of Metallurgy, doc. J. Petrík, PhD., doc. Jarmila Trpčevska, PhD.

Faculty of Electrical Engineering, Prof. Ján Mihalík, CSc., Prof. Dušan Marchevský, CSc. .;

Faculty of Production Technologies based in Prešov, Prof. Jozef Zajac, CSc.;

* **Matej Bel University in Banská Bystrica**

Faculty of Natural Sciences, Prof. PaedDr. Milan Ďuriš, CSc., externally - prof. M. Piatrik, PhD., prof. RNDr. Iveta Marková, PhD., doc. Ing. ;

* **University of St. Petersburg Cyril and Methodius in Trnava**

 Faculty of Natural Sciences, doc. Ing. Stanislav Hostin, PhD.;

**Dubnica Institute of Technology in Dubnica nad Váhom** prof. Ladislav Várkoly, PhD., doc. ;

* **Catholic University of Ružomberok**

UMFI, Ružomberok – doc. Igor Černák, PhD. ;

* **Academy of the Armed Forces Liptovský Mikuláš**

.doc. Jozef Puttera, CSc., doc. Ľuboš Antoška, CSc., doc. Ľubomír Andráš, CSc.;

### 4.1.2 FEMT's cooperation with foreign university departments

* Vysoké učení technické v Brno, prof. Milan Pavelek, CSc., doc. Miroslav Škopán, Faculty of Mechanical Engineering inženýrství Ing. Z. Smékal, CSc., Czech Republic;
* Czech Technical University in Praza, Faculty of Electrical Engineering, Prof. S. Ďaďo, DrSc., Prof. M. Laipert, CSc., Strojní fakulta , Martin Hlinovský, Ph.D., Libor Reif, CSc., Czech Republic;
* Czech University of Agriculture in Praza, Faculty of Forestry and Dřevařská Prague, doc. Jirko Dvořák, Ph.D., doc. Milan Gaff, Ph.D., Faculty of Technology Prague, Prof. Vladimír Jurča, CSc., Prof. Martin Libra, CSc., Doc. M. Müller, PhD., Czech Republic;
* Palacký University in Olomouc, Industrial Laboratory of Optics, RNDr. Jiří Keprt, DrSc., Czech Republic;
* Technical University of Ostrava – doc. J. Kionka, CSc., doc. Dr. J. Punčochář, CSc., Faculty of Security Inženýrství Ing.
* Jan Evangelisty Purkyně University, Ústí nad Labem, Faculty of Production Technologies and Anagement, doc. Nataša Náprstková, PhD., Czech Republic;
* University of Silesia in Opava, Faculty of Entrepreneurship in Karviné; RNDr. R. Jewellery, PhD., Czech Republic;
* Mendel University in Brno, Faculty of Lesnická a dřevařská, doc. D. Tesařová, PhD., prof. Miroslav Rousek, CSc., doc. Ing, Zdenko Kopecký, PhD., doc. Karel Janák, CSc. , Czech Republic;
* University of Pardubice, Faculty of Chemistry and Technology, Prof. P. Kalenda, CSc., Prof. A. Kalendová, Dr., Czech Republic;
* Technical University, Faculty of Mechanical Engineering, Liberec, Eva Nováková, PhD., Czech Republic;
* University of West Bohemia in Pilsen, Faculty of Mechanical Engineering, Marek Bureš, PhD., Prof. Dr. Antonín Kříž, Czech Republic;
* Voronezh State Academy of Forestry Engineering, Prof. Dr. Tech. Sci. Larissa I. Belchinskaya, Russia;
* University of Life Sciences – SGGW, Faculty of Forestry and Wood Technology, Warsaw, prof. Dr. hab. Krzysztof J. Krajewski, Dr.hab. Piotr Borysiuk, prof. Dr hab inž. Ewa Dobrowolska, Poland;
* SGGW, Faculty of Production Engineering Warszawa, prof. dr. Hab. Jerzy Wiesik, Poland;
* AR, Department of Mechanizacji Prac Lesnych Krakow, prof. dr. Hab. Józef Walczyk, Poland;
* Ukrainian derzavnyj lisotechničnyj universytet Lviv, prof. Nestor J, Bybljuk, DrSc., doc. Oleg Styranivsky, Ph.D., Ukraine;
* Nyguat-Magyarországi Egytem Sopron, Prof. Belo Horváth, Prof. Z. Kovacs, Hungary;
* Sveučilište u Zagrebu, Šumarski fakultet, prof. Dr. Sc. Dr.h.e. Vlado Goglia, Croatia;
* Kazan National Research Technological University, Prof. Ruslan R. Safin, DrSc., Russia;
* Belarusian State University, Minsk, doc. Pavel M. Rudak, PhD., Belarus.
* Volga State University of Technology, Yoshkar Ola,doc.Ing. Evgeny Y. Razumov,CSc, Russia
* Instytut Technologii Mechanicznej, Wydział Budovy Maszyn i Zarządzania, Politechnika Poznańska, Poznań , Dr. inž. Bartosc Palubicki, Poland;
* University of Rijeka, Faculty of Engineering, Prof. T. Mikac, Croatia;
* Josip Juraj Strossmayer University of Osijek, Mechanical Engineering Faculty in Slavonsky Brod, Prof. D. Kozak, Croatia;
* Technical University of Sofia, Prof. G. Popov, Bulgaria;
* [Gdansk University of Technology](https://www.researchgate.net/institution/Gdansk_University_of_Technology), [Faculty of Mechanical Engineering,Dr](https://www.researchgate.net/institution/Gdansk_University_of_Technology/department/Faculty_of_Mechanical_Engineering). Mieczyslaw Siemiatkowski), Poland;
* Transilvania University of Brasov, Brasov, Prof. M. Ispas, Romania;
* Politechnika Koszalińska, Wydział Mechaniczny, prof. nadzw. dr hab. inż. Witold Gulbiński, prof. nadzw. dr hab. inż. Krzysztof Rokosz, Poland

## FEMT's cooperation with professional workplaces

FEMT staff cooperates with various institutions in solving projects, their development and implementation work, in arranging operational exercises, within the framework of diploma theses.

* HIVUS s.r.o. , Žilina, Jaroslav Kocian;
* K-system, s.r.o., Žiar nad Hronom, Ľudovít Červenýk, Andrea Kúdelová;
* Zvolenská teplárenská, a.s., Zvolen, Ing. Jozef Petrinec;
* Doka Drev, s.r.o, Banská Bystrica, Štefan Mátik;
* DETOX, s.r.o., Plant Banská Bystrica, Katarína Babková, Karina Paulíny, PhD.;
* VIMAR Ecological boilers VIGAS, Slovenská Ľupča, Pavel Vigaš;
* Wastewater treatment plant Rakytovce, Banská Bystrica, Pavol Badinský
* Euroheat SK, s.r.o. , Bratislava, Ján Karman;
* SHMÚ Banská Bystrica, RNDr. Jana Podolinská;
* SECOLÓG, s.r.o., Brezno (Landfill) – Richard Bergel, PhD.;
* Slovak Academy of Sciences, Institute of Polymers, Department of Theoretical and Applied Polymer Research, Bratislava, Igor Novák, CSc., Institute of Electrical Engineering, M. Polák, DrSc.
* Research Institute of Plastic Substances, Nitra, Dana Červinková, Eva Lukáčiková;
* PPS Group, a. s., Detva, Areál PPS Group a.s., Tajovského 7, 962 12 DETVA, Vladimír Ľalík, Jozef Klimo ;
* LKT, s. r. o., Trstená; Štefan Furdek 270/12, **Peter Šinál** ;
* ESSEL Slovenská Lupča, Ing. Szylágy;
* Forest Technology Plant Banská Bystrica, Sivčo, Franta PhD.;
* Continental Automotive System Slovakia, Zvolen, Zvolen, Slovakia, p. Šimiak, (contractual cooperation, Ing.
* BRC Slovakia, s. r. o. , Drmla, Dobrotová;
* SLAVIA PRODUCTION SYSTEMS a.s. , Detva, Dobrota, Michal Kucej, Jana Kucejová;
* Zetor Slovakia, Ing. Klonga;
* Innovated by Ladomerská Vieska, Slovak Academy of Sciences, Institute of Materials and Mechanics machine SAS, Dr. František Simančík, Ing.
* Institute of Material Research SAS, Košice, RNDr. Miroslav Džupon, PhD. ;
* ŽOS Zvolen, a. s., Zvolen , Ing. Martinská;
* Ironworks Podbrezová, a. s., Podbrezová , Ing.
1. Hriňovské strojárne, a. s., Hriňová , Ing. A. Krnáčová;
2. Mint Kremnica, š. p., Kremnica (contractual cooperation), R. Kaštan, PhD. ;
3. GeWiS Slovakia, spol.
4. NEMAK Slovakia, spol.
5. Foundry Hronec, a. s. , Ing.
6. Fronius, a. s., Slovakia , Bc. P. Acs ;
7. Slovak Society for Quality – PS " Education and Training" Ing.
8. K – Kosorín system, Ing.
9. STATON , Turany , Ing.
10. WAY Industries Krupina a.s. Macko, Frost ;
11. Ironal, s. r. o., Banská Bystrica Ing. L. Kamenický;
12. Certification bodies: PQM s.r.o. Banská Bystrica., Ing. Snopek ;
13. ITQ – CZ s.r.o. Žilina;
14. CADvision – Mihálik ;

# SCIENTIFIC AND PROFESSIONAL EVENTS OF FEMT

In 2016, the departments of the Faculty of Environmental and Production Technology organized or participated in the co-organization of the following scientific and professional events:

*Type of event:* Lecture for the Forestry and Wood Museum in Zvolen *Roboty – Fun and playful:*

*Date of the event:* **28.4.2016**

*Expert guarantor:* **Doc. Mgr. Elena Pivarčiová, PhD.**

*Number of participants:* - home: **12**

*Type of event:* Conference with international participation, FEMT TU in Zvolen

*Event date:* **02/06/2016**

*Expert guarantor:* **Marián Minárik, PhD.**

*Number of participants:* - home: **17**

 - foreign: **2**

*Focus of the event:* Improving the teaching process in the field of technical

 Drive

*Title of the proceedings:* Implementation of educational methods to improve the teaching process

 in the field of technical mechanics

*Type of event:* Roboplaying **-** Entertainment and competitions for elementary school students

 presentation of robotics

*Date of the event:* 27.6-28.6.2016

*Expert guarantor:* **Doc. Mgr. Elena Pivarčiová, PhD.**

*Number of participants:* - domestic: **27.6.2016: 62 participants, 28.6.2017: 84 participants**

*Event focus:* Robotics

*Type of event:* Virtual reality presentation - FEMT: presentation event for the public, *Date of the event:* **26.8.2016**

*Expert guarantor:* **Jaroslav Matej, PhD.**

*Focus of the event:* Virtual Reality Presentation

*Type of event:* Virtual reality presentation – FEMT: presentation event for the SpŠ transport in

 Elected

*Event date:* **09/09/2016**

*Expert guarantor:* **Jaroslav Matej, PhD., (**doc. M. Kučera, PhD., Ing. T. Kuvik)

*Focus of the event:* Virtual Reality Presentation

*Type of event:* Presentation of virtual reality at the Days of Technology - SSOŠT Žiar n. Hronom

*Event date:* **09/09/2016**

*Expert guarantor:* **Jaroslav Matej, PhD., (**doc. M. Kučera, PhD., Ing. T. Kuvik)

*Focus of the event:* Virtual Reality Presentation

*Type of event:* **International Scientific Conference on the 20th anniversary of FEMT**

 **prepared under the auspices of the Rector of the TU Prof. Rudolf Kropil, CSc.**

 **and dean of FEMT doc. Marián Kučera, PhD.,**

*Date of the event:* **12-14/09/2016**

*Number of participants:* - domestic: 31

 - Foreign:29

*Focus of the event:* Presentation of current scientific research results and operational

 knowledge in the field of production and environmental technology and its applications.

*Title of the proceedings:* **Trends in production and environmental technology in the 21st century**

*Type of event:* Information seminar on student mobility abroad

*Date of the event:* **3.11.2016**, at 9.00 a.m. , room F 123a

*Expert guarantor:* Denisa Voskárová, program coordinator, SAIA, n. o. BB

*Number of participants:* - home:35

*Focus of the event* :Information seminar on student mobility abroad

*Type of event:* **"Science and Technology Week 2016" at FEMT –** Expert lectures and practical

 demonstrations for students aimed at linking study with practice.

*Date of the event:* **10.11.2016**

*Number of participants:* - domestic: 180

 1. Expert lecture by Fronius Slovensko s. r. o.,

 *Expert guarantor:* **Miroslava Ťavodová, PhD.**

 *Focus of the event:* Expert lecture associated with virtual and

 real welding.

 2. Professional seminar of BRC Slovakia s.r.o.

 *Expert guarantor:* **Jozef Krilek, PhD.**

*Focus of the event:* Seminar associated with the workshop and is focused on the presentation of diagnostics of hydraulic and pneumatic systems from BRC Slovakia. Power measurement of hydraulic equipment, pressure measurement, flow measurement, temperature and oil pollution measurement.

 3. Professional seminar of IPM SOLUTION, s.r.o. Modeling and utilization

 Autodesk 2D and 3D products in practice.

 *Expert guarantor:* **Jozef Krilek, PhD.**

*Focus of the event:* The seminar associated with the workshop and is focused on the presentation of modeling and design of components, the creation of reports and drawings, the actual analysis of entire structures and their animation in programs from Autodesk.

 4. Expert lecture of SOVA Digital a.s. – Industry 4.0.

 *Expert guarantor:* **Miroslav Dado, PhD.**

 *Focus of the event:* Presentation of the Industry 4.0 concept

*Type of event:* Presentation event for secondary schools: Technical Academy Zvolen
 presentation of robotics and projects of the KRSAT and KMSD departments

*Date of the event:* **15.11.2016**

*Expert guarantor:* **Mgr. Elena Pivarčiová, PhD., Jaroslav Matej, PhD.**

*Number of participants:* - home: **8**

*Event focus:*  robotics, algorithmics, virtual reality, industrial computer programming

*Type of event:* presentation of robotics and projects of the departments of KRSAT and KMSD - Presentation event for

 secondary schools: SOŠ and SOU technical, Třemošnice, Czech Republic
*Event date:* **16.11.2016**

*Expert guarantor:* **Mgr. Elena Pivarčiová, PhD., Jaroslav Matej, PhD.**

*Number of participants:* - home: **12**

- foreign: **7**

*Event focus:*  robotics, algorithmics, virtual reality, industrial computer programming

*Type of event:* Colloquium to the grant task VEGA 1/0826/15

*Event date:* **11/2016**

*Expert guarantor:* **Jozef Krilek, PhD.**

*Number of participants:* - home: **14**

 - foreign: **22**

*Focus of the event:*

The Colloquium on the grant task VEGA 1/0826/15 presented the results of the project solution for the project solution period (2015-2016) of domestic investigators, cooperating from TUZVO, SPU Nitra, TU Košice and also within the framework of international cooperation (National Forestry University of Ukraine; University of Agriculture in Krakow, Poland; Saint-Peterburg State Forest Technical University, Russia; National Technical University of Ukraine and National University in Lviv, Ukraine) in the field of research of cutting mechanisms in the process of wood processing, where the contributions focused on the issues of initial wood processing and wood processing, machine-tool-workpiece interaction, increasing tool life, ergonomics, measurement and evaluation of data.

*Title of proceedings:* **Colloquium on grant task No 1/0826/15.**

*Type of event:* **Practical workshop -** ROBOPLAY: workshop for working with LEGO robots

 Mindstorms. Workshop for technical academy Zvolen

*Date of the event:* **20.-21.12.2016**

*Expert guarantor:* **Doc. Mgr. Elena Pivarčiová, PhD.**

*Number of participants:* - home: **8**

 - foreign:0

*Event focus:*  robotics, construction, algorithmization, programming

#  SCIENCE AND TECHNOLOGY PROJECTIONS

## 6.1 Grant projects VEGA, KEGA

In 2016, **3** VEGA projects were solved, the solution of two pswarms continues in 2017. FEMT participated in the solution of VEGA projects at the Faculty of Wood Sciences of tu in Zvolen.

**Table 6.1** Allocations for VEGA grant projects in 2016 (in EUR)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PROJECT NO** | **PROJECT NAME** | **PROJECT LEADER** | **DEPARTMENT** | **SOLUTION TIME** | **ALLOTTED** |
| **Bv** | **Kv** |
| VEGA 1/0676/14 | Technical and ecological research aimed at eliminating the undesirable effects of machine operation on forest soil and water  | Marian Kučera | KMSD | 2014 - 2016 | 7 585 | 0 |
| VEGA1/0826/15 | Research of cutting mechanisms in the process of processing wood mass | Jozef Krilek | kELT | 2015 - 2018 | 4 426 | 0 |
| VEGA1/0531/15 | Increasing the service life of tools and structural parts of mechanisms used in forestry technologies | Richard Hnilica | KVTMK | 2015 - 2018 | 5 660 | 0 |
| **TOGETHER** |  **17 671** | **0** |
| **Cooperation on projects of other faculties** |
| VEGA 1/0538/14 | Theoretical, experimental and model analysis of physico-technical properties of building envelopes | Ivan Ružiak, **co-investigators for FEMT:** Jozef Černecký, Ján Koniar, Zuzana Brodnianská | Faculty of Wood Sciences | 2014 - 2016 | 353 | 0 |

**Results achieved in solving VEGA projects in 2016**

**COMPLETED VEGA PROJECTS:**

**VEGA 1/0676/14 Technical and ecological research aimed at eliminating the undesirable effects of machine operation on forest soil and water**

**.doc. Ing. Marián Kučera, PhD.**

*Achievements:*

The solution of the scientific project has acquired theoretical as well as practical knowledge, which can be used in the development and construction of agricultural, forestry and transport machines. This is mainly the evaluation and use of ecological lubricants in the circulatory systems of machines, which are monitored from an environmental and energy point of view with the impact of the work of machines in forest operation on the soil. For direct application in practical conditions, designed tribometric devices may be used for accelerated durability tests of machine parts of lubricating and pressure working systems of machines and tests of circulatory system parameters, in particular for monitoring the effects of wheeled running gears. Use could also be made in the issue of monitoring the interaction processes of tracked running machines to monitor processes related to the decoupling or compaction of earth or soils. The results of the solution were presented mainly in the journals of the SCOPUS database or WOS, in which at least one member of the research team always participates in the presented scientific papers.

**VEGA 1/0538/14 Theoretical, experimental and model analysis of physico-technical properties of building envelope structures**

**Mgr. Ivan Ružiak, PhD. – Faculty of Wood Sciences**

The team behind KELT, FEMT carried out experimental measurements of heat flux through window glass and for this purpose an experimental assembly was designed and constructed taking into account the STN ISO 12567-1 standard. The results have been published and the documents can be used for the complex design of window structures for wood-based buildings. A device was also designed and constructed to measure heat transfer through various types of window meshes (different mesh material, mesh size, fiber thickness), from which an industrial utility model was also created in cooperation with the company K-Systém, Žiar nad Hronom, which deals with shading technology. Results from heat transfer measurements in a heated tube system under natural air convection were also realized and published. The results are applicable, for example, to the design of cylindrical heating elements, since the geometry and relative position of the pipes affect the heat transfer parameters, which in turn also affects operating costs and energy consumption.

In total, the team (KELT) has published 1 scientific paper in a foreign journal, 2 scientific papers in foreign journals registered in WOS, SCOPUS, 1 industrial utility model and papers at foreign scientific conferences in 3 years of solving partial tasks of the project.

**ONGOING PROJECTS:**

**VEGA 1/0826/15 Research of cutting mechanisms in the process of processing wood mass**

**.doc. Ing. Jozef Krilek, PhD.**

*Results achieved:* As part of the project 1/0826/15, an analysis of the current state of affairs and an analysis of the problems of solving the methodology for measuring and evaluating specific monitored indicators were solved. During 2016, a measurement methodology was proposed and measurements were carried out on the basis of the established methodology. As part of the project, the Scientific Peer-Reviewed Colloquium on the grant task was published.

**VEGA 1/0531/15 Increasing the service life of tools and structural parts of mechanisms used in forestry technologies**

**.doc. Ing. Richard Hnilica, PhD.**

*Achievements:*

In the second year of the project, we focused on the initial analyses of samples of materials of mulcher working tools working in forestry operations. The samples of working tools themselves showed significant signs of deformation. Since no input data was known to the instruments, chemical analysis, hardness measurement and evaluation of the microstructure of the material were carried out. Based on the data found, we identified the material and designed heat treatment to increase the service life of the tools, followed again by material analysis to detect changes in structure and mechanical properties. Subsequently, we proposed alternatives to improve the life of the tools. The first alternative is to heat-treat the entire forging. For the second alternative, we used visualization to mark the exposed areas on the tool body that would be suitable for heat treatment by surface hardening. Both designs will contribute to increasing the resistance of the tools to abrasive wear.

In 2016, 5 KEGA projects were solved, the solution of four projects continues in 2016.

**Table 6.2**  Allocations for KEGA grant projects in 2016 (in EUR)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PROJECT NO** | **PROJECT NAME** | **PROJECT LEADER** | **DEPARTMENT** | **TIME** | **ALLOTTED** |
| **SOLUTIONS** | **Bv** | **Kv** |
| KEGA 018TUZ-4/2014 | Implementation of educational methods for improving the teaching process in the field of Technical Mechanics | Marian Minárik | KMSD | 2014 - 2016 | 3 106 | 0 |
| KEGA 019TUZ-4/2015 | Innovation of forms and methods of the teaching process in the field of agricultural and forestry technology | Ján Kováč | kELT | 2015 - 2017 | 7 319 | 0 |
| KEGA 008TUZ-4/2016 | New forms and methods of teaching in the field of machinery safety | Miroslav Dado | KVTMK | 2016-2018 | 2 907 |   |
| KEGA 003TUZ-4/2016 | Research and teaching laboratory of robotics | Elena Pivarčiová | KRSAT | 2016-2018 | 5 901 | 0 |
| KEGA 001TUZ-4/2016 | Support for teaching heat and substance transfer in technical education | Ján Černecký | kELT | 2016-2018 | 9 561 | 0 |
| Together |   |   |   |   | **28 794** | 0 |
| **Cooperation on projects of other faculties** |
| KEGA 044SPU-4/2014 | Environmental technologies and technology | Ivan Janoško, **co-investigators for FEMT:** Jozef Černecký, Ján Koniar, Zuzana Brodnianská, Milan Mikleš | TF SPU in Nitra | 2014 - 2016 | 4074 (+ 1318.69 as of 2014) | 0 |

**COMPLETED KEGA PROJECTS:**

**KEGA018TU Z-4/2014 Implementation of educational methods for improvement of the teaching process in the field of Technical Mechanics**

**Ing. Marián Minárik, PhD.**

*Achievements:*

The main goal of the project was to improve the teaching of subjects related to the field of mechanics and with the subsequent connection of teaching in subjects covering the topic of study in Slovak and non-Slavic languages in the bachelor's and master's degree of university studies. Emphasis was placed on the application of modern didactic means based on modern software and hardware products. The consideration of modern didactic principles has found application, among other things, in the idea of linking professional and foreign language competence. A significant contribution is made by the specific outputs of the project resulting from the concept of the project solution. The implementation of the solution of the project task in the chosen way has a positive impact on the streamlining of the educational process, therefore, the fulfillment of the goals can be noted. The project ended with a final opposition.

**KEGA 044SPU-4/2014 Environmental technologies and technology – doc. Ivan Janoško, CSc., Faculty of Technology, Slovak University of Technology in Nitra**

In the last year of the project, the creation of a university textbook was finalized, in which the researchers Černecký and Brodnianská participated:

Janoško – Černecký – Brodnianská – Hujo. Environmental technologies and technology. SPU in Nitra, 2016. ISBN 978-80-552-1604-1.

From the research during the overall solution of the project, the collective for KELT (FEMT) published 14 outputs (2 scientific articles in foreign peer-reviewed journals, 2 scientific papers in foreign journals registered in WOS, SCOPUS, 6 industrial utility models, 1 scientific work in a peer-reviewed proceedings, monograph, 1 scientific work in a domestic journal, 3 papers at foreign scientific conferences).

**ONGOING PROJECTS:**

**KEGA 019TUZ-4/2015 Innovation of forms and methods of the teaching process in the field**

 **agricultural and forestry equipment**

**.doc. Ing. Ján Kováč, PhD.**

*Achievements:*

## The aim of the project is to create wider opportunities for better preparation of students in all forms of study, with an emphasis on the needs of the labour market and the knowledge society. For this purpose, the project will innovate the current subject offer and create new study materials. The targets set for 2016 have been met according to the planned scope. In the second year of the project solution, a laboratory is created based on knowledge from faculty study programs. The structural design was processed and the production of a functional model of the harvester head began, which will serve as a didactic aid.

**KEGA 008TU Z-4/2016 New forms and methods of teaching in the field of machinery safety**

**.doc. Ing. Miroslav Dado, PhD.**

*Achievements:*

In the first year of the project solution, an analysis of existing platforms in the virtual cave environment was carried out. Based on the results of the analysis, it can be concluded that the originally planned solution in the CAVE environment will not be fully implemented due to the significant difference in the volume of funds requested and allocated. Thus, two alternative platforms were selected for the creation of educational materials - simulation models, the common software basis of which is TECNOMATIX JACK and the hardware framework will be represented by a stereoscopic 3D HMD or CAVE + haptic device. In addition, individual project investigators have developed partial databases of problem situations that need to be taken into account in the design or may occur when operating selected machinery (e.g. circular saw, chainsaw, etc.).

**KEGA 003TU Z-4/2016 Research and Teaching Laboratory of Robotics**

**.doc. Mgr. Elena Pivarčiová, PhD.**

*Achievements:*

• laboratory preparation,

• web portal design: www.robohranie-proFEMT.wz.sk,

• organization of workshops,

• popularization of science and technology – presentations at 13 different events throughout the year,

• participation in 2 conferences,

• 8 publication outputs, of which 3 registered in the SCOPUS + database prepared one utility model,

• prepared 6 master's theses and 4 bachelor's theses related to the solution of the project.

**KEGA 001TU Z-4/2016 Support of heat and substance transfer teaching in technical education.**

**Prof. Jozef Černecký, CSc.**

*Achievements:*

In the first year of the project solution, the investigators published 1 scientific work in a foreign journal registered in WOS, SCOPUS and 2 papers at foreign scientific conferences.

## APVV projects (Agency for the Promotion of Research and Development)

In 2016, no APVV project was solved at the Faculty of Environmental and Production Technology.

 FEMT staff participated in the solution of **1** APVV project at the Faculty of Forestry.

**Table 6.3** Allocations for APVV projects in 2016 (in EUR)

|  |
| --- |
| **Cooperation on the APVV project of another faculty** |
| **PROJECT NO** | **PROJECT NAME** | **PROJECT LEADER** | **DEPARTMENT A** | **TIME****SOLUTIONS** | **ALLOTTED** |
| **Bv** | **Kv** |
| APVV-14-0468 | Development of the adapter and its technological deployment to increase the efficiency of forest firefighting | Valéria Messingerová, **co-investigators for FEMT:** Richard Hnilica, Miroslav Dado, Stanislav Kvočka, Jaroslav Matej | Faculty of Forestry | 2015 -2018 | 0 | 0 |

**Results achieved in solving APVV projects in 2016 at the LF**

**APVV-14-0468 Adapter development and technological deployment to increase the efficiency of forest firefighting – Prof. Valéria Messingerová, CSc. – Faculty of Forestry**

*Achievements:*

As part of the second year of the project, the analysis of existing fire extinguishing and transport equipment used in the destruction of forest fires in Slovakia and the world continued. The main forestry and fire-fighting requirements for fire extinguishing equipment have been developed. Based on these requirements, we have established specific technical parameters of fire extinguishing equipment for extinguishing fires in inaccessible terrains of forestry operations. Based on these parameters, thetechnical drawing documentation of the functional model of the adapter for the destruction of ground forest fires with possible alternatives to its deployment was carried out. The project also included the analysis and evaluation of the suitability of using selected additives in the extinguishing medium (water) to increase the efficiency of extinguishing together with chemical and physicochemical analysis of samples. The stated objectives of the project were met so that it was possible to continue the production of its own adapter solution and the design of a suitable fire extinguishing medium with an admixture of additives.

## Institutional research

For institutional research, the Faculty of Environmental and Production Technology was allocated EUR 6 367, which was used for the main activities of the faculty.

## Internal Project Agency Projects

In 2016, **3** projects funded by the Internal Project Agency tu in Zvolen were solved at FEMT.

 **Table 6.4** 2016 IPA project allocations (in EUR)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **No.**  | **project name** | **project leader** | **department** | **allocated funds** |
|
| 6- 2016 | Research on the energy intensity of circular saws when using coatings on a wood-cutting tool-saw blade | Milan Štefánek | CELT | 878 |
| 8-2016 | Energy intensity of the mechanism with a saw chain | Tomáš Kuvik | KMSD | 811 |
| 3-2016 | Influence of selected technological, tool and material factors on the quality of surface machining in plane milling of thermally modified oak wood | Marek Vančo | GROWTH | 850 |
| **Together** |   |   |   | **2 539** |

**Results achieved in addressing IPA projects in 2016**

### Institutional projects completed

**IPA No 6/2016 Research on the energy intensity of circular saws when using coatings on a woodcut tool – saw blade**

 **Ing. Milan Štefánek**

*Achievements:*

As part of the project solution, torque and speed waveforms were recorded at various cutting parameters and types of saw blades in order to determine the lowest energy intensity of cutting when changing the type of saw blade, the type of woody plant, the speed of displacement of the woody plant into the cut and the cutting speed.

**IPA No 8/2016 Energy intensity of the saw chain mechanism**

**Ing. Tomáš Kuvik**

*Achievements:*

The project examined the impact of selected factors on the sawing chain sawing process. The measured results showed a significant influence of the tree species as well as moisture. Which was reflected in the amount of torque and the decrease in spindle speed during the sawing process.

**IPA No 3/2016 Influence of selected technological, tool and material factors on the quality of surface machining in plane milling of thermally modified oak wood**

 **Ing. Marek Vančo**

*Achieved results:* Thermal modification of wood (oak) performed, specified properties of thermally modified wood.

## Projects other

|  |  |  |
| --- | --- | --- |
|  |  |  |
| **Table 6.5** Allocations for other projects in 2016 (in EUR) |  |  |  |
| **PROJECT NO** | **PROJECT NAME** | **PROJECT LEADER** | **DEPARTMENT** | **SOLUTION TIME** | **ALLOTTED** |
| **Bv** | **Kv** |
| R-7583/2015 | Simulation of motor vehicle dynamics in virtual reality as a tool for predicting and setting its parameters in the real world in order to increase driving comfort and safety – project financed by the economic sphere: Volkswagen Slovakia | Jaroslav Matej | KMSD | 2015 - 2016 | 1 975 | 0 |
| 179/16-RT | "Roboplay – proFEVT" – Popularization of RObotics at FEMT, project financed by the economic sphere: Volkswagen Slovakia Foundation |  Elena Pivarčiová | KRSAT | 2016-2017 | 6 000 | 0 |
| **TOGETHER** | **7 975** | **0** |

**Results achieved by other projects in 2016**

**R-7583/2015 Simulation of motor vehicle dynamics in virtual reality as a tool for predicting and setting its parameters in the real world in order to increase driving comfort and safety – project financed by the economic sphere: Volkswagen Slovakia**

**Ing. Jaroslav Matej, PhD.**

*Achievements:*

The project was defended and terminated. The stend of the passenger car was built with a view to its further improvement and purchased ICT technology, especially the virtual reality HTC Vive.

**179/16-RT Roboplay – proFEVT – Popularization of RObotics at FEMT – project financed by the economic sphere: Volkswagen Slovakia** Foundation**: Develop a technician(s)u**

**.doc. Mgr. Elena Pivarčiová, PhD.**

*Achievements:*

By "robohra", we expanded FEMT's cooperation with primary and secondary schools, allowed young people to have an active and creative approach to robotic systems, aroused interest in technical creation, pointed out the importance of algorithmic thinking, taught them the principles of teamwork and found, designed and implemented their own solutions.

We organized:

– workshops for working with robots LEGO Mindstorms Education: design of structures, programming, competitione

– presentation events with demonstrations of functional robots – popularization of science and technology at various events

We supported the events of the Technical Academy for attracting those interested in studying technology (TA Open Doors Day, Technical Talent)

We promoted events in the media, thereby raising public awareness about TUZVO – FEMT

# 7 Student scientific professional activity

The 16th faculty conference of ŠVOČ FEMT took place in the academic year 2015/2016 on 4.5.2016. In total, 15 students with 14 competitive theses participated in the faculty conference of ŠVOČ.

The number of works is shown in Table 7.1.

**Organizing Committee of the ŠVOČ:**

***Prof. Štefan Barcík,*** CSc.Vice-Dean for Science, Research and Doctoral Studies

 barcik@tuzvo.sk

***Marián Minárik,*** PhD.Chairman of the Board of ŠVOČ

 minarik@tuzvo.sk

***Zuzana Brodnianská***  Member of the Board of ŠVOČ

zuzana.brodnianska@tuzvo.sk

***Peter Koleda,***  PhD.member of the board of ŠVOČ

 peter.koleda@tuzvo.sk

***Mária Krajčovičová,*** PhD.member of the board of ŠVOČ

 krajcovicova@tuzvo.sk

***Andrea Neupauerová,***  PhD.member of the board of ŠVOČ

 neupauerova@tuzvo.sk

***Romuald Mozdík***  Member of the Board of the ŠVOČ

 xmozdik@is.tuzvo.sk

**Evaluation committees:**

**Ecotechnics section**

***Prof. Jozef Víglaský,***  CSc.Chairman of the Commission

***Milan Helexa,*** PhD.member of the Commission

***Ján Kováč,*** PhD.member of the Commission

***Dr.h.c. Eva Ružinská,*** PhD.member of the commission

***Lukáš Ohanka***  student representative

**Section Production Technology**

***Prof. Štefan Barcík,*** CSc.Chairman of the Commission

***doc. Pavel Beňo,***  PhD.member of the Commission

***doc. Ing.Daniela Kalincová, PhD.member***  of the commission

***doc. Ján Svoreň,***  PhD.member of the Commission

***Romuald Mozdík*** representative of the študentov

**Table 7.1** Number of works by year

|  |  |
| --- | --- |
| **Section** | **Vintage** |
| **1.** | **2.** | **3.** | **4.** | **1.** | **2.** |
| **Bachelor's degree (I. degree)** | **Engineering (level II)** |
| Ecotechnics |  |  | 3 |  |  | 3 |
| Production Engineering |  |  | 5 |  |  | 4 |
| **Together** | **presented works** |

**Evaluation of the tenders:**

When evaluating the competition works, the topicality of the topic, the objectivity of the execution of experimental works (if any), the level of evaluation of one's own conclusions, the formal level of the work as well as the level of presentation itself were taken into account. The submitted competition works were at a good level from a professional point of view. Minor shortcomings were in the area of the level of presentation itself.

 The participants were awarded the diplomas for placement according to the statement of the evaluation committee. The diplomas were handed over by the dean of the FEMT TU in Zvolen doc. Marián Kučera, PhD. and Chairman of the Board of the ŠVOČ Marián Minárik, PhD. In the ecotechnics section as well as in the Production Technology section, the Honorable Mention award was awarded to selected participants of the ŠVOČ, who were rewarded with a material prize.

# 8 DOCTORAL STUDIES

Doctoral studies at the faculty took place in the academic year 2015/2016 in one study programme within the meaning of Act No. 131/2002 on Higher Education Institutions.

**Table 8.1** PhD programme at FEMT

|  |  |  |
| --- | --- | --- |
| **code** | **field of study** | **study program** |
| 5.2.50 | Production Engineering | Production Engineering |

### 8.1. 5.2.50 Production Engineering

***List of trade union commission members in 2016***

***Chairman OK 5.2.50***

Prof. Štefan Barcík, CSc. FEMT TU in Zvolen

***MEMBERS OK 5.2.50***

|  |  |
| --- | --- |
| .doc. Ing. Pavel Beňo, PhD. | FEMT TU in Zvolen |
| .doc. Ing. Ferdinand Bodnár, CSc. | FEMT TU in Zvolen |
| Prof. Pavol Božek, CSc. | STU Bratislava, MTF Trnava |
| Prof. Jozef Černecký, CSc. | FEMT TU in Zvolen |
| .doc. Ing. Miroslav Dado, PhD. | FEMT TU in Zvolen |
| .doc. Ing. Branislav Danko, PhD. | FEMT TU in Zvolen |
| Prof. Peter Demeč, CSc. | TU Košice, Faculty of Mechanical Engineering |
| .doc. Ing. Richard Hnilica, PhD. | FEMT TU in Zvolen |
| .doc. Ing. Ľubomír Javorek, CSc. | FEMT TU in Zvolen |
| .doc. Ing. Ján Kováč, PhD. | FEMT TU in Zvolen |
| .doc. Ing. Marián Kučera, PhD. | FEMT TU in Zvolen |
| Prof. Milan Mikleš, DrSc. | FEMT TU in Zvolen |
| .doc. Ing. Ľubomír Naščák, CSc. | FEMT TU in Zvolen |
| .doc. Mgr. Elena Pivarčiová, PhD. | FEMT TU in Zvolen |
| Prof. Mikuláš Siklienka, PhD. | DF TU in Zvolen |
| .doc. Ing. Ján Svoreň, CSc. | FEMT TU in Zvolen |
| Prof. Jozef Víglaský, CSc. | FEMT TU in Zvolen |

***Study programme under the responsibility of the trade union committee:***

Production technology

***Headquarters of the trade union commission:***

Faculty of Environmental and Production Technology

Technical University of Zvolen

Student 26, 960 53 Zvolen

In the last academic year 2015/2016 (as of 31.12.2016), 3 phD students successfully passed the dissertation examination, of which 2 in the full-time form of doctoral studies and 1 in part-time form.

**Table 8.2** Successfully passed dissertation examinations in the academic year 2015/2016 (status as of 31.12.2016)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Workplace | Name | Supervisor | Branch | Date | Theme |
| KRSAT | Mozdík Romuald, Ing. | doc. Ing. Ľubomír Naščák, CSc. | 5.2.50 | 26.04.2016 | Analysis of positioning accuracy of a mechatronic system controlled through wireless communication |
| CELT | Ohanka Lukáš, Ing. | Prof. Jozef Černecký, CSc. | 5.2.50 | 26.04.2016 | Research of thermal and pressure ratios in a thermosiphon |
| KRSAT | Pondušová Nadezhda, Ing. | doc. Ing. Ľubomír Naščák, CSc. | 5.2.50 | 23.03.2016 | Analysis of selected parameters of a mobile photovoltaic cell |

The dissertation was successfully defended by 1 internal doctoral student and 2 external doctoral students in the SoS 5.2.50 Production Technology.

**Table 8.3** Successfully conducted dissertation defenses in the academic year 2015/2016 (status as of 31.12.2016)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Workplace | Name | Supervisor | Branch | Date | Theme |
| KELT | Hedgehog Marian, Mgr., PhD. | Prof. Jozef Víglaský, CSc. | 5.2.50 | 22.08.2016 | Design of a technical solar system from the point of view of efficient capture of solar energy |
| KVTMK | Kaštan Rudolf, Ing., PhD. | .doc. Ing. Daniela Kalincová, PhD. | 5.2.50 | 22.08.2016 | Increasing the service life of tools for minting coins by heat treatment |
| KMSD | Kotšmíd Stanislav, Ing., PhD. | .doc. Ing. Pavel Beňo, PhD. | 5.2.50 | 13.07.2016 | Influence of selected factors on the bearing capacity of rods with variable cross-section of supporting structures |

# 9 CONCLUSION

The submitted Report on Scientific Research Activities (SCC) summarizes the results of the SCC and provides basic information about the personnel, technical and financial provision of the faculty's scientific and research work.

The focus of scientific and research activities is in accordance with the professional profiling of the faculty. The scope and effectiveness of SCC is largely determined by external conditions, in particular the lack of financial resources, which, among other things, directly affect the construction of laboratories and their equipment with the necessary technology. It is necessary that the initiative of the faculty staff be aimed at obtaining grants, projects and other activities to provide financial resources for scientific research activity.

Increased attention in this regard should be paid to cooperation with practice and the commercial exploitation of the results of scientific research activities. In this area, scientific and research activity at the faculty has stabilized compared to previous years.

# 10 DRAFT MEASURES FOR 2017

Based on the incipient Long-Term Development Plan of FEMT for 2017-2023 , the draft measures in scientific research activities are mainly focused on:

**1.** To maintain the position of the faculty in the scientific community and to develop the research character of the faculty by involving all creative faculty employees in solving domestic and international research projects, especially in the main directions of research.

**Responsible:** Dean, Vice-Dean for VVČ, Head of Departments

**T:** continuous

**2.** In the field of the structure of scientific research projects, focus on basic and applied research projects in order to achieve a balanced structure of funding of scientific research activities from all available sources, which are Slovak grant agencies (APVV, VEGA, KEGA); EU framework programmes, cross-border cooperation projects, operational programme research and development (Agency of the Ministry of Education of theSlovak Republic for EU Structural Funds) with maximum use of the activities of the FEMT Project Office.

**Responsible:** Dean, Vice-Dean for VVČ and ZS, Head of Departments

**T:** continuous

**3.** In the field of presentation of the results of the scientific research activities of the faculty, focus on increasing the quality and frequency of published outputs, especially focusing on categories A1, A2 and B, which are the main categories in the accreditation, design and subsidy processes of the faculty, search for citations according to WOS/Scopus and obtaining attributes of awards of top international quality in the field of research 14 - mechanical engineering. In each output of publishing activity, it is mandatory to indicate the address (affiliation) of the authorship of the Technical University in Zvolen/Technical University in Zvolen.

**Responsible:** dean, vice-dean for SRA, head of departments, all creative employees

**T:** continuous

**4.** To combine the research capacities of departments into larger projects with regard to the complex use of the laboratory and instrumental potential of the faculty.

**Responsible:** Dean, Vice-Dean for SRA, Head of Departments

**T:** continuous

**5.** Maintain and deepen cooperation with domestic and foreign research and production institutions in order to improve the quality of research results and their commercial exploitation.

**Responsible:** Dean, Vice-Dean for SRA and ZS, Head of Departments

**T:** continuous

**6.** Use all available means to improve the image of the faculty and tu in professional circles and the public by presenting the results of scientific research activities.

**Responsible:** Dean, Vice-Dean for SRA and ZS, Head of Departments

**T:** continuous

**7.** In the field of construction and expansion of instrumentation, contribute regularly to the purchase of apparatus and equipment from the means to deal with projects. Use development projects and all other available options to improve the status quo.

**Answer:** Project Supervisors

**T:** continuous

**8.** Continue to support the development of student scientific and professional activities and focus on improving the quality of the presented works. To promote ŠVOČ FEMT at other technical faculties in Slovakia with similar professional profiling.

**Responsible:** Vice-Dean of the SRA, Head of Departments, President of the ŠVOČ

**T:** continuous

**9.** To support the presentation of one's own scientific research activity and the possibility of comparing it with the results of other departments by organizing scientific events at the faculty.

**Responsible:** Vice-Dean of the SRA, Head of Departments

**T:** continuous

**10.** Focusing the publication activity of doctoral students on improving its quality, in particular with a focus on categories B and C, on the best possible fulfilment of the criteria for obtaining funds from the subsidy breakdown and for the need to meet the criteria of future comprehensive accreditation in the field of research 14 - mechanical engineering. In each output of publishing activity, it is mandatory to indicate the address of the authorship of the Technical University in Zvolen/Technical University in Zvolen.

 **Responsible:** Dean, Vice-Dean of the SRA, Head of Departments, Trainers

 **T:** continuous

**11.** Innovate the Study Regulations of Doctoral Studies at the Faculty in the context of the criteria of the Ak SR as

and the current requirements imposed on this type of sludge under EU standards.

 **Responsible:** Vice-Dean of the SRA, Head of Departments

 **T:** 31.12.20017

**12.** Constituencyand implement the Institute of Postdoctoral Studies at the faculty.

 **Responsible:** Dean, Vice-Dean for SRA, Head of Departments

 **T:** 31.12.2017