**Faculty of Technology**

technical university in zvolen



**report**

**on scientific and research activities at ft TU in zvolen for 2019**

Proposal for a decision:

Scientific board of FT TU in Zvolen

Sthe law for the 2019 FT Approved:

 (a) no comments,

 (b) with comments

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from the documents of the heads of the FT TU workplaces in Zvolen

Zvolen 2020

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# INTRODUCTION

We present to the Scientific Council of the Faculty of Technology the Report on Scientific and Research Activities for 2019.

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 2019 assessment 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 preparation of materials for the periodic evaluation of the faculty by the bodies of the Ministry of Education, Science, Research and Sport of the Slovak Republic (MŠVVaŠ SR) and the Slovak Accreditation Agency for Higher Education (SAAVŠ),
* to provide the members of the Scientific Council of FT 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 shall be compiled in such a way as to provide a comprehensive and objective picture of what is happening in the fields of science and research, scientific education, cooperation, direction and development concepts. The report comprehensively assesses the following areas of science and research:

* scientific and research profile of FT,
* organizational, personnel, financial and material-technical provision of science and technology,
* publishing activities of the faculty,
* cooperation in the field of science and technology at home and abroad,
* scientific and professional events,
* science and technology projects,
* ŠVOČ,
* scientific journal,
* doctoral studies.

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

The measures taken for 2019, resulting from the last Report on Scientific research activities, have been largely fulfilled.

The aim of the evaluation of the scientific research activities of the FT was to create an objective deduction of the faculty's activities for the year 2019, which was also the second year of fulfillment of the Long-Term Plan of the Faculty of Technology of the Technical University in Zvolen for the years 2017 – 2023 with a vision for 2030. It was drawn up in accordance with the requirements of Act No. 131/2002 Coll. on Higher Education Institutions, as amended, and approved by the Academic Senate of the FT. The long-term plan is the basic planning document for ensuring the development of the faculty in all key areas. The long-term objective is an open document, the implementation of the strategic objectives will be evaluated annually on the basis of defined indicators, the measures will be updated, if necessary, in accordance with the change in the internal and external conditions of its implementation.

Evaluating the implementation of the measures of the areas of scientific research and creative activity, it can be concluded that in the past year every faculty employee has been involved in solving research projects. The publishing activity of the faculty has a balanced and slightly decreasing trend in the field of more valuable publications, the proportion of less valuable publications decreases, the qualification structure of faculty staff improves. PhD students are actively involved in project solutions and publish in renowned database journals with regard to quartiles, the faculty carries out activities in the field of popularization of achieved results and visibility in national and international forums and events.

# SCIENTIFIC AND RESEARCH PROFILE OF FT

The basic platform of profiling of the Faculty of 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 the protection of the environment from the negative effects of production processes, in the field of production technology with a focus on forestry and mobile technology, in woodworking machinery and equipment, in the management of machines and equipment, in industrial engineering and management with a focus on safety engineering and in the field of technical provision of production activity. An essential starting point for the focus of the scientific and research profile of FT is the know-how of the faculty, its personnel capabilities and material and 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 research tasks is mainly implemented through grant projects VEGA, KEGA, IPA and APVV. The largest 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 the FT. The scientific and research activities of FT are built on the principle of maximum interconnectedness of pedagogical and scientific activities, respecting global trends and current transfer of knowledge into economic and 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 resources, biomass), quality management of production enterprises.

The concept of FT'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, woodworking, forestry industries and for the development and improvement of environmental facilities. This will take into account the requirements of society and will be based on the needs of innovation in the teaching subjects of the faculty's fields of study. The strategy of FT TU in Zvolen is also aimed at developing contacts with universities in European countries in the form of bilateral agreements on scientific and research cooperation and student exchange. 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 Technology is to develop creative scientific research and, on its basis, to provide higher education in all three levels of study in the Slovak and European research and educational space.

In the field of research, the faculty fulfills its mission by solving research projects and programs 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, human protection and integrated safety, as well as other related and application areas. Based on the Long-Term Intention of the FT TU in Zvolen for 2017 – 2023 with a vision for 2030, the focus of scientific research activities 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.

To fulfill the mission of the faculty and its long-term intention, the following measures are defined:

* publish the results of research and creative activities in the international environment, in particular in indexed renowned international scientific journals,
* strengthen the faculty's position in scientific research projects of national and international cooperation,
* build research infrastructure, including qualified operators,
* deepen the involvement of PhD students in research, subject to publication in indexed international scientific journals,
* build and ensure the effective dissemination and commercialisation of research results through a university technology transfer centre,
* to popularize and raise the profile of the results of scientific research and other creative activities of the faculty of professional public.

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

## Scientific research capacity of FT and its qualification structure

The scientific research capacity consists of scientific, pedagogical and researchers. PhD students or students – diplomats are also involved in the scientific research capacity of FT 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 FT staff by individual workplace as of 31.12.2019

|  |  |  |  |
| --- | --- | --- | --- |
| Workplace | C o u n c il a t i on o f the | Together | Of the total |
| scientific and pedagogical staff | VVz |
| Prof. | .doc. | Oa | DrSc., Dr. | CSc., PhD. |
| KELT | 0 | 2 | 3 | 0 | 5 | 0 | 5 |
| KMSD | 0 | 3 | 5 | 0 | 8 | 0 | 8 |
| KVAT | 1 | 4 | 4 | 0 | 9 | 0 | 9 |
| KVTMKv | 0 | 5 | 0 | 1 | 6 | 0 | 6 |
| TOGETHER | 1 | 13 | 13 | 1 | 28 | 0 | 28 |

Figure 2. 1 Qualification structure of FT staff as of 31/12/2019

The research capacity deployed to solve all research tasks is presented in Table 2.2. One researcher at KVTMKv participated in the total capacity with a number of hours of 2000 in solving the APVV project. On average, 943.33 hours are spent per 1 reported pedagogical or researcher of FT.

Table 2. 2 Research capacity of teaching staff and VVz FT on scientific projects in classes in 2019

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Workplace | VEGA | KEGA | APVV | Ipa | Together |
| KELT | 3200 | 1100 | 0 | 0 | 4300 |
| KMSD | 1800 | 3350 | 750 | 0 | 5900 |
| KVAT | 5100 | 1650 | 450 | 700 | 7900 |
| KVTMKv | 3000 | 2000 | 4700 | 500 | 10200 |
| Together | 13100 | 8100 | 5900 | 1200 | 28300 |

Doctoral students are also involved in solving research tasks. Their research capacities are shown in Table 2.3.

Table 2. 3 Solver capacity of phD students of FT on grant and other scientific projects in classes in 2019

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Workplace | VEGA | KEGA | APVV | Ipa | Together |
| KELT | 2000 | 0 | 0 | 0 | 2000 |
| KMSD | 1000 | 500 | 0 | 0 | 1500 |
| KVAT | 3700 | 0 | 150 | 450 | 4300 |
| KVTMKv | 1000 | 500 | 700 | 500 | 2700 |
| Together | 7700 | 1000 | 850 | 950 | 10500 |

For one phD student at FT, the research capacity is 770 hours.

## Thematic concentration and financial provision of research on FT

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 2.4 and 2.5, graphically shown in Figure 2.2. A more detailed overview of the allocations for individual projects is given in Chapter 6.

Table 2. 4 Departments' allocations in 2019 for VEGA and KEGA projects (in EUR)

|  |  |  |  |
| --- | --- | --- | --- |
| Workplace | VEGA | KEGA | Together |
| Capital | Common | Capital | Common |
| KELT | 0 | 16760,09 | 0 | 0 | 16760,09 |
| KMSD | 0 | 0 | 0 | 5129,00 | 5129,00 |
| KVAT | 0 | 7 354,00 | 0 | 5 200,00 | 12554,00 |
| KVTMKv | 0 | 9 615,00 | 0 | 6 234,00 | 15849,00 |
| Together | 0 | 33729,09 | 0 | 16563,00 | 50292,09 |

Table 2. 5 Departments' allocations in 2019 for APVV projects, institutional research, IPA (in EUR)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Workplace | APVV | Ipa | Institutional research | Together |
| Capital | Common | Capital | Common | Common |
| KELT | 0 | 0 | 0 | 0 | 0 | 0 |
| KMSD | 0 | 0 | 0 | 0 | 0 | 0 |
| KVAT | 0 | 0 | 0 | 933,00 | 0 | 933,00 |
| KVTMKv | 0 | 101 253,43 | 0 | 944,00 | 0 | 102197,43 |
| Ft | 0 | 0 | 0 | 0 | 6 489,00 | 6489,00 |
| Together | 0 | 101253,43 | 0 | 1877,00 | 6489,00 | 109619,43 |

Figure 2. 2 Overview of funds allocated to project solutions by department

Figure 2.3 gives an overview of the volume of allocated funds from the Ministry of Education of the Slovak Republic and funds from other programs.

Figure 2. 3 Overview of the volume of funds allocated to address projects (in EUR)

Figure 2.4 shows the evolution by volume of funding allocated to grant and other projects in 2016-2019.

Figure 2. 4 Project allocations 2016-2019

# publishing activity

## Evaluation of employees' publishing and citation activities

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.

 Table 3.1 and Figures 3.1 and 3.2 represent the publishing activity followed by individual departments as well as from 2016 to 2019 at the faculty. The overall publishing performance of FT and its quality of publications is evaluated through the preferred categories A1 to D. It can be concluded that the publishing activity of the faculty in 2019 was adequately oriented to those categories that have a positive effect on the allocation of subsidies and professional growth of employees.

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 to TU and FT, with priority being given to subsidy categories. Based on the evaluation of publishing activity, it can be concluded that the share of categories A1, A2 has decreased somewhat compared to previous years. In category B, publishing activity increased by a quarter compared to the previous evaluation period. In category C, there was a decrease of more than half the number of publications. According to the current criteria, it is necessary to focus intensively on these types of publications in relation to the subsidy system of the Ministry of Education of the Slovak Republic. From a global perspective, FT must maintain the trend of an increase in publishing outputs per creative worker, especially in categories B and C, and in terms of professional growth also in categories A1 and A2.

Table 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 2019 – employees

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Workplace | A1 | A2 | B | C | D |
| KELT | Together | 1,60 | 1,70 | 2,00 | 1,00 | 12,50 |
| average per person | 0,27 | 0,28 | 0,33 | 0,17 | 2,08 |
| KMSD | Together | 0 | 2,10 | 1,60 | 1,25 | 12,95 |
| average per person | 0 | 0,26 | 0,20 | 0,16 | 1,62 |
| KVAT | Together | 0 | 0 | 3,34 | 3,35 | 22,26 |
| average per person | 0 | 0 | 0,37 | 0,37 | 2,47 |
| KVTMKv | Together | 0,58 | 0 | 1,60 | 2,10 | 19,70 |
| average per person | 0,08 | 0 | 0,23 | 0,30 | 2,81 |

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

Figure 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 2019 – employees

Figure 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 3.2 provides an assessment of the citation activity of individual faculty staff:

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

2 - In domestic 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 the Web of Science and the Scopus database.

Table 3.3 shows the H-index of FT executives by WoS Core Collection database and Scopus database.

Table 3. 2 Evaluation of citation activities for individual departments in 2019 – staff

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Workplace | 1 | 2 | 3 | 4 |
| KELT | Together | 31 | 9 | 6 | 47 |
| Average per person | 5,17 | 1,50 | 1,00 | 7,83 |
| KMSD | Together | 45 | 0 | 3 | 54 |
| Average per person | 5,63 | 0 | 0,38 | 6,75 |
| KVAT | Together | 99 | 23 | 24 | 49 |
| Average per person | 11,00 | 2,56 | 2,67 | 5,44 |
| KVTMKv | Together | 66 | 2 | 12 | 57 |
| Average per person | 9,43 | 0,29 | 1,71 | 8,14 |

Table 3. 3 H-index of creative employees of FT as of 14.02.2020

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DEPARTMENT | NAME, TITLE | ENLISTMENT | WoS Core Collection | Scopus |
| 2017 | 2018 | 2019 | 2019 |
| KELT | Kováč Ján, doc. Ing. PhD. | associate professor with CSc./PhD. | 2 | 2 | 2 | 4 |
| Krilek Jozef, doc. Ing. PhD. | associate professor with CSc./PhD. | 1 | 2 | 2 | 3 |
| Brodnianská Zuzana, Ing. PhD. | odb. as. with CSc./PhD. | 1 | 1 | 2 | 3 |
| Helexa Milan, Ing. PhD. | odb. as. with CSc./PhD. | 0 | 0 | 0 | 1 |
| Kuvik Tomáš, Ing. PhD. | odb. as. with CSc./PhD. | 0 | 1 | 2 | 1 |
| KMSD | Beňo Pavel, doc. Ing. PhD. | associate professor with CSc./PhD. | 1 | 1 | 2 | 3 |
| Bodnár Ferdinand, doc. Ing. CSc. | associate professor with CSc./PhD. | 1 | 1 | 1 | 1 |
| Kučera Marian, doc. Ing. PhD. | associate professor with CSc./PhD. | 2 | 2 | 2 | 7 |
| Kotšmíd Stanislav, Ing. PhD. | odb. as. with CSc./PhD. | 0 | 0 | 1 | 1 |
| Kvočka Stanislav, Ing. ArtD. | odb. as. with CSc./PhD. | 0 | 0 | 1 | 0 |
| Matej Jaroslav, Ing. PhD. | odb. as. with CSc./PhD. | 1 | 1 | 2 | 4 |
| Minárik Marián, Ing. PhD. | odb. as. with CSc./PhD. | 0 | 0 | 1 | 0 |
| Turis Ján, Ing. PhD. | odb. as. with CSc./PhD. | 0 | 0 | 0 | 2 |
| KVAT | Javorek Ľubomír, doc. Ing. CSc. | associate professor with CSc./PhD. | 2 | 2 | 2 | 3 |
| Naščák Ľubomír, doc. Ing. CSc. | associate professor with CSc./PhD. | 1 | 1 | 1 | 1 |
| Pivarčiová Elena, doc. Mgr. PhD. | Associate Professor with CSc./PhD. | 2 | 3 | 3 | 6 |
| Svoreň Ján, doc. Ing. CSc. | associate professor with CSc./PhD. | 1 | 2 | 3 | 3 |
| Hrčková Mária, Ing. PhD. | odb. as. with CSc./PhD. | 0 | 0 | 1 | 1 |
| Koleda Pavol, Ing. PhD. | odb. as. with CSc./PhD. | 0 | 1 | 2 | 1 |
| Koleda Peter, Ing. PhD. | odb. as. with CSc./PhD. | 0 | 2 | 4 | 2 |
| Krajčovičová Mária, Ing. PhD. | odb. as. with CSc./PhD. | 0 | 0 | 1 | 1 |
| Barcík Štefan, prof. Ing. CSc. | professor with CSc./PhD. | 8 | 9 | 11 | 10 |
| KVTMKv | Čierna Helena, doc. Ing. PhD. | Associate Professor with CSc./PhD. | 0 | 0 | 2 | 4 |
| Dado Miroslav, doc. Ing. PhD. | associate professor with CSc./PhD. | 1 | 2 | 2 | 4 |
| Hnilica Richard, doc. Ing. PhD. | associate professor with CSc./PhD. | 2 | 2 | 2 | 4 |
| Sujová Erika, doc. Ing. PhD. | Associate Professor with CSc./PhD. | 1 | 2 | 2 | 4 |
| Hnilicová Michaela, Ing. PhD. | VVz. | 0 | 0 | 1 | 3 |
| Ťavodová Miroslava, doc. Ing. PhD. | Associate Professor with CSc./PhD. | 0 | 1 | 2 | 5 |

Table 3.4 shows the utility models that were registered in 2019. In total, 7 utility models were registered (in 2018 it was 6).

Table 3. 4 Utility models of FT workers for 2019

|  |  |  |
| --- | --- | --- |
| Utility model No | TITLE | NAME OF THE DESIGNER |
| 197-2018 | Branch knife with interchangeable cutting edge | Melicherčík Ján, Krilek Jozef |
| 163-2018 | Special motor vehicle for rescue work | Božek Pavol, Abramov Ivan Vasilievich, Pivarchiova Elena, Abramov Andrei Ivanovich |
| 181-2018 | Stabilization method for mobile robots | Kuric Ivan, Pivarčiová Elena, Sagová Zuzana, Božek Pavol, Škultéty Emil |
| 111-2018 | Preparation for a manual vibration grinder | Mikušová Lucia, Dado Miroslav |
| 206-2018 | Automated system for recording the presence of persons | Božek Pavol, Pivarčiová Elena, Kuric Ivan, Karrach Ladislav Więcek Dariusz |
| 59-2019 | Fire protection adapter for forest wheeled tractor | Hnilicová Michaela, Hnilica Richard, Chromek Ivan, Dado Miroslav, Kvočka Stanislav, Matej Jaroslav, Messingerová Valéria |
| 82-2019 | Equipment for chipless wood cutting | Harvánek Pavol, Smith John |

## Evaluation of publication and citation activities of PhD students

In particular, the publishing and citation activities of phD students of the departments for the year 2019 were evaluated at the Faculty of Technology of the University of Technology in Zvolen, which is presented in Tab. 3.5 and 3.6 and figure 3.3. Increasing the publication activity of PhD students is one of the indicators of fulfillment of the long-term goal of TUZVO for the years 2017 - 2023.

Table 3. 5 Evaluation of publishing activities for individual departments according to the criteria of the Ministry of Education of the Slovak Republic for 2019 - PhD students

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  Workplace | A1 | A2 | B | C | D |
| KELT | Together | 0,2 | 0 | 1 | 0 | 5,20 |
| average per person | 0,03 | 0 | 0,17 | 0 | 0,87 |
| KMSD | Together | 0 | 0 | 0 | 0 | 2,40 |
| average per person | 0 | 0 | 0 | 0 | 2,40 |
| KVAT | Together | 0 | 0 | 0,45 | 0,05 | 4,52 |
| average per person | 0 | 0 | 0,09 | 0,01 | 0,90 |
| KVTMKv | Together | 0 | 0 | 0,8 | 0,25 | 6,15 |
| average per person | 0 | 0 | 0,27 | 0,08 | 2,05 |

Figure 3. 3 Evaluation of the publication outputs of PhD students for individual departments

Table 3.6 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 domestic 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 the Web of Science and the Scopus database.

Table 3. 6 Evaluation of citation activities for individual departments for 2019 – PhD students

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Workplace | 1 | 2 | 3 | 4 |
| KELT | Together | 0 | 0 | 0 | 4 |
| average per person | 0,00 | 0,00 | 0,00 | 0,67 |
| KMSD | Together | 0 | 0 | 0 | 1 |
| average per person | 0,00 | 0,00 | 0,00 | 1,00 |
| KVAT | Together | 7 | 2 | 4 | 1 |
| average per person | 1,40 | 0,40 | 0,80 | 0,20 |
| KVTMKv | Together | 2 | 0 | 1 | 2 |
| average per person | 0,67 | 0,00 | 0,33 | 0,67 |

## Evaluation of implementation activities

 Table 3.7 and Figures 3.4 and 3.5 provide an overview of the implementation, management and organisational activities of individual employees of FT for the period 1.1.2019 – 31.12.2019 in the categories:

A. Implementation activity,

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

C. Assessment activity.

Table 3. 7 Scoring of the activities of FT departments in individual categories for 2019

|  |  |  |  |
| --- | --- | --- | --- |
| Workplace | A | B | C |
| KELT | Together | 2,5 | 9 | 21 |
| average per person | 0,42 | 1,50 | 3,50 |
| KMSD | Together | 3 | 27 | 40 |
| average per person | 0,38 | 3,38 | 5,00 |
| KVAT | Together | 27 | 27 | 59 |
| average per person | 3,00 | 3,00 | 6,56 |
| KVTMKv | Together | 9,35 | 23 | 19 |
| average per person | 1,34 | 3,29 | 2,71 |

Figure 3. 4 Evaluation of the activities of departments in individual categories for 2019

Figure 3. 5 Evaluation of FT's activity in each category for 2018 and 2019

# cooperation in the field of science and technology at home and abroad

## Cooperation with higher education institutions

**Domestic university workplaces:**

* University of Žilina
* Faculty of Mechanical Engineering: doc. L. Dulina, PhD., Prof. A. Czán, PhD., Prof. RNDr. Milan Malcho, PhD., Prof. Jozef Jandačka, PhD., Doc. Andrej Kapjor, PhD., Doc. Štefan Papučík, PhD., Doc. Radovan Nosek, PhD., Prof. Jozef Pilc, CSc., Prof. Dr. Ing.
* Department of Construction and Machine Parts: doc. Jozef Bronček, PhD.,
* Slovak University of Technology in Bratislava
* Faculty of Materials Technology based in Trnava: Prof. L. Čaplovič, PhD., Prof. Maroš Soldán, PhD., Prof. Pavol Božek, CSc., doc. Ing. Marta Kučerová, PhD.,
* Faculty of Mechanical Engineering: Prof. Marian Peciar, PhD., Prof. Ladislav Gulan, PhD., prof. Ľubomír Šooš, PhD., Michal Bachratý, PhD., Doc. Marián Rabbit, CSc., Doc. Ľuboš Magdolen, PhD.,
* Matej Bel University in Banská Bystrica
* Faculty of Natural Sciences: doc. A. Očkajová, CSc.,
* Slovak University of Agriculture in Nitra
* Faculty of Technology: doc. M. Kotus, PhD., doc. P. Čičo, CSc., doc. Ivan Janoško, CSc., prof. Zdenko Tkáč, PhD., prof. h. c. prof. Pavol Findura, PhD., doc. Ľubomír Hujo, PhD., doc. Ing. Ján Jobbágy, PhD., prof. Ing. Roman Gálik, PhD.,
* Technical University of Košice
* Faculty of Mechanical Engineering: Prof. E. Lumnitzer, CSc., Prof. Peter Horbaj, PhD., Prof. Mária Čarnogurská, CSc., Prof. Augustín Varga, CSc., doc. Ján Kizek, PhD., doc. Peter Frankovský, PhD., doc. Jozef Kuľka, PhD., doc. Ing. Martin Mantič, PhD., prof. Ing. Katarína Monková, PhD., prof. Ing. Peter Demeč, CSc.,
* Faculty of Production Technologies based in Prešov: Prof. Jozef Zajac, CSc.,
* Faculty of Electrical Engineering: Prof. Ján Mihalík, CSc., Prof. Dušan Marchevský, CSc,
* University of St. Petersburg Cyril and Methodius in Trnava
* Faculty of Natural Sciences: doc. Ing. Stanislav Hostin, PhD.

**Foreign university departments:**

**Belarus**

* Belarusian State Technological University, Minsk: doc. Valery Zhylinski,
* Belarusian State University, Minsk: Vadzim Chayeuski, PhD.,

**Bulgaria**

* University of Forestry, Faculty of Forest Industry: doc. Ing. Zhivko Gochev, PhD.,

**Czech Republic**

* Technical University in Brno
* Faculty of Mechanical Engineering: L. Kotek, Ph.D., Prof. Milan Pavelek, CSc.,
* Faculty of Electrical Engineering and Communication Technologies: Prof. Z. Smékal, CSc.,
* Czech Technical University in Prague,
* Faculty of Electrical Engineering: Prof. S. Ďaďo, DrSc., Prof. M. Laipert, CSc.; Ing. Martin Hlinovský, Ph.D.,
* Faculty ofArts: Ing. Jan Kudláček, PhD.,
* Jan Evangelista Purkyně University in Ústí nad Labem
* Faculty of Mechanical Engineering: doc. N. Náprstková, Ph.D.,
* VŠB TU Ostrava
* Faculty of Security Inženýrství: K. Sikorová, Ph.D.,
* Technical University, Ostrava: doc. J. Kionka, CSc., doc. Dr. J. Punčochář, CSc.,
* Upper Silesian University of Business, Ostrava: Dr. Ing.
* Czech University of Agriculture, Prague
* Faculty of Technology: Prof. Miroslav Müller, Ph.D., Prof. Martin Libra, CSc., doc. Zdeněk Aleš, Ph.D., doc. Ing. Jiří Mašek, Ph.D.,
* Faculty of Forestry and Dřevařská: doc. Jiří Dvořák, Ph.D., Martin Jankovský, Ph.D., doc. Ing. Milan Gaff, PhD.,
* Mendel University in Brno
* Faculty of Forestry and Dřevař: doc., Zdenko Kopecký, Ph.D., prof. Jindřich Neruda, CSc., doc. Karel Janák, CSc., Ing. Luďka Hlásková, PhD.,
* Faculty of Agronomy: doc. Ing. Jiří Čupera, Ph.D.,
* Technical University of Liberec
* Faculty of Mechanical Engineering: Prof. I. Nováková, Ph.D.,
* Palacký University in Olomouc
* Industrial laboratory of optics: RNDr. Jiří Keprt, DrSc.,
* University of West Bohemia in Pilsen
* Faculty of Mechanical Engineering: Prof. Dr. Ing. Antoním Kříž,
* Tomáš Bata University in Zlín
* Faculty of Applied Informatics: Prof. Dagmar Janáčová, CSc.,

**Croatia**

* University of Zagreb
* Faculty of Forestry: izv. Prof. dr. Sc. Marian Šušniar, doc. Dr. sc. Igor Dukić, prof. R. B. Lučić, PhD., prof. Dr. sc. With. Pervan, PhD.,
* Josip Juraj Strossmayer University of Osijek
* Faculty of Mechanical Engineering: prof. dr. Sc. Dražan Kozak,

**Hungary**

* Nyguat-Magyarországi Egytem: prof. Ing. Belo Horváth, prof. Ing. Etele Csanady, PhD.,
* Széchenyi István University Department of Information Technology, Gyór,: Horváth Erno,

**Poland**

* Silesian University of Technology
* Faculty of Organization and Management: Prof. W. Biały,
* The State School of Higher Education in Chełm: dr. Hab. inż. Arkadiusz Tofil, prof. dr hab. Pawel Skrzydlewski, mgr. Kamil Jaszczuk,
* University of Life Sciences, Warsaw
* Faculty of Forestry and Wood Technology: Prof. Dr. Hab. Inž. Ewa Dobrowolska, Dr. Hab. Marcin Zbieć,
* University of Technology, Gdansk: Prof. Dr. Hab. inž. Kazimierz Orlowski,
* Politechnika Koszalińska: prof. nzw. dr hab. inż. Krzysztof Rokosz, Prof. nadzw. dr. hab. Inz. Jerzy Chojnacki,
* Warszaw University of Life Sciences
* Faculty of Production Engineering: doc. Monika Aniszewska,
* Faculty of Wood Technology: dr. Hab. Grzegorz Kowaluk,
* University of Agriculture in Krakow
* Department of Mechanizacji Prac Lesnych: prof. dr. Hab. Józef Walczyk, Dr hab. inż. Paweł Tylek, Dr hab. inż. Krzysztof Słowiński, Dr hab. inż. Mariusz Kormanek, prof. Janusz Sowa, Ph.D., D.Sc.,
* Wyzsza Szkola Agrobiznesu: prof. nadzw. Dr.. Hab. Roman Engler,

**Romania**

* Transilvania University of Brasoin Romania – prof. Mihai Ispas,

**Russia**

* Voronezh State Academy of Forestry Engineering, Russian Federation
* Воронежская Государственная Лесотехническая Академия: Prof. Dr. Tech. Sci. Larissa I. Beľchinskaya,
* Volga State University of Technology, Russia, – doc. Ing. Evgeny Y. Razumov, CSc.,
* Kazan National Research Technological University: prof. Ing. Ruslan R. Safin, DrSc.,
* State institution of Higher profesional Education, State Forest Technical University: doc. Sergey Spiridonov,
* Kalashnikov Izhevsk State Technical University: Assoc. prof. PhD. Yury Rafailovich Nikitin,

**Taiwan**

* National Chi Nan University, College of Science and Technology
* Department of Civil Engineering,

**Italy**

* University of L'Aquila, Italy
* Las.E.R. Laboratory - Department of Industrial and Information Engineering and Economics: Stefano Sfarra, PhD.,
* ALMA MATER STUDIORUM Università di Bologna
* Department of Industrial Engineering: Msc. Cristiano Fragassa, PhD.,

**Ukraine**

* Ukrainian derzavnyj lisotechničnyj universytet: prof. Nestor J. Bybljuk, DrSc., doc. Oleg Styranivsky, Ph.D., doc. Oleg Machuga, Ph.D., doc. Igor Rebeznyuk, Ph.D.,

**USA**

* Ryerson University
* Dept. of Mechanical & Industrial Engineering, , Toronto, Ontario Canada: Prof. David Naylor, Ph.D., P.Eng.

## Cooperation with professional workplaces

The Faculty of Technology cooperates with companies and institutions with regional, national and international scope. Cooperation consists in organizing excursions and presentations, providing material, spatial and technical provision of research, pedagogical activities and writing final theses, sponsorship of conferences and professional events, etc. Many cooperations are underpinned by contractual agreements.

* Continental ASS, s. r. o.: Radoslav Hraško (contractual cooperation), Šimiak, Remper, Jozef Salaj,
* ŽOS Zvolen, a. s.: Ing. Marián Marcinek,
* Železiarne Podbrezová, a. s.: Ing. A. Schmidt-Škultétyová,
* Hriňovské strojárne, a. s.: Ing. A. Krnáčová,
* Kremnica Mint, š. p.: R. Kaštan, PhD. (contractual cooperation),
* GeWiS Slovakia, s.r.o.: L. Mazúrová,
* NEMAK Slovakia, s.r.o.: R. Palacka, PhD.,
* Foundry Hronec, a. s.: Ing.
* FRONIUS, a. s., Slovakia: Bc. P. Acs,
* IRONAL s. r. o.: Ing. L. Kamenický,
* Slovak Society for Quality – PS "Education and Training": M. Šesták,
* PQM s.r.o.: Ing. Ľ. Snopek,
* Welding Research Institute - Industrial Institute of the Slovak Republic: D. Šefčík,
* Slovak Welding Company: P. Radič,
* INOVAL: P. Oslanec, doc. Milan Hviezdian, CSc.,
* FOREST MERI, s.r.o.: M. Šmíd,
* ROYAL FOREST, s. r.o., Sokol: J. Sepeši,
* OZ ZLT Banská Bystrica: Ing. B. Sivčo,
* GRD s. r. o.: M. Gregáň (contractual cooperation),
* PPS Group, a. s.: Ing. R. Golian, Ing. Ľalík,
* Slavia Production System a.s.: Jana Kucejová, p. Kucejn,
* Slovak National Accreditation Service: Mgr. Martin Senčák,
* Institute of Material Research SAS: RNDr. Miroslav Džupon, PhD. (contractual cooperation).,
* SAS Institute of Electrical Engineering: M. Polák, DrSc.,
* HIVUS s.r.o., Žilina: Jaroslav Kocian,
* K-system, s.r.o., Žiar nad Hronom: Ing. Ľudovít Červenák, Andrea Kúdelová,
* Zvolenská teplárenská, a.s., Zvolen,
* Doka Drev, s.r.o, Banská Bystrica,
* DETOX, s.r.o., Plant Banská Bystrica,
* VIMAR, s.r.o., Slovenská Ľupča,
* Rakytovce wastewater treatment plant, Banská Bystrica: Pavol Badinský
* Euroheat SK, s.r.o., Bratislava,
* SHMÚ, Banská Bystrica branch,
* Secondary Industrial School of Transport, Zvolen: Ing.
* KWD, s.r.o., Zvolen,
* Development martin a.s, Martin: Robert Pilát
* LKT, s.r.o, Trstená,
* IDOS Projekt, s.r.o., Banská Bystrica,
* IQM s.r.o., Hriňová,
* ESSEL, s.r.o., Slovenská Lupča: Ing. Gregáň,
* Services of legal metrology of the Slovak Republic, Metrology Department Banská Bystrica,
* PHS Strojárne a.s, Aluminium nad Hronom,
* Lesy SR, š.p., Forest Technology Plant, Banská Bystrica: Sivčo, Ing.
* BRC Slovakia, s.r.o., Martin: p. Drmla, Ing. Dobrotová, PhD.,
* Way industry, a.s., Krupina: Ing.
* Kia Motors Slovakia s.r.o., Teplička nad Váhom,
* CADvision, s.r.o., Martin: p. Mihalik,
* Sekologist, s.r.o., Brezno: Richard Bergel, PhD.
* IPM Engineering, s.r.o., Zvolen: Ing. Dušan Paulíny, PhD.
* DAVOS trade – logistics, s.r.o., Krupina: Marián Dado
* KOVACO, s.r.o., Veľká Lehota: Hanes, Ing. Petrenec
* SITTRANS, s.r.o., Banská Štiavnica: Juraj Blahút
* SPIG, s.r.o., Zvolen: Weakness
* Wim, s.r.o., Podzámčok: Ing. Petrenec
* Brother Industries Slovakia, s.r.o., Dave Lawrence
* DEWEX, s.r.o., Vígľaš – Pstruša,
* Schier Technik Slovakia s.r.o., Na kameni 1870/1A, 911 01 Trenčín, Katarína Hrabovská
* PMS Delta s.r.o., Vernier Exclusive Representation for Slovakia, Fándlyho 1, 071 01 Michalovce, RNDr. Peter Spišák, CSc.,
* Slovak Society for Tribology and Tribotechnics - RNDr. Pavol Klucho, Jozef Stopka,
* Slovak Institute for Standardization, Metrology and Testing - Technical Commission No. 62,
* IDEA StatiCa s.r.o., Jihomoravské innovation centre (JIC), U Vodárny 2a, 616 00, Brno, Klára Thielová,
* National Instruments, s. r o., Sokolovská 136D, 18600 Praha 8, Ing. Pavel Krčil,
* International Organization for Standardization. Technical Committee 213 Dimensional and geometrical product specifications and verification. Chemin de Blandonnet 8, CP 401 - 1214 Vernier, Geneva, Switzerland,
* CEIT Engineering Services, s.r.o., Žilina: Ing. Ján Hromada,
* Wood-B, Nové Zámky: Ing. Boris Bršel.

# scientific and professional events

Name of department: **KELT**

Event title:Mobile energy assets – Hydraulics – Environment – Ergonomics of mobile machines

Type of event:International scientific conference

Date of the event: 9-11/09/2019

Expert guarantor: doc. Ing. Jozef Krilek, PhD.

Number of participants: domestic: 10, foreign: 10

Focus of the event: The conference focused on the presentation of current scientific research results and operational knowledge in the field of mobile energy means of their hydraulic systems and ergonomics of work. The professional and scientific focus of the conference is also the assessment of the impact of mobile energy resources on the environment, especially the forest and agricultural landscape.

Name of department: **KVAT**

Event name: II. International Scientific Conference Production and Automation Technology 2019

Type of event:conference

Event date: 17-18 September 2019

Expert guarantor: prof. Ing. Štefan Barcík, CSc.

Number of participants: domestic: 19, foreign: 2

Focus of the event: The event was dedicated to the areas of production and machine tools and equipment, handling equipment, tools used in machine tools, wood-based material processing technologies, electric drives, sensors and automation of technological processes.

Name of department: **KVAT**

Event name:Roboplay 2019: robot competition for high school and university students TUZVO

Type of event: robot competition

Date of the event: 29.1.2019

Expert guarantor: doc. Mgr. Elena Pivarčiová, PhD.

Number of participants: domestic: 13 teams (31 competitors), 5 guests, foreign: 0

Focus of the event: robotics

Name of department: **KVAT**

Event name:Roboplay 2019: competitive robot show for primary schools

Type of event: robot competition

Event date: 30.1.2019

Expert guarantor: doc. Mgr. Elena Pivarčiová, PhD.

Number of participants: domestic: 10 teams (23 competitors), 11 guests, foreign: 1

Focus of the event: robotics

Name of department: **KVAT**

Name of the event:Presentation of robotic sets Gymnasium - Gimnázium, Štúrovo

Type of event: presentation

Date of the event: 18.3.2019

Expert guarantor: doc. Mgr. Elena Pivarčiová, PhD.

Number of participants: domestic: 80, foreign: 0

Event focus: robotics, construction, algorithmization, programming

Name of department: **KVAT**

Name of the event:Workshop for gymnasium - Gimnázium, Štúrovo

Type of event: practical workshop

Date of the event: 18.3.2019

Expert guarantor: doc. Mgr. Elena Pivarčiová, PhD.

Number of participants: domestic: 13, foreign: 0

Event focus: robotics, construction, algorithmization, programming

Name of department: **KVTMKv**

Name of the event:Meeting of material departments and institutes of Slovakia, Czech Republic and Moravia

Type of event: seminar

Date of the event: 14-15/05/2019

Expert guarantor: doc. Ing. Miroslava Ťavodová, PhD.

Number of participants: domestic: 18, foreign: 5

Focus of the event:Meeting of pedagogical and scientific staff of material departments and institutes of Slovakia, Czech Republic and Moravia

Name of department: **KVTMKv**

Event Name:Quality Manager Course

Type of event: course

Date of the event: 15-16/05/2019

Expert guarantor: doc. Helena Čierny, PhD.

Number of participants: domestic:38, foreign: 0

Focus of the event: professional course accredited by the Ministry of Education

 **FT**

Event name:Career Day

Type of event: professional presentations

Date of the event: 06.11.2019

Expert guarantor: doc. Ing. Pavel Beňo, PhD.

Number of participants: domestic: 150, foreign: 0

Focus of the event: professional event within the framework of the Week of Science and Technology. The aim of the event was to create a space for students of the faculty to establish contacts with potential employers and at the same time to arouse the interest of high school students in university studies in technical disciplines. Almost 200 participants of the event had the opportunity to see not only engaging presentations and exhibits of WAY INDUSTRIES, a. s.; CONTINENTAL AUTOMOTIVE SYSTEMS SLOVAKIA, s. r. o.; ZF SLOVAKIA, a. s. and EDGECOM, a. s., but also to get acquainted with the results of research of faculty staff.

 **FT**

Event name:Open Day

Type of event: professional presentations

Date of the event: 06.02.2019

Expert guarantor: doc. Ing. Pavel Beňo, PhD.

Number of participants: domestic: 150, foreign: 0

Focus of the event: presentation of scientific and professional activities and studies at the faculty

 **FT**

Event title:Student scientific and professional activity

Type of event: conference

Date of the event: 14.05.2019

Expert guarantor: doc. Ing. Pavel Beňo, PhD.

Number of participants: domestic:30, foreign: 0

Focus of the event:presentation of the best student scientific and professional papers

# achieved results in solving science and technology projects

## Grant projects VEGA, KEGA

In 2019, the creative staff of the Faculty of Technology were the principal investigators of 4 VEGA projects (Table 6.1) and 4 KEGA projects (Table 6.2). At the same time, employees were involved in solving 6 VEGA and 1 KEGA project, where investigators from other faculties or universities were responsible.

Table 6. 1 Solved VEGA projects at the Faculty of Technology in 2019

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Project number | Project name | Principal investigator | Workplace | Solution time | Prid. Fin. (€) |
| Bv | Kv |
| 1/0642/18 | Analysis of the impact of structural parts of forestry mechanisms in the forest environment in terms of energy and ecological | Ján Kováč | KELT | 2018-2020 | 7757,09 | 0 |
| 1/0086/18 | Research of temperature fields in a system of shaped heat exchange surfaces | Elena Pivarčiová | KELTKVAT | 2018-2021 | 9003 | 0 |
| 1/0019/19 | Predictive models of solid aerosol contamination of working air in mechanical wood processing | Miroslav Dado | KVTMKv | 2019-2022 | 9615 | 0 |
| 1/0315/2017 | Research of relevant properties of thermally modified wood in contact phenomena in the machining process with prediction of obtaining an optimal surface | Štefan Barcík | KVAT | 2017-2019 | 7354 | 0 |
| Together | 33729,09 | 0 |

Table 6. 2 Solved KEGA projects at the Faculty of Technology in 2019

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Project number | Project name | Principal investigator | Workplace | Solution time | Prid. Fin. (€) |
| Bv | Kv |
| 028SPU-4/2019 | Practical use of knowledge of designing and testing transmission systems of hydraulic mechanisms of mobile agricultural and forestry technology | Ľubomír HujoMarián Kučera | SPU NitraKMSD | 2019-2021 | 1028 | 0 |
| 015TU Z-4/2019 | Progression and application of educational methods in the field of body mechanics | Marian Minárik | KMSD | 2019-2020 | 4101 | 0 |
| 005TU Z-4/2018 | Building a progressive machining CNC workplace for innovation of forms of teaching in study programs at the Faculty of Technology | Peter Koleda | KVAT | 2018-2020 | 5200 | 0 |
| KEGA 011TU Z-4/2017 | Integration of progressive information technologies and soft-skills into study programs focused on production process management | Erika Sujová | KVTMKv | 2017-2019 | 6234 | 0 |
| Together | 16563 | 0 |

*VEGA grant projects – completed*

**1/0315/2017 Research of relevant properties of thermally modified wood in contact phenomena in the machining process with prediction of obtaining an optimal surface**

Prof. Ing. Štefan Barcík, CSc.

As part of the 3rd stage of the VEGA project, experiments and their statistical evaluations were carried out, aimed at monitoring the influence of independent technical, technological, material and tool factors on the energy intensity and quality of machining of two thermally modified trees of the exotic Meranti tree from the point of view of optimizing the machining process. Comprehensively processed outputs from these experiments have been continuously published both in registered journals (CC, WofS, Scopus...) and on the IGC. At the end of this stage, the documents for the final report of the solved project were prepared from the point of view of the optimization database of information, how thermally modified wood behaves during plane milling within the framework of changes in material, technological and tool factors, which will allow to increase the final quality of production, as well as the overall economy of the machining process.

*Completed VEGA projects from other workplaces*

* Ľubomír Javorek, CSc. – VEGA 1/0822/2017 **Modification of the surface of wood and coatings in order to increase the stability of the wood-coating system** (prof. Jozef Kúdela, CSc., DF)
* Ján Svoreň, CSc., doc. Ľubomír Javorek, CSc. – **VEGA 1/0556/19 Lightweight wood materials based on veneers and their application in products** (doc. Jozef Gáborík, CSc., DF)
* Richard Hnilica, PhD. – **VEGA 1/0471/17 Modelling of technical, economic and environmental parameters of timber removal in forestry conditions** (prof. Valéria Messingerová, CSc., LF)

The evaluation and processing of data from the ROADSCANNER laser scanning equipment continued, evaluating the use of the above method for monitoring and rapid assessment of the condition of the forest road network used for timber removal. As part of the research activity, the results of the analysis of occupational accidents in wood removal in the Forests of the Slovak Republic š.p. over a period of 10 years were published in scientific journals of the Current Contents category. From the above research, relevant results are available to improve the OSH of the employees of the company Lesy SR š.p. in the above activities. In 2019, a scientific monograph was completed: "Transport of wood by road and rail transport in Slovakia, technology and technological possibilities".

* Miroslav Dado, PhD., doc. Erika Sujová, PhD. – **VEGA 1/0377/17 Research on the synergistic effect of the interaction between noise and ototoxic substances in hazardous operations of forestry and woodworking enterprises** (Prof. Marián Schwarz, CSc., FEE)

As part of the project, the mechanisms of hearing impairment were characterized both by the effect of noise as a physical factor and by the action of substances with an ototoxic effect as a chemical agent; risky working professions and activities in wood-forestry operations were identified, where the combined effects of both physical and chemical agents were objectified in a model experiment when working with a chainsaw as the most risky work activity in this sector. Subsequently, a strategy and procedures were developed to eliminate/reduce the effects of hearing impairment/loss.

*VEGA grant projects – ongoing*

**VEGA 1/0642/18 Analysis of the impact of structural parts of forestry mechanisms in the forest environment from the point of view of energy and ecological**

Doc. Ing. Ján Kováč, PhD.

Based on theoretical analyses and experiments using modern instrumentation of measuring soil compaction and traction properties of the ride, technical solutions will be recommended from the point of view of preventing further negative effects on the pad. Verification experiments (field - laboratory) were carried out depending on the changing observed factors (techno-technological, instrumental, material) and their evaluation.

**VEGA 1/0086/18, Research of temperature fields in a system of shaped heat exchange surfaces.**

Prof. Mgr. Elena Pivarčiová, PhD.

During the second year of the project, the investigators published 13 outputs, including 2 scientific papers in foreign peer-reviewed journals and 1 in a domestic journal, 2 scientific papers in foreign journals registered in web of science databases, SCOPUS and 1 in a domestic journal, 1 scientific work in a foreign journal and 1 in a domestic journal, 1 scientific work in a domestic peer-reviewed scientific proceedings, 2 papers at foreign scientific conferences and 2 abstracts of papers at domestic conferences.

**VEGA 1/0019/19 Predictive Models of Solid Aerosol Contamination of Working Air in Mechanical Wood Processing**

.doc. Miroslav Dado, PhD. (KVTMK)

Based on the literary review, the mechanisms of formation of a solid aerosol during wood grinding were clarified and characterized, and subsequently the factors (technological parameters of grinding – e.g. type of grinding, cutting speed, grinding direction, graininess of the abrasive, size of the thrust force; physico-mechanical properties of the grinded wood – e.g. density, humidity) affecting the qualitative-quantitative characteristics of the wood dust generated into the working air were clarified and characterized.

*Ongoing VEGA projects from other locations*

* Marián Minárik – **VEGA 1/0556/19 Lightweight wood materials based on veneers and their application in products** (doc. Jozef Gáborík, CSc., DF)
* Ján Turis, PhD. – **VEGA 1/0155/18 Applied research on the use of ecological energy carriers in agricultural, forestry and transport technology** (doc. Ľubomír Hujo, PhD., TF SPU Nitra)

*KEGA grant projects completed*

**KEGA 011TU Z-4/2017 Integration of progressive information technologies and soft-skills into study programs focused on production process management**

.doc. Ing. Erika Sujová, PhD.

The priority objective of the project was the integration of progressive information technologies and soft-skills into study programs focused on the management of production processes with the ambition of increasing the applicability of graduates into practice. This objective was achieved through the implementation of the planned scientific and pedagogical outputs of the project. The solution of the project "Integration of progressive information technologies and soft-skills into study programs focused on the management of production processes" created several important outputs: foreign and domestic monograph, university textbook. We also consider as important outputs the publication of the results of research on the implementation of soft-skills and ICT in journals registered in the WOS and SCOPUS databases (8 outputs), as well as the presentation of the achieved results at foreign and domestic scientific conferences. The original results of the research carried out in the project are created competency models that display a graphical representation of the level of individual soft-skills competencies and knowledge of information and communication technologies based on the identified expectations of employers, what level they expect for the graduates admitted. Competency models present a comprehensive representation of the level of soft-skills and ICT skills that university graduates should achieve in order to meet employers' expectations. The proposed models are the first step for reflection by both academia and the professional public on the possibility of using competency models in practice. This is an important and positive example of possible cooperation between theory and practice.

*Completed KEGA projects from other workplaces*

* Miroslava Ťavodová, PhD. – **KEGA 010TU Z-4/2017 Facilitation of reading competence and teaching of professional foreign languages at technical universities** (PaedDr. Darina Veverková, Ph.D.)

The implementation of the project and its outputs contributed to the improvement of the teaching of professional foreign languages and facilitated the reading competence of students. The main outputs of the project are electronic teaching texts for six fields of study of technical universities.

*KEGA grant projects continuing*

**KEGA 028SPU-4/2019, Practical use of knowledge of designing and testing transmission systems of hydraulic mechanisms of mobile agricultural and forestry technology.**

.doc. Ing. Ľubomír Hujo, PhD. SPU Nitra

.doc. Marián Kučera, PhD. for TU Zvolen

**KEGA 015TU Z-4/2019, Progression and application of educational methods in the field of body mechanics** By Marián Minárik, PhD.

By modifying the wiring, the classroom and the network connection of computers were realized, which allows new as well as existing workstations to communicate with each other. The project is intended to support the teaching of issues in the field of mechanics with the aim of improving the quality of education in this area, where a procedure for expanding the base of study materials for teaching in this area is proposed. A corpus of literature has been compiled, which is continuously processed and supplemented in order to extend modern educational methods into the current teaching of subjects of a technical nature and thus improve the conditions that allow students to visually follow the online activity of mechanical systems.

**KEGA 005TU Z-4/2018 Building a progressive CNC machining workplace for innovation of forms of teaching in study programs at the Faculty of Technology**

Ing. Peter Koleda, PhD.

Introduction of a new subject Programming of CNC production technology and CNC - production technology, elaborated and defended 2 bachelor's theses,in the elaboration of lectures and handouts for exercises from the subject programming of CNC production technology and CNC - production technology, purchase and installation of software licenses Autodesk FeatureCAM and SinuTrain for Sinumerik Operate., continuation of the teaching of the subjects Programming of CNC production technology and CNC production technology, 4-day intensive training in the Autodesk FeatureCam CAD system, foreign business trip at the Forestry University in Sofia, Bulgaria with the aim of exchanging experience in the field of teaching CNC technology programming, successful defense of final theses, participation in a conference with a focus on programming of CNC technology - Production and Automation Technology 2019.

## APVV projects

Table 6. 3 Solved APVV projects at the Faculty of Technology in 2019

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number | Title | Principal investigator | Workplace | Good solutions | Prid. Fin. (€) |
| Bv | Kv |
| APVV-16-0194 | Research on the impact of production process innovations on the durability of tools and components of forest mechanisms | Richard Hnilica | KVTMKv | 2017-2020 | 80851 | 0 |
| APVV 17-0400 | Strengthening the ethical environment in Slovakia (institutional processes, actors, risks, strategies) | Helena Čierna | KVTMKv | 2018-2022 | 20402,4 | 0 |
| Together | 101253,43 | 0 |

**APVV-16-0194 Research on the impact of innovations in production processes on the service life of tools and components of forest mechanisms**

doc. Ing. Richard Hnilica, PhD.

The results of laboratory abrasive wear tests showed that all E520 RB, RD571, LMN420 FM, E DUR 600 and WEARTRODE 62 ranged from 16MnCr5 showed lower weight loss and therefore higher resistance to abrasive wear relative to the reference material. High resistance to abrasive wear was shown by "E520 RB" welds (3.5% w/w. C), "RD 571" (60% hm. W2C) and "WEARTRODE 62" (3% w/w. Of these welds, the material "E520 RB" showed the highest resistance to abrasive wear due to a beneficial microstructure of the "ledeburite" type with a specific "interconnected" eutectic morphology. Morphological wear analyses revealed typical features of the control mechanisms of abrasive wear of individual hard surfaces. In real operating conditions, the functional surface of the tools of forest mechanisms is periodically stressed by stochastic shock loads in combination with abrasive wear of the processed substrate of the forest stand. The results of operational tests showed that the functional surface of the tools of the forest mechanisms was plastically deformed to a depth of 0.2-0.3 mm. This phenomenon is related to the voltage-deformation state on and under the surface of all tested welds. Increased resistance to abrasive wear has been observed in E520 RB welds. The internal structure of these welds was formed by a ledeburitic skeleton and a hard martensitic matrix. This type of microstructure showed the smallest value of plastic deformation on and below the surface of the functional parts of forest mechanisms.

**APVV 17-0400 Strengthening the ethical environment in Slovakia (institutional processes, actors, risks, strategies)**

doc. Helena Čierna, PhD.

As part of the project solution, an analysis of the areas of business ethics was carried out and the presence of ethics in the business environment in Slovakia was examined. A network of partner enterprises was created. Furthermore, a reflection was carried out on the state of business environment ethics from the point of view of the number of companies with ethical elements, with the intention of drawing up a database of enterprises and carrying out monitoring of the business environment. In addition, the ethical credibility of selected entities in Slovakia (students of technical faculties versus business practice) in the field of soft skills was assessed and evaluated.

*APVV projects from other workplaces*

* Prof. Štefan Barcík, CSc. – **APVV -0456 Thermal modification of wood with saturated water vapor for the purpose of targeted and stable color change of wood mass** (prof. Ladislav Dzurenda, PhD., DF)
* Ľubomír Javorek, CSc. – **APVV – 16-0177 Progressive modifications of wood surface, film-forming substances and their interactions at the phase interface** (Prof. Jozef Kúdela, CSc.)

## IPA projects

Table 6. 4 Solved IPA projects at the Faculty of Technology in 2019

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number | Title | Principal investigator | Workplace | Solution time | Prid. Fin. (€) |
| Bv | Kv |
| IPA – 2/2019, I-07-043-00 | Influence of selected technological tool and material factors on the quality of surface machining and energy intensity of plane milling of thermally modified spruce wood | Michal Korčok | KVAT | 2019 | 933 | 0 |
| IPA TUZVO 05/2019 | Simulation of production processes using digital enterprise tools | Roman Bambura | KVTMKv | 2019 | 944 | 0 |
| Together | 1877 | 0 |

**IPA – 2/2019, I-07-043-00Impact of selected technological tool and material factors on surface machining quality and energy intensity during plane milling of thermally modified spruce wood**

Ing. Michal Korčok

The obtained results expand the scientific knowledge in applied research in the solved issue and allow for practice the optimal selection of technical- technological and material parameters of cutting processes (plane milling). Based on this experiment, we determined the optimal technological parameters (angle of the cutting tool face, sliding speed, cutting speed, thermal treatment temperature and material of the cutting tool used) for the planar milling process to achieve the required quality and energy of woody surface machining. However, when choosing them, production productivity must also be taken into account, the quality of the created surface is the primary parameter that determines the optimal setting of the milling process, therefore, from the summary of individual experimental results and their statistical evaluation, it is possible to determine the optimal technical and technological parameters for milling thermally modified spruce wood as follows: high cutting speed, low sliding speed, tool face angle (15°), a thermal modification temperature of about 160 °C.

**IPA TUZVO 05/2019 Simulation of production processes using digital enterprise tools**

Ing. Roman Bambura

As part of the project solution, a production line simulation was developed with the subsequent collection and implementation of data into a simulation to evaluate the behavior of the production line. The simulation was created verified and validated according to the actual production line. The simulation provides a more detailed view of production systems, where, using a time- and low-cost method, we can better understand processes and implement and observe changes in production before they are implemented in the real world.

# Student scientific professional activity

The 19th faculty conference of ŠVOČ FT took place in the academic year 2018/2019 on 14.5.2019. The conference was divided into 2 sections. The first section was the section Ecotechnics and production technology and the second section was secondary schools. In total, 18 students participated in the faculty conference of ŠVOČ. The number of works is shown in Table 7.1. Table 7.2 shows the number of competitors by high school.

**Organizing Committee of the ŠVOČ:**

Vice-Dean for VVČ and DŠ:prof. Ing. Štefan Barcík, CSc.

Chairman of the Board of ŠVOČ:Ing. Tomáš Kuvik, PhD.

Members of the Board of ŠVOČ:Ing. Zuzana Brodnianská, PhD.

 Ing. Peter Koleda, PhD.

 Ing. Emil Škultéty

**Evaluation committees:**

*Section Ecotechnics and Production Technology*

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

 Members of the Commission:Prof. Jozef Víglaský, CSc.

 Ing. Zuzana Brodnianská, PhD.

 Ing. Tomáš Kuvik, PhD.

Student representative - Roman Bambura

*Secondary schools section*

Chairand commission: Pavel Beňo, PhD.

 Members of the Commission:doc. Ing. Miroslav Dado, PhD.

 Ing. Martin Remper, PhD.

 Ing. Pavel Žabenský

 Student representative-:Ing. Michal Korčok

Table 7. 1 Number of competition works by year

|  |  |  |
| --- | --- | --- |
| Section | Year – Bachelor's degree | Year – engineering degree |
| 1 | 2 | 3 | 1 | 2 |
| Ecotechnics and production technology |  |  | 3 | 2 | 5 |
| Secondary schools | 9 |
| TOGETHER | 19 works presented |

Table 7. 2 Number of competitors in the Secondary schools section by secondary school

|  |  |
| --- | --- |
| High school | Number of students |
| Secondary Technical School, Zvolen | 4 |
| Private secondary technical school, Žiar nad Hronom | 2 |
| Secondary Industrial School of Mechanical and Electrical Engineering, Levice | 2 |
| Secondary Industrial School of Transport, Zvolen | 1 |
| TOGETHER | 9 |

**Evaluation of the tenders:**

When evaluating the competition works, the topicality of the topic, the level of evaluation of own results, the formal level of 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 and the formal editing of the works.

The participants were presented with diplomas for placement according to the statement of the relevant commission. The diplomas were presented by the Dean of the FEVT (now FT) of the TU in Zvolen, Pavel Beňo, PhD. and the Chairman of the Board of the ŠVOČ, Tomáš Kuvik, PhD.

# Scientific journal

In 2019, the 24th edition of the scientific journal Acta Facultatis Technicae was published in two issues. In issue 1, 10 scientific articles and 1 paper were published, in issue 2 10 scientific articles were published.

The scientific journal Acta Facultatis Technicae has been published by the Technical University of Zvolen in its publishing house since 1997, it is intended for the general scientific and professional public. The journal publishes only **original scientific papers** from the following areas:

* production and automation technology,
* developments in hydraulic elements, systems and fluids used in agricultural, forestry and production technology,
* robotics and informatics,
* energy and environment,
* the quality and reliability of machinery and equipment,
* technique and mechanization of agriculture and forestry,
* technique of production processes,
* the characteristics and processing of agricultural and forestry materials and products,
* marketing of machines and safety of technical systems.

The journal is published in two issues per year and is assigned international standard number ISSN 1336-4472. The deadline for contributions is two times a year – **January 30 and June 30.**  **The papers are published in English.**

**Composition of the editorial board:**

**Pavel Beňo, PhD. – President of RR**

**Prof. Štefan Barcík, CSc. – scientific editor**

**Peter Koleda, PhD. – technical editor**

**Members of the RR:**

.doc. Ing. Marián Kučera, PhD.

.doc. Ing. Miroslav Dado, PhD.

.doc. Ing. Miroslava Ťavodová, PhD.

.doc. Ing. Ján Kováč, PhD.

.doc. Ing. Jozef Krilek, PhD.

.doc. Mgr. Elena Pivarčiová, PhD.

# DOCTORAL STUDIES

Doctoral studies at the faculty took place in the academic year 2018/2019 in one study program Production Technology in accordance with Act No. 131/2002 on Higher Education Institutions, which since 01.09.2019 is included in the study field of Mechanical Engineering in accordance with Decree No. 244/2019 Coll. on the System of Study Fields of the Slovak Republic.

Table 9. 1 Program doctoral studies at FT

|  |  |  |  |
| --- | --- | --- | --- |
| Code | FIELD OF STUDY | STUDY PROGRAMME | note |
| 5.2.50 | Mechanical Engineering | Production Engineering | from 01.09.2019 |
| 5.2.50 | Production Engineering | Production Engineering | until 31.08.2019 |

List of trade union commission members in 2019

**Chair of OK**

Prof. Štefan Barcík, CSc.FT TU in Zvolen

**OK members**

|  |  |
| --- | --- |
| .doc. Ing. Pavel Beňo, PhD. | FT TU in Zvolen |
| .doc. Ing. Ferdinand Bodnár, CSc. | FT TU in Zvolen |
| Dr.h.c. prof. Ing. Pavol Božek, CSc. | MTF Trnava STU Bratislava, |
| .doc. Ing. Miroslav Dado, PhD. | FT TU in Zvolen |
| Prof. Peter Demeč, CSc. | Faculty of Mechanical Engineering tu Košice |
| .doc. Ing. Jiří Fries, Ph.D. | Faculty of Mechanical Engineering VŠB-TU Ostrava |
| .doc. Ing. Richard Hnilica, PhD. | FT TU in Zvolen |
| .doc. Ing. Ľubomír Javorek, CSc. | FT TU in Zvolen |
| .doc. Ing. Ján Kováč, PhD. | FT TU in Zvolen |
| .doc. Ing. Jozef Krilek, PhD. | FT TU in Zvolen |
| .doc. Ing. Marián Kučera, PhD. | FT TU in Zvolen |
| .doc. Ing. Ľubomír Naščák, CSc. | FT TU in Zvolen |
| .doc. Mgr. Elena Pivarčiová, PhD. | FT TU in Zvolen |
| Prof. Mikuláš Siklienka, PhD. | DF TU in Zvolen |
| .doc. Ing. Ján Svoreň, CSc. | FT TU in Zvolen |
| Prof. Jozef Víglaský, CSc. | FT TU in Zvolen |

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

Production technology

**Headquarters of the trade union commission:**

Faculty of Technology

Technical University of Zvolen

Student 26, 960 01 Zvolen

In the past year (as of 31.12.2019), the dissertation exam was successfully passed by 3 phD students in full-time form and 2 students in part-time form.

Table 9. 2 Successfully passed dissertation exams in 2019 (status as of 31.12.2019)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| DEPARTMENT | NAME | TRAINER | BRANCH | DATE | THEME |
| KVAT | Ing. Ladislav Karrach | .doc. Mgr. Elena Pivarčiová, PhD. | Production technology | 30.04.2019 | Analysis and application of 2D codes in production |
| KELT | Ing. Juraj Klukan, PhD. | Prof. Ing. Jozef Víglaský, CSc. | 30.04.2019 | Research into alternative energy sources and fuels for efficient use in advanced technology |
| KMSD | Ing. Silvia Kopčanová | Doc. Ing. Marián Kučera, PhD. | 30.04.2019 | Multiparametric diagnostics of machinery in technical practice |
| KVAT | Ing. Michal Korčok | Prof. Ing. Štefan Barcík, CSc. | 30.04.2019 | Analysis of the impact of thermally modified wood technology on the energy intensity and morphology of surface formation of the machining process |
| KELT | Ing. Ján Melicherčík | Doc. Ing. Jozef Krilek, PhD. | 30.04.2019 | Research on selected factors for the wood sectoring process |

The dissertation was successfully defended by 1 internal phD student and 3 external phD students (Table 9.3).

Table 9. 3 Successfully conducted dissertation defenses in 2019 (as of 31.12.2019)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| DEPARTMENT | NAME | TRAINER | BRANCH | DATE | THEME |
| KVAT | Ing. Zuzana Jamberová, PhD. | Prof. Ing. Štefan Barcík, CSc. | Production technology | 28.08.2019 | Analysis of factors affecting energy indicators in the machining of thermally modified oak wood |
| KELT | Ing. Juraj Klukan, PhD | Prof. Ing. Jozef Víglaský, CSc. | 28.08.2019 | Research into alternative energy sources and fuels for efficient use in advanced technology |
| KVTMKv | Ing. Lucia Mikušová, PhD. | Doc. Ing. Miroslav Dado, PhD. | 28.08.2019 | Research on the process of generating a solid aerosol when grinding wood with electric hand tools |
| KVAT | Ing. Mohammad Emal Qazizada, PhD. | .doc. Mgr. Elena Pivarčiová, PhD. | 28.02.2019 | Influence of selected parameters on the reliability of centrifugal pumps |

# 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 important that the initiative of the faculty staff is aimed at obtaining grants, projects and other activities to provide financial resources for scientific research activities. In publishing activity, it is necessary to focus on publications in indexed journals with the highest quartile according to the JCR indicator.

Increased attention in this regard must 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 is not at the required level compared to previous years.

#  DRAFT MEASURES FOR 2020

Based on the Long-Term Development Plan of FT 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 R & D, Head of Departments

 Timeframe: continuous

1. 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. These are Slovak grant agencies (EU framework programmes, cross-border cooperation projects, operational program research and development Agency of the Ministry of Education of the Slovak Republic for EU Structural Funds, or international projects H2020) with maximum use of the activities of the newly conceived FT Project Office.

**Responsible:** dean, vice-deani for VV and ZS, head of departments

 Timeframe: continuous

1. In the field of presentation of the results of scientific and research activities of the faculty, focus on increasing the quality and frequency of published outputs. Focus especially on the preferred categories, which are the main ones in the faculty's subsidy, evaluation and project processes (priority of the faculty registered with the highest possible IF and the lowest quartile and A1, A2 registered in WoS). Increasing the CI according to WOS/Scopus and obtaining the attributes of awards of top international quality in the field of technical research.

**Responsible:** Dean, Vice-Dean for R & D, heads of departments, all creative staff

 Timeframe: continuous

1. 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 R & D, Head of Departments

 Timeframe: continuous

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

**Responsible:** dean, vice-deani for VV and ZS, head of departments

 Timeframe: continuous

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

**Responsible:** dean, vice-deani for VV and ZS, head of departments

 Timeframe: continuous

1. In the field of building and expanding instrumentation, regularly contribute to the purchase of instruments and equipment from the means to solve projects. Use development projects and all other available options to improve the status quo.

**Responsible:** project leaders

 Timeframe: continuous

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

**Responsible:** Vice-Dean for Vv, Head of Departments, President of ŠVOČ

 Timeframe: continuous

1. To support the presentation of own scientific and research activities and the possibility of comparing it with the results of other workplaces by organizing international scientific events at the faculty.

**Responsible:** Vice-Dean for Vv, Head of Departments, Head of Projects

 Timeframe: continuous

1. Orientation of the publishing as well as citation activities of phD students on improving its quality, especially focusing on the preferred categories, on the best possible fulfillment of the criteria for obtaining funds from the subsidy schedule, as well as for the need to meet the criteria of future evaluations of the faculty in the context of the Dean's Methodological Guidance "Rules and requirements for the VT doctoral study program at FT TU in Zvolen. "

**Responsible:** Dean, Vice-Dean for R & D, heads of departments, trainers

 Timeframe: continuous