**Faculty of Technology**

technical university in zvolen



**report**

**on scientific and research activities at ft TU in zvolen for the year 2021**

Proposal for a decision:

Scientific board of FT TU in Zvolen

The 2021 FT SCC report was approved by:

 (a) no comments,

 (b) with comments

Presented by: **doc. Pavel Beňo, PhD.**

Dean of FT TU in Zvolen

Processed by: **doc.**  **Peter Koleda, PhD.**

Vice-Dean for Science, Research and Doctoral Studies

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

Zvolen 2022

Content

[INTRODUCTION 2](#_Toc116565042)

[1 SCIENTIFIC AND RESEARCH PROFILE Facultures of technology 4](#_Toc116565043)

[1.1 Orientation and supporting directions of research 4](#_Toc116565044)

[1.2 Main areas and orientations of scientific research activity 4](#_Toc116565045)

[2 ORGANIZATIONAL, PERSONNEL, FINANCIAL AND MATERIAL – TECHNICAL PROVISION OF SCIENCE AND TECHNOLOGY 6](#_Toc116565046)

[2.1 Scientific research capacity of FT and its qualification structure 6](#_Toc116565047)

[2.2 Thematic concentration and financial provision of research on FT 7](#_Toc116565048)

[3 publishing activity 10](#_Toc116565049)

[3.1 Evaluation of employees' publishing and citation activities 10](#_Toc116565050)

[3.2 Evaluation of the publication activity of PhD students 14](#_Toc116565051)

[3.3 Evaluation of implementation activities 15](#_Toc116565052)

[4 scientific and professional events 17](#_Toc116565053)

[5 achieved results in solving science and technology projects 19](#_Toc116565054)

[5.1 Grant projects VEGA, KEGA 19](#_Toc116565055)

[5.2 APVV projects 23](#_Toc116565056)

[5.3 IPA projects and others 24](#_Toc116565057)

[6 Student scientific professional activity 27](#_Toc116565058)

[7 Scientific journal 28](#_Toc116565059)

[8 DOCTORAL STUDIES 29](#_Toc116565060)

[9 CONCLUSION 31](#_Toc116565061)

[10 DRAFT MEASURES FOR 2022 32](#_Toc116565062)

# INTRODUCTION

We submit to the Scientific Council of the Faculty of Technology the Report on Scientific research activities for the year 2021.

The purpose of the report is to:

* capture and document the state of the art in the field of science and research, as well as in other activities in the year 2021 under review,
* 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 inthe 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,
* 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 and graphs.

The measures adopted for 2021, 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 year20 21, which was also the fifth year of fulfillment of the Long-Term Plan 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.

Not only the scientific and research activities of the faculty were also affected in 2021 by the SARS-CoV-2 coronavirus pandemic. Evaluating the scientific and research activity, it can be concluded that in the past year each faculty employee was involved in solving research projects. The publishing activity of the faculty has a balanced and slightly growing trend in the field of more valuable publications, the share of less valuable publications is decreasing. 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.

The long-term objective of the Technical University defines in the field of Scientific research, creative and artistic activity the strategic goal of internationally accepted results in research and artistic activity and the transfer of knowledge into economic and social practice with the following measures:

**2.1** Publish the results of research, creative and artistic activity in the international environment, in particular in indexed renowned international scientific journals.

**Indicator:** Number of publications registered in CCC, Web of Science and SCOPUS per creative employee. Number of the highest quality outputs in artistic creation per creative employee of artistic activity.

**2.2** Strengthen the position of the University in scientific research projects of national and international cooperation.

**Indicator:** Number of grants from international sources addressed, including the amount of financial support per creative employee. Number of grants from domestic sources, including the amount of financial support per creative employee.

**2.3** Identify and support top-notch and excellent scientific research activities and activities at individual faculties.

**Indicator:** Number of top and excellent scientific research teams.

**2.4** Build research infrastructure, including qualified operators.

**Indicator:** Financial value and outputs of research infrastructure. Number of creative staff and students using units of research infrastructure.

**2.5** Deepen the involvement of PhD students in research, creative and artistic activities, subject to publication in indexed renowned international scientific journals.

**Indicator:** Number of publications registered in CCC, Web of Science and SCOPUS per phD graduate.

**2.6** Build and ensure the efficient operation of a technology transfer centre with an emphasis on the commercialisation of research results.

**Indicator:** Number of contracts for scientific research activities and the financial value of revenues from research and development projects per creative employee. The number of patents, utility models and designs per creative employee.

**2.7** To popularise and raise the profile of the results of the university's scientific research and other creative activities in the professional public.

**Indicator:** Number of international and national scientific and professional events organised.

# SCIENTIFIC AND RESEARCH PROFILE Facultures of technology

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 theD-term intention of the TEhnica University 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 workplace as at 31.12.2021

|  |  |  |  |
| --- | --- | --- | --- |
| Workplace | C o u n c il a t i on of the | Together | Of the total |
| scientific and pedagogical staff | VVz |
| Prof. | .doc. | Oa | DrSc., Dr. | CSc., PhD. |
| KELT | 0 | 3 | 2 | 1 | 6 | 0 | 6 |
| KMSD | 0 | 2 | 4 | 1 | 7 | 0 | 7 |
| KVAT | 1 | 4 | 3 | 0 | 8 | 0 | 8 |
| KVTMKv | 0 | 5 | 0 | 1 | 6 | 0 | 6 |
| TOGETHER | 1 | 13 | 9 | 3 | 26 | 0 | 26 |

Figure 2. 1 Qualification structure of FT staff as of 31.12.2021

The research capacity deployed to solve all research tasks is presented in Table 2.2. On average, 1,0,50 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 2021

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Workplace | VEGA | KEGA | APVV | IPA and others | Together |
| KELT | 6700 | 1000 | 450 | 515 | 8665 |
| KMSD | 4750 | 1400 | 0 | 368 | 6518 |
| KVAT | 3100 | 1000 | 2200 | 500 | 6800 |
| KVTMKv | 3200 | 1500 | 1350 | 250 | 6300 |
| Together | 17750 | 4900 | 4000 | 1633 | 28283 |

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

Table 2. 3 Research capacity of phD students of FT on grant and other scientific projects in classes in 2021

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Workplace | VEGA | KEGA | APVV | Ipa | Together |
| KELT | 8000 | 0 | 0 | 1000 | 9000 |
| KMSD | 0 | 0 | 0 | 0 | 0 |
| KVAT | 500 | 700 | 1100 | 0 | 2300 |
| KVTMKv | 1000 | 500 | 0 | 600 | 2100 |
| Together | 9500 | 1200 | 1100 | 1600 | 13400 |

For one phD student at FT, the research capacity was 1120 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 allocation in 20 21 for VEGA and KEGA projects (in EUR)

|  |  |  |  |
| --- | --- | --- | --- |
| Workplace | VEGA | KEGA | Together |
| topital | bežné | topital | Common |
| KELT | 0 | 22,240.0 | 0 | 1 050,0 | 23,290.0 |
| KMSD | 0 | 0 | 0 | 5,387.0 | 5,387.0 |
| KVAT | 0 | 15 444,0 | 0 | 5 849,0 | 21 293,0 |
| KVTMKv | 0 | 10 448,0 | 0 | 0 | 10 448,0 |
| Together | 0 | 48 132,0 | 0 | 12,286.0 | 60 418,0 |

Table 2. 5 Departments allocation in 20 21 for APVV projects, institutional research, IPA (in EUR)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Workplace | APVV | IPA | Institutional research | Together |
| topital | Common | topital | Common |
| KELT | 0 | 0 | 0 | 944,0 |  | 944,0 |
| KMSD | 0 | 0 | 0 | 0 |  | 0 |
| KVAT | 0 | 57 293,0 | 0 | 0 |  | 57 293,0 |
| KVTMKv | 0 | 26 829,0 | 0 | 978,0 |  | 27 807,0 |
| Ft |  |  |  |  | 5 743,0 | 5,743.0 |
| Together | 0 | 84 122,0 | 0 | 1,922.0 | 5,743.0 | 91 787,0 |

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 2016-2021.

Figure 2. 4 Project allocations in 2016 -2021

# 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 publication activity followed by individual departments as well as the years 2016 to 202 1 at the faculty. The overall publishing performance of FT and its quality of publications is evaluated through categories A1 to D. It can be concluded that the publishing activity of the faculty in 2021 was oriented towards those categories (B and C) 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 proportion of book publications of categories A1 and A2 has decreased compared to previous years. In category B, publishing activity has increased compared to the previous evaluation period. In category C, there has been a decrease in 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, i.e. to give preference to publication in journals classified in Q1 and Q2 according to the JCR. 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 2021 – employees

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Workplace | A1 | A2 | B | C | D |
| KELT | Together | 0,00 | 1,20 | 6,35 | 3,05 | 13,88 |
| Average per person | 0 | 0,20 | 1,06 | 0,51 | 2,31 |
| KMSD | Together | 0 | 0,00 | 2,84 | 0,00 | 1,18 |
| Average per person | 0 | 0 | 0,41 | 0 | 0,17 |
| KVAT | Together | 0,5 | 2 | 4,75 | 0,50 | 12,46 |
| Average per person | 0,06 | 0,22 | 0,53 | 0,06 | 1,38 |
| KVTMKv | Together | 0,00 | 0 | 1,80 | 1,20 | 5,45 |
| Average per person | 0 | 0 | 0,36 | 0,24 | 1,09 |
| Ft | Together | 0,50 | 3,20 | 15,74 | 4,75 | 32,97 |
| Average per person | 0,02 | 0,12 | 0,58 | 0,18 | 1,22 |

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

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 the year 2021 – employees

Figure 3. 2 Comparison of the development of the number of outputs of employees in individual categories of publishing activity according to the criteria of the Ministry of Education of the Slovak Republic

Figure 3. 3 Comparison of the development of the number of outputs of employees and PhD students in individual categories of publishing activity according to the criteria of the Ministry of Education of the Slovak Republic

Figure 3.4 shows the number of outputs in periodicals assigned quartile in WoS according to the currently available JCR (20 20 per year). The number of publications included in Q1 and Q2 needs to be further increased in the coming years , since the methodology for allocating subsidies in the field of science and research for publishing results in periodical journals continues to be based on these scientometric data.

Figure 3. 4 Number of outputs in periodicals by quartiles

Table 3.2 shows the H-index of FT executives by WoS Core Collection database and Scopus database.

Table 3. 2 H-index of creative employees of FT as of 10.02.202 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DEPARTMENT | NAME, TITLE | ENLISTMENT | WoS Core Collection | Scopus |
| 2018 | 2019 | 2020 | 2021 | 2019 | 2020 | 2021 |
| KELT | Brodnianská, Zuzana, doc. Ing. PhD. | Associate Professor with CSc./PhD. | 1 | 2 | 3 | 4 | 3 | 3 | 4 |
| Helexa, Milan, Ing. PhD. | odb. as. with CSc./PhD. | 0 | 0 | 0 | 0 | 1 | 2 | 2 |
| Kováč, Ján doc. Ing. PhD. | associate professor with CSc./PhD. | 2 | 2 | 3 | 4 | 4 | 4 | 4 |
| Krilek, Jozef, prof. Ing. PhD. | associate professor with CSc./PhD. | 2 | 2 | 3 | 4 | 3 | 4 | 5 |
| Kuvik, Tomáš, Ing. PhD. | odb. as. with CSc./PhD. | 1 | 2 | 2 | 2 | 1 | 1 | 1 |
| Melicherčík, Ján, Ing. PhD. | HEI,DrSc.CSc.PhD. vz | - | - | 0 | 1 | - | 0 | 1 |
| KMSD | Beňo, Pavel, doc. Ing. PhD. | associate professor with CSc./PhD. | 1 | 2 | 2 | 3 | 3 | 3 | 4 |
| Hnilicová, Michaela, Ing. PhD. | odb. as. with CSc./PhD. | 0 | 1 | 1 | 2 | 3 | 5 | 5 |
| Kučera, Marian, doc. Ing. PhD. | associate professor with CSc./PhD. | 2 | 2 | 4 | 6 | 7 | 8 | 8 |
| Kotšmíd, Stanislav, Ing. PhD. | HEI,DrSc.CSc.PhD. vz | 0 | 1 | 1 | 2 | 1 | 1 | 2 |
| Matej, Jaroslav, Ing. PhD. | odb. as. with CSc./PhD. | 1 | 2 | 2 | 2 | 4 | 3 | 3 |
| Minárik, Marian, PhD. | odb. as. with CSc./PhD. | 0 | 1 | 1 | 1 | 0 | 1 | 1 |
| Turis, Ján, Ing. PhD. | odb. as. with CSc./PhD. | 0 | 0 | 1 | 1 | 2 | 2 | 2 |
| KVAT | Hrčková, Maria, PhD. | odb. as. with CSc./PhD. | 0 | 1 | 1 | 1 | 1 | 1 | 2 |
| Javorek, Ľubomír, doc. Ing. CSc. | associate professor with CSc./PhD. | 2 | 2 | 3 | 4 | 3 | 3 | 4 |
| Koleda, Pavol, Ing. PhD. | odb. as. with CSc./PhD. | 1 | 2 | 2 | 2 | 1 | 1 | 2 |
| Koleda, Peter, doc. Ing. PhD. | associate professor with CSc./PhD. | 2 | 4 | 5 | 5 | 2 | 4 | 5 |
| Naščák, Ľubomír, doc. Ing. CSc. | associate professor with CSc./PhD. | 1 | 1 | 1 | 2 | 1 | 2 | 3 |
| Pivarčiová, Elena, prof. Mgr. PhD. | Professor with CSc./PhD. | 3 | 3 | 5 | 7 | 6 | 7 | 8 |
| Svoreň, John, doc. Ing. CSc. | associate professor with CSc./PhD. | 2 | 3 | 3 | 3 | 3 | 3 | 4 |
| Vargovská, Maria, PhD. | odb. as. with CSc./PhD. | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| KVTMKv | Čierna, Helena, doc. Ing. PhD. | HEI,DrSc.CSc.PhD. vz | 0 | 2 | 3 | 4 | 4 | 4 | 7 |
| Dado, Miroslav, doc. Ing. PhD. | associate professor with CSc./PhD. | 2 | 2 | 4 | 4 | 4 | 4 | 5 |
| Rot, Richard, doc. Ing. PhD. | associate professor with CSc./PhD. | 2 | 2 | 4 | 5 | 4 | 4 | 6 |
| Sujová, Erika, doc. Ing. PhD. | Associate Professor with CSc./PhD. | 2 | 2 | 3 | 4 | 4 | 4 | 6 |
| Ťavodová, Miroslava, doc. Ing. PhD. | Associate Professor with CSc./PhD. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Table 3.3 lists the copyright certificates, patents and discoveries that were published in 2021 and whose authors or members of the authors' collective were workers of FT. In total, 5 outputs in this category were published (in 2020 it was 6).

Table . Copyright certificates, patents and discoveries of FT workers for 2021

|  |  |  |
| --- | --- | --- |
| SpeciesNumber | TITLE | NAME OF THE DESIGNER |
| Utility model No 9380 | Wheel-sled truck for transporting firefighter equipment in extreme terrain | HNILICA, Richard - HNILICOVÁ, Michaela - PRIATKA, Matej |
| Application for utility model No. 196-2020 | Security device for asset protection against theft on single-track means of transport | PIVARČIOVÁ, Elena - MARKO, Marek |
| Application for utility model No. 205-2020 | Minimized line for the preparation and foundation of wire rings into the mesh | VARGOVSKAYA, Maria - HORTOBÁGYI, Aaron |
| Application for utility model No. 231-2020 | Method of adjusting the functional parts of the tool by mechanical grooving | DŽUPON, Miroslav - HNILICA, Richard - ŤAVODOVÁ, Miroslava - HNILICOVÁ, Michaela - PETRYSHYNETS, Ivan |
| Application for utility model No. 118-2020 | Preparation for attaching the tractor torque and speed sensor | KRILEK, Jozef - TICHÝ, Branislav |

Table 3.4 shows the assessment of the citation activity of staff by departments of the faculty divided into 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. 4 Evaluation of citation activities for individual departments for 2021 – staff

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Workplace | 1 | 2 | 3 | 4 |
| KELT | Together | 35 | 3 | 4 | 8 |
| Paverage per person | 5,83 | 0,50 | 0,67 | 1,33 |
| KMSD | Together | 40 | 4 | 5 | 6 |
| Paverage per person | 5,71 | 0,57 | 0,71 | 0,86 |
| KVAT | Together | 92 | 11 | 21 | 11 |
| Paverage per person | 10,22 | 1,22 | 2,33 | 1,22 |
| KVTMKv | Together | 55 | 7 | 7 | 4 |
| Paverage per person | 11,00 | 1,40 | 1,40 | 0,80 |
| Ft | Together | 217 | 25 | 37 | 29 |
| Average per person | 8,22 | 0,93 | 1,37 | 1,07 |

## Evaluation of the publication activity of PhD students

In particular, the publishing activity of phD students of the departments for the year20 21, which is mentioned in Table 3.5, was evaluated at the Faculty of Technology of the University of Technology in Zvolen. 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 the year 2021 – phD students

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Workplace | A1 | A2 | B | C | D |
| KELT | Together | 0 | 0 | 0,85 | 0,8 | 2,8 |
| Paverage per person | 0,00 | 0,00 | 0,14 | 0,13 | 0,47 |
| KMSD | Together | 0 | 0 | 0 | 0 | 1 |
| Paverage per person | 0 | 0 | 0 | 0 | 1 |
| KVAT | Together | 0 | 0 | 1,45 | 0,5 | 3,44 |
| Paverage per person | 0 | 0 | 0,36 | 0,13 | 0,86 |
| KVTMKv | Together | 0 | 0 | 0 | 0 | 3 |
| Paverage per person | 0 | 0 | 0 | 0 | 0,50 |
| Ft | Together | 0,00 | 0,00 | 2,30 | 1,30 | 10,24 |
| Average per person | 0,00 | 0,00 | 0,18 | 0,10 | 0,79 |

## Evaluation of implementation activities

In Table 3. 6 and in Figures 3. 5 and 3. 6 is an overview of the implementation, management and organizational activities of individual departments of FT for the202 202 evaluation 1 in categories:

A. realiization activity,

B. rorganizing and organising activities in the field of science and technology,

C. pfatal activity.

Table 3. 6 Scoring of the activities of FT departments in individual categories for the year 2021

|  |  |  |  |
| --- | --- | --- | --- |
| Workplace | And | B | C |
| KELT | Together | 6 | 14 | 21 |
| Paverage per person | 1,0 | 2,33 | 3,5 |
| KMSD | Together | 9,5 | 30 | 34 |
| Paverage per person | 1,2 | 3,8 | 4,3 |
| KVAT | Together | 4,5 | 25 | 43 |
| Paverage per person | 0,5 | 2,78 | 4,78 |
| KVTMKv | Together | 4 | 18 | 28 |
| Paverage per person | 0,7 | 3,0 | 4,7 |
| Ft | Together | 24 | 87 | 126 |
| Average per person | 0,80 | 2,90 | 4,20 |

Figure 3. 5 Evaluation of the activities of departments in individual categories for the year 2021

Figure 3. 6 Evaluation of FT's activity in each category for the years 2018 to 2021

# scientific and professional events

Name of department: **KELT**

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

 Type of event:medzinárodná conference

 Date of the event: 6.9.2021 – 8.9.2021

Expert guarantor: Prof. Jozef Krilek, PhD.

 Number of participants: home: 20

 Foreign:15

 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.

 Title of proceedings:Mobile energy resources - Hydraulics - Environment - Ergonomics of mobile machines: scientific peer-reviewed proceedings

Name of department: **KVAT**

Event name:Mechatronics, production technologies, digital enterprise:latest success, challenges and trends

Type of event: international scientific conference – online

Date of the event: 14. April 2021

Expert guarantor: Dr.h.c. Prof. Pavol Božek, CSc.

Guaranteeing workplace: **KVAT FT**, MTF based in Trnava, STU Bratislava, Kalashnikova State Technical University in Izhevsk, Russia

Number of participants:40 participants from 5 universities

Focus of the event:latest achievements, challenges and trends in mechatronics, manufacturing technology and digital enterprise

Title of proceedings:MECHATRONICS, PRODUCTION TECHNOLOGIES, DIGITAL ENTERPRISE: latest success, challenges, trends

 **Ft**

Event title: XXIII International Scientific Conference of Young People

Type of event: international conference

Event date: 22.0 6.202 1

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

Number of participants: domestic: 12, foreign: 10

Focus of the event: The international scientific conference of young people has a long tradition and rotates between three faculties: the Faculty of Technology of the Technical University in Zvolen, the Technical Faculty of the Slovak University of Agriculture in Nitra and the Technical Faculty of the Czech University of Agriculture in Prague. The conference is intended primarily for PhD students and young scientists and allows them to share the results of their creative activities with each other. This year, participants met in an online space, where they presented their scientific activities in 22 posts.

Title of proceedings: XXIII International Scientific Conference onf Young Scientists: Book of Extended Abstracts

# achieved results in solving science and technology projects

## Grant projects VEGA, KEGA

In 2021, the creative staff of the Faculty of Technology were the principal investigators of 5 VEGA projects (tab. 5.1). At the same time, the employees were involved in solving 4 VEGA and 4 KEGA projectov (Tab. 5.2) where investigators from other faculties or universities were responsible.

Table 5. 1 VEGA projects solved at the Faculty of Technology in 2021

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Project number | Project name | Principal investigator | Workplace | Solution time | Prid. Fin. (€) |
| Bv | Kv |
| 1/0086/18 | Research of temperature fields in a system of shaped heat exchange surfaces | Prof. Mgr. Elena Pivarčiová, PhD. | KELTKVAT | 2018-2021 | 10 863,- | 0 |
| 1/0019/19 | Predictive models of solid aerosol contamination of working air in mechanical wood processing | Doc. Ing. Miroslav Dado, PhD. | KVTMKv | 2019-2022 | 10 448,- | 0 |
| 1/0609/20 | Research on cutting tools in the processing of dendromasa from agricultural and forestry production | Prof. Jozef Krilek, PhD. | KELT | 2020-2023 | 15 255,- | 0 |
| 1/0364/21 | Research of working mechanisms of forestry machines with regard to new design parameters and working principles | Doc. Ing. Ján Kováč, PhD. | KELT | 2021-2023 | 6 985 | 0 |
| 1/0791/21 | Research on a non-contact method of analysis of small particles and dust particles arising in the production process with prediction of negative effects of dust particles | Ing. Pavol Koleda, PhD. | KVAT | 2021-2023 | 4 581,- | 0 |
| 1/0556/19 | Lightweight wood materials based on veneers and their application in products | doc. Ing. Jozef Gáborík, CSc.Ing. Marián Minárik, PhD. | DFKMSDKVAT | 2019-2021 | 0 | 0 |
| 1/0155/18 | Applied research on the use of ecological energy carriers in agricultural, forestry and transport technology | doc. Ing. Ľubomír Hujo, PhD.Ing. Ján Turis, PhD. | SPU in NitraKMSD | 2018-2021 | 0 | 0 |
| 1/0102/21 | Reducing chemical burdens and degradation of agricultural and forest soils by choosing appropriate agrotechnologies in the light of climate change | Prof. h. c. prof. Pavol Findura, PhD.(Marián Minárik, PhD.) | SPU in NitraKMSD | 2021-2023 | 0 | 0 |
| 1/0324/21 | Analysis of the risks of changing the material composition and technological background to the quality of the working environment in small and medium-sized woodworking companies | Doc. Ing. Richard Kminiak, PhD.Doc. Ing. Miroslav Dado, PhD. | DFKVTMKv | 2021-2023 | 0 | 0 |
| Together | 48 132,- | 0 |

Table 5. 2 Solved KEGA projects at the Faculty of Technology in 2021

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Project number | Project name | Principal investigator | Workplace | Solution time | Prid. Fin. (€) |
| Bv | Kv |
| 012SPU-4/2020 | Innovation of the educational process and implementation from practice with a focus on winemaking and viticulture | Prof. Ján Jobbágy, PhD..doc. Ing. Ján Kováč, PhD. | SPU in NitraKELT | 2020-2022 | 1,050,- | 0 |
| 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.Doc. Ing. Marián Kučera, PhD. | SPU in NitraKMSD | 2019-2021 | 794,- | 0 |
| 003SPU-4/2021 | Innovation of study programmes using new methods of education and progressive production technologies | doc. Ing. Martin Kotus, PhD.doc. Ing. Pavel Beňo, PhD. | SPU in NitraKMSD | 2021-2023 | 4 593,- | 0 |
| 006STU-4/2021 | Progressive form of interdisciplinary education and support for the development of the study of professional subjects in the university environment | Dr. H. c. prof. Ing. Pavol Božek, CSc.Prof. Mgr. Elena Pivarčiová, PhD. | STU BAKVAT | 2021-2023 | 5 849,- | 0 |
| Together | 12,286,- | 0 |

**VEGA grant projects – completed**

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

Prof. Mgr. Elena Pivarčiová, PhD.

As part of the project, 1 foreign scientific monograph was published, 7 scientific papers in foreign and 1 in domestic journal, 5 scientific papers in foreign and 1 in domestic journal registered in Web of Science databases, Scopus, 1 scientific paper in foreign and 7 scientific papers in other domestic journals, 1 scientific paper in foreign and 3 scientific papers in domestic scientific proceedings, 2 published papers at foreign scientific conferences. The most important results of the project were created using the experimental method of holographic interferometry and using numerical simulations in Ansys Fluent.

*Completed VEGA projects from other workplaces*

* Ján Svoreň, CSc., doc. Ľubomír Javorek, CSc., Marián Minárik, PhD. – **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 in Nitr e)

**VEGA grant projects – ongoing**

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

doc. Ing. Miroslav Dado, PhD.

In the third year of the project, analytical models were created taking into account the influence of the predicted factors (chain pitch, thickness of the guide link, profile of the planing tooth, size of the thrust force, density and humidity of the cut wood) on the qualitative-quantitative characteristics of wood dust generated into the working air when cutting wood with a portable chainsaw. In order to verify the created models, factorial experiments were designed and implemented. Based on their results, the significance of the influence of individual input factors (technological parameters, wood properties) and their interactions on the size of the output factors (wood dust characteristics) was subsequently established.

**VEGA No.**  **1/0609/20 - Research on cutting tools in the processing of dendromasa from agricultural and forestry production.**

Prof. Jozef Krilek, PhD.

The main objective of the project is based on reducing the energy requirements of the wood division process and obtaining data that will lead us to a deeper knowledge of the influencing technical-technological parameters in the process of dividing the dendromasa using different kinds of dividing mechanisms. The influence of wood properties in the interaction process of wood division and initial processing in terms of wood species, its anisotropy, humidity, technical-technological factors and forestry technology will be monitored, following the energy intensity of the process. During the second year of the solution, initial tool analyses and experimental measurements were carried out, where the results are published in 4 scientific articles in CCC. The results were published and presented at the conference Mobile Energy Means - Hydraulics - Environment - Ergonomics of Mobile Machines and at the 47th International Scientific Conference of the Departments of Transport, Handling, Construction and Agricultural Technology: under the auspices of Prof. Danieli Marasová, CSc., Head of the Institute of Logistics of the Faculty of BERG technical university in Košice.

**VEGA 1/0364/21 Research of working mechanisms of forestry machinery with regard to new design parameters and working principles**

Doc. Ing. Ján Kováč, PhD.

The project is focused on theoretical analysis and experimental verification of working (cutting) mechanisms during the initial processing of wood in order to determine their optimal parameters with regard to their technical-technological parameters, following the energy intensity of the entire process of primary wood processing with forestry technology cutting mechanisms, to determine cutting conditions, to improve ergonomic requirements and durability of tools, as well as to analyze the shapes of cutting tools. As part of the project solution, several scientific articles were published in the journals CCC and WOS, as well as at conferences.

**VEGA 1/0791/21 Research on a non-contact method of analysis of small and dust particles arising in the production process with prediction of negative effects of dust particles**

 Pavol Koleda, PhD.

Within the first year of the project, a literary search was carried out on methodologies for evaluating the quality parameters of particles arising in the manufacturing industry with a prediction of the applicability of optical methods directly in the production process. The purchase of consumables necessary for the preparation and future implementation of experiments was carried out.

*Ongoing VEGA projects from other locations*

* Marián Minárik, PhD. – **VEGA 1/0102/21 Reduction of chemical loads and degradation of agricultural and forest soils by choosing suitable agrotechnologies with regard to climate change** (prof. h. c. prof. Pavol Findura, PhD. , TF SPU in Nitrae)
* Doc. Ing. Miroslav Dado, PhD. – **VEGA 1/0324/21 Analysis of the risks of changing the material composition and technological background to the quality of the working environment in small and medium-sized woodworking companies** (doc. Richard Kminiak, PhD. , DF)

**KEGA grant projects completed**

*Completed KEGA projects from other workplaces*

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

.doc. Ľubomír Hujo, PhD. – TF, SPU in Nitr e

.doc. Marián Kučera, PhD. (principal investigator of the co-investigator organization)

As part of the project, in cooperation with the Department of Transport and Manipulation of TF SPU Nitra, participation in the 47th TF SPU Nitra was realized. International scientific conference of departments of transport, handling, construction and agricultural machinery in Tatranská Lomnica. Learning Module 1 was produced – elements of the hydraulic circuit in the cut. Scripts from the subject Fluid mechanisms of the lecture/exercise have been submitted to the press (print February to March 2022) and a manuscript of the joint textbook Fluid Mechanisms is ready, which will be published only in April 2022 in connection with COVID-19.

**KEGA grant projects continuing**

*Ongoing KEGA projects from other workplaces*

**KEGA 006STU-4/2021 Progressive form of interdisciplinary education and support for the development of the study of professional subjects in the university environment**

Dr. H. c. prof. Pavol Božek, CSc. – MTF, STU in Bratislava

Prof. Elena Pivarčiová, PhD. (principal investigator of the co-investigator organization)

As part of the project, an online international scientific conference "Mechatronics, Production Technology, Digital Enterprise: the latest achievements, challenges and trends" was organized, 1 scientific paper was published in a foreign journal registered in Web of Science/Scopus, 6 published papers at foreign scientific conferences, 3 published papers at domestic scientific conferences.

**KEGA 012SPU-4/2020 Innovation of the educational process and implementation from practice with a focus on winemaking and viticulture.**

Prof. Ján Jobbágy, PhD. – TF, SPU in Nitr e

doc. Ján Kováč, PhD. (principal investigator of the co-investigator organization)

The focus of the project is to innovate the educational process through the creation of modern educational spaces and the preparation of innovative literature and didactic aids with regard to the need for practice. The targets planned for 2021 have been partially met due to the introduction of nationwide restrictions at the beginning of the year (COVID-19 pandemic) for business trips. In the second year of the project, the co-investigators continued to process documents from the issues of winemaking, viticulture, related mechanization and the issue of waste treatment obtained during cutting and cutting of vines by chipping. The result is also a planned colloquium to the project, the output of which is a collection of scientific papers. The team of project investigators continues to prepare documents and documentation for the production of the textbook.

**KEGA 003SPU-4/2021 Innovation of study programmes using new methods of education and progressive production technologies**

doc. Martin Kotus, PhD. – TF, SPU in Nitra

doc. Pavel Beňo, PhD. (principal investigator of the co-investigator organization)

The most important results achieved in solving the project during the period under review. As part of the study of the technological possibilities of devices for additive manufacturing, we began to create a set of samples of additive manufacturing products, which will serve as the basis for the creation of a stencil of 3D models. Taking into account the acquired knowledge was reflected in the proposal to change the structure of the existing study program and the content of several subjects. We have incorporated new knowledge in the field of production technologies into the subject "Progressive production technologies". Given the current situation in the way of education, we have proposed thematic plans for the new subject "Introduction to Virtual Reality", which will serve as a support for the use of knowledge transfer in the field of progressive technologies using virtual and mixed reality.

## APVV projects

Table 5. 3 APVV projects solved at the Faculty of Technology in 2021

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number | Title | Principal investigator | Workplace | Good solutions | Prid. Fin. (€) |
| Bv | Kv |
| APVV-17-0400 | Strengthening the ethical environment in Slovakia (institutional processes, actors, risks, strategies) | Doc. Ing. Helena Čierna, PhD. | KVTMKv | 2018-2022 | 26 829,- | 0 |
| APVV-20-0403 | FMA analysis of potential signals suitable for adaptive management of non-stick milling strategies for wood-based agglomerates | Doc. Ing. Peter Koleda, PhD. | KVAT | 2021-2025 | 57 293,- | 0 |
| Together | 84 122,- | 0 |

**APVV projects continuing**

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

doc. Helena Čierny, PhD.

Compared to the planned outputs in 2021, there was a real increase in outputs in category I part 1.02 (number of publications in foreign peer-reviewed journals) and in section 1.06 (number of scientific papers published in peer-reviewed scientific journals in the Slovak Republic), by a total of two outputs, namely:

* Sujová, E., Čierna, H., Simanová, L., Gejdos, P., Štefková J.: Soft Akills Integration into Budiness Processes Based on the Requirements of Employere – Approach for Sustainable Education
* Čierny, H. Sujová, E.: Evaluation of ethical credibility in production companies of the Slovak Republic. APVV-17-0400. In: TIABP "Trends and Innovative Approaches in Business Processes 2021", Volume 24. Publisher: Technical University of Košice. ISBN 978-80-553-3835-4.

In 2021, we carried out a presentation of the project APVV-17-0400 and a presentation of the partial results of the project to domestic and foreign universities. Due to the covid situation and limited travel in 2021, we held the presentation at three universities, namely:

* UJEP Ústí nad Labem, Faculty of Mechanical Engineering, Czech Republic
* Silesian University of Technology, Faculty of Organization and Management, Zabrze, Poland
* Technical University of Košice, Faculty of Mechanical Engineering, Košice.

**APVV-20-040** **3 FMA analysis of potential signals suitable for adaptive management of non-stick milling strategies of wood-based agglomerates**

.doc. Peter Koleda, PhD.

Phase I of experimental measurements of cutting forces in the milling process took place. The given phase is necessary for determining the optimal technical-technological conditions of the milling process, for the next stages of experiments. Within a given phase, the conditions of the open milling process were simulated. On the obtained MDF samples from the I stage of the experiment, a measurement of the unevenness of the formed surface was carried out on the Alicona optical measuring instrument. 3D surface roughness values as well as area surface scans were obtained. Complete the analysis of existing methodologies and procedures for obtaining and processing acoustic emission signals and tool temperatures in real time with an emphasis on machining processes. Implementation of comparative experiments in terms of electricity consumption during the wood division process, publication of the article: Svoreň, J., Naščák, L., Barcík, Š., Koleda, P., Stehlík, Š. Influence of Circular Saw Blade Design on Reducing Energy Consumption of a Circular Saw in the Cutting Process. Appl. Sci. 2022, 12(3), 1276; https://doi.org/10.3390/app12031276.

*APVV projects from other workplaces*

* Prof. Štefan Barcík, CSc. – **APVV 17-0456 Thermal modification of wood with saturated water vapor in order to purposefully and steadily change the color of wood mass** (prof. Ladislav Dzurenda, PhD., DF)

## IPA projects and others

Table 5. 4 IPA projects solved at the Faculty of Technology in 2021

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number | Title | Principal investigator | Workplace | Solution time | Prid. Fin. (€) |
| Bv | Kv |
| 1/2021 | Proposal for options for increasing the viability of forestry tools | Ing. Monika Vargová | KVTMKv | 2021 | 978,- | 0 |
| 2/2021 | Modification of the cooling method of a compact heat exchanger in the cooling circuit of a car engine | Ing. Marek Lipnický | KELT | 2021 | 944,- | 0 |
| Together | 1 922,- | 0 |

**IPA No 1/2021 Proposal for options for increasing the viability of forestry workers**

Monika Vargová

The project aimed to increase the lifespan of forestry workers. The tools were pre-prepared by removing the material in a mechanical and energetic way on the exposed surfaces of the tool. In these places were applied weld materials, of different compositions. Compared to the original material of the body of the tool, better results were achieved - resistance to abrasive wear, hardness of HRC, obtained by laboratory tests and tests. The microstructure of the weld material was also studied by electron microscopy. At the same time, the pre-preparation of the areas by removing the material ensured that the weight of the tools did not increase.

**IPA No . 2/2021 Modification of the method of cooling a compact heat exchanger in the cooling circuit of a car engine**

Ing. Marek Lipnický

The results of research on various types of coolants for an automotive radiator were presented within the framework of the XXIII. International Scientific Conference of Young People 2021 and published in the form of an abstract of a paper from a domestic conference (AFH). The design of the heating element of coolants for experimental research on thermal parameters of automotive coolers was published in the form of a scientific work in the domestic journal Acta Facultatis Technicae (ADF). The main goal of the project was to investigate the effectiveness of the classical method of cooling the heat exchange area of the radiator with a fan, compared to the newly designed design modification of the cooling method by high-pressure air jets. For this, an experimental assembly of the refrigeration circuit of the car was constructed, which was a prerequisite for conducting experimental research. A series of measurements was carried out on the constructed circuit, where the thermal parameters of three types of G12+ cooling mixtures based on ethylene glycol (0, 50,000, 100,000 km) were monitored, which circulated through the cooling circuit with the fitted used and new cooler, while after reaching the operating temperature they were cooled by a fan (in the classical way). Subsequently, a modification of the experimental assembly with a pneumatic circuit was proposed to study the efficiency of cooling by nozzles compared to the classical way.

**Other projects**

**UNIVNET – University and industrial research and education platform of the recycling society.**

Dr. h. c. prof. Ing. Rudolf Kropil, PhD.

Doc. Ing. Pavel Beňo, PhD.

Prof. Jozef Krilek, PhD.

The continuous development of industry, as well as of the consumer lifestyle, leads to an increase in the amount of waste produced, which also includes plastic and rubber waste from the automotive industry. Currently, the share of plastics in the total weight of cars ranges from 10 to 15%, in terms of volume up to 30%. With the increasing share of increasing the application of plastics, the increasing number of cars produced, the volume of decommissioned cars, car wrecks, as well as the volume of plastic waste is also increasing. Like plastic waste, waste rubber (insulation, carpets, etc.) and worn-out tyres are still a global problem and their volume is much higher than the amount of waste that can be rationally recovered. The amount of waste tyres increases by around 17 million tonnes per year. This situation forced the formation of recycling projects and the use of plastic and rubber waste from discarded cars. Therefore, the goal of many scientists is to develop new methods of recycling some of the most widely produced plastic polymers. This consortium aims to reduce the content of plastics, tyres and other rubber materials representing waste from the automotive industry, to reduce the consumption of raw materials, especially those from non-renewable sources and using waste rubber and plastics as a secondary raw material, and to reduce the huge environmental burden on waste plastics and rubbers. Theaim of the project was to prepare new composite materials containing waste rubber (tyres, carpets, insulation) and plastics from cars, to evaluate the properties of composites and the possibilities of their use as a structural material for exterior and/or interior. Based on partial results, new composites that will be protected by intellectual property in 2022 have been produced. At the same time, the concept of an investment business plan for the production of new composites was created.

As part of the project, the partial results were published in monographs entitled *"Progressive waste recovery technologies in the automotive industry"* and the second in a renowned publishing house abroad entitled *"Analysis of the state, forecasts and new technologies of waste recovery in the automotive industry"*. Theresults of the monographs were presented at the UNIVNET online conference.

# Student scientific professional activity

The 20th year of the faculty conference ŠVOČ na FT, which was postponed from 2020, was held on May 12, 2021 via the MS Teams application. The main topic was production technology and ecotechnics, toonference was divided into 2 sections: secondary schools (4 works) and colleges (7 works). In total, 1,1 students attended the faculty conference of ŠVOČ.

**Organizing Committee of the ŠVOČ:**

Vice-Dean for VVČ and DŠ: doc. Ing. Peter Koleda, PhD.

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

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

 Monika Vargová

 Lukáš Hudec

**Evaluationand commissions:**

 Chairman of the Commission:Doc. Ing. Pavel Beňo, PhD.

 Members of the Commission:Mgr. Ondrej Kubaliak

 .doc. Ing. Miroslava Ťavodová, PhD.

 .doc. Peter Koleda, PhD.

Crowd of students: Ing. Monika Vargová

**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.

Participants receivedtheir diplomas for placement according to the evaluation committee, for the 3 best works in each section they were awarded a financial reward. At the same time, the student was awarded the prize of the Association of Slovak Scientific and Technical Societies.

# Scientific journal

In 2021, the 26th edition of the scientific journal Acta Facultatis Technicae was published in two issues. In issue 1, 7 scientific articles were published, in issue 2 5 scientific articles and 1 paper 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. Mgr.**  **Elena Pivarčiová, PhD. – scientific editor**

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

**Members of the Editorial Board:**

doc. Ing. Miroslav Dado, PhD.

doc. Ing. Ján Kováč, PhD.

Prof. Jozef Krilek, PhD.

doc. Ing. Marián Kučera, PhD.

doc. Ing. Miroslava Ťavodová, PhD.

# DOCTORAL STUDIES

Doctoral studies at the faculty took place in the academic year20 20/2021 in one study program Production Technology, which 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 8. 1 Program doctoral studies at FT

|  |  |
| --- | --- |
| FIELD OF STUDY | STUDY PROGRAMME |
| Mechanical Engineering  | Production Engineering |

List of trade union commission members in 2021

**Chairwoman of the Program Committee of the Study Programme**

Prof. Mgr. Elena Pivarčiová, PhD. FT TU in Zvolen

**Members of the Programme Committee of the Study Programme**

|  |  |
| --- | --- |
| .doc. Ing. Pavel Beňo, PhD. | FT TU in Zvolen |
| Dr.h.c. prof. Ing. Pavol Božek, CSc. | MTF Trnava STU Bratislava, |
| .doc. Ing. Zuzana Brodnianská, PhD. | FT TU in Zvolen |
| .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. Peter Koleda, PhD. | FT TU in Zvolen |
| .doc. Ing. Ján Kováč, PhD. | FT TU in Zvolen |
| Prof. Jozef Krilek, PhD. | FT TU in Zvolen |
| .doc. Ing. Marián Kučera, PhD. | FT TU in Zvolen |
| .doc. Ing. Erika Sujová, PhD. | FT TU in Zvolen |
| .doc. Ing. Miroslava Ťavodová, PhD. | FT TU in Zvolen |

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

Production technology

**Headquarters of the Programme Committee of the Study Programme:**

Faculty of Technology

Technical University in Zvolen

Student 26

960 01 Elected

The dissertation was successfully defended by 2 interní and 1 external doctoral student (tab. 8. 2).

Table 8. 2 Successfully conducted dissertation defenses in 20 21 (status as at 31.12.2021)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| DEPARTMENT | NAME | TRAINER | BRANCH | DATE | DISSERTATION TITLE |
| KVTMKv | Roman Bambura, PhD. | Doc. Ing. Miroslav Dado, PhD. | Production Engineering | 2 4.08.2021 | Optimization of production processes using the tools of a digital enterprise |
| KELT | Pavol Harvánek, PhD. | Doc. Ing. Ján Kováč, PhD. | 2 4.08.2021 | Research of the cutting mechanism of the cutting head for chipless wood division |
| KELT | Pavel Ťavoda, PhD. | Doc. Ing. Ján Kováč, PhD. | 2 7.08.2021 | Research on the operational reliability of the selected removal vehicle |

# 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 all 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 commercial exploitation of the results of scientific research activities , including with the support of the Department for Technology Transfer. In this area, scientific and research activity at the faculty is not at the required level compared to previous years.

#  DRAFT MEASURES FOR 2022

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

1. Prepare documents for the evaluation of the outputs of creative activities and the scientifico-pedagogical characteristics of persons providing the field of habilitation and inaugural procedures and persons guaranteeing study programs during the process of harmonization of these areas with the standards of SAAVŠ.

**Responsible:** Dean, Vice-Dean for Science, Research and Doctoral Studies, responsible persons

**Timeframe:** June 2022

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 Science, Research and Doctoral Studies, 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 mainly EU framework programmes, cross-border cooperation projects, operational programme research and development Agency of the Ministry of Education of the Slovak Republic for EU Structural Funds, or international projects Horizont Europe.

**Responsible:** Dean, Vice-Dean for Science, Research and Doctoral Studies, 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 best 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 Science, Research and Doctoral Studies, 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 Science, Research and Doctoral Studies, 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-Dean for Science, Research and Doctoral Studies, Vice-Dean for Development and External Relations, 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 Science, Research and Doctoral Studies, 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 Science, Research and Doctoral Studies, Head of Departments, Project Leaders

 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 Science, Research and Doctoral Studies, Trainers

 Timeframe: continuous