UNIVERSITY OF ŽILINA

# FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY

ANNUAL REPORT 2021

# UNIVERSITY OF ŽILINA

## Foreword

The Faculty of Electrical Engineering and Information Technology is an essential part of the University of Žilina – a modern university providing a full range of technological, economic, management, and a limited range of humanistic and natural science education at under-graduate, graduate and post-graduate levels.

During its more than 60-year existence the University has become a reputable institution with the firm position in the system of the Slovak higher education institutions. It was originally established in 1953 as the College of Railways in Prague. In 1959 the College changed its name to the University of Transport and in 1962 it was moved to Žilina. Afterwards, as a result of the increasing role of communications, the title was amended to the University of Transport and Communications. A series of transformation steps that brought essential changes into the academic life of the University and its Faculties and Institutes started in 1989. They proved effectiveness on the way towards a modern institution, featuring a character of a full-value university, named the University of Žilina since November 1996.

Nowadays, the University of Žilina consists of 7 Faculties (important dates of their establishing and/or transformation are indicated in parentheses):

- Faculty of Electrical Engineering and Information Technology (1953; 1992; 2019),
- Faculty of Mechanical Engineering (1953; 1992),
- Faculty of Operation and Economics of Transport and Communications (1953),
- Faculty of Civil Engineering (1990),
- Faculty of Management Science and Informatics (1990, 1996),
- Faculty of Security Engineering (1952, 1998, 2014),
- Faculty of Humanities (1998, 2010).

In addition to the Faculties, the University also involves the following 10 Institutes:

- Institute of High Mountain Biology,
- CETRA – Centre for Transportation Research,
- Institute of Forensic Research and Education,
- Institute of Competitiveness and Innovations,
- University Science Park,
- Research Centre,
- Institute of Physical Education,
- Institute of Lifelong Education,
- Aviation Training and Education Centre,
- Institute of Information and Communication Technologies.

# PROFILE AND STRUCTURE OF THE FACULTY OF ELECTRICAL ENGINEERING AND INFORMATION TECHNOLOGY

As mentioned above, history of the Faculty of Electrical Engineering and Information Technology of the University of Žilina goes back to the year 1953 when the College of Railways in Prague was founded. Another milestone in its history is the year 1959, when the College of Railways was renamed to the University of Transport and a joint faculty was created by the Faculty of Mechanical Engineering and the Faculty of Electrical Engineering.

In 1962, the College of Railways moved to Žilina. Along with the College, important representatives came to Žilina, who had rich experience from practice, scientific research activities and especially university pedagogical practice. In 1992, after the split, the Faculty returned to its previous original name. The Faculty of Electrical Engineering was renamed in January 2019 to the Faculty of Electrical Engineering and Information Technology. It became the first technically oriented faculty and generally the second Faculty in the Slovak Republic awarded the Quality Certificate for quality control system according to ISO 9001 (in 2003). Since that time further three successful re-certifications were realized (2007, 2010, 2013 and 2016).

## Structure of the Faculty

From a structure point of view, the Faculty of Electrical Engineering and Information Technology (FEEIT) consists of eight departments (seven departments are located directly in Žilina and one institute established at the satellite work place in Liptovský Mikuláš), the Service centre and the Dean's office. Scientific and research activities, properly projected to educational activities, are dynamically developing as a response to floating markets seen within both national and pan-European context. At the very beginning, the activities of original departments were mainly oriented on technical aspects of classical transport, its safety and problems of technical operation of telecommunications. At present, the scientific and research activities addresses the latest problems of information and communication technologies, safety-related control of transport and industry processes, telecommunication engineering, power electronic systems, modern control of electric networks and others. Additionally, such interdisciplinary fields as mechatronic and biomedical engineering are also developed.

The FEEIT's Departments are listed below:

- Department of Physics (DPh),
- Department of Measurement and Applied Electrical Engineering (DMAEE),
- Department of Electromagnetic and Biomedical Engineering (DEBE),
- Department of Mechatronics and Electronics (DME),
- Department of Power Systems and Electric Drives (DPSED),
- Department of Control and Information Systems (DCIS),
- Department of Multimedia and Information-Communication Technology (DMICT),
- Institute of Aurel Stodola situated in Liptovský Mikuláš (IAS).

The following table 1 shows the distribution of the pedagogical and the research positions at particular FEEIT's departments as of 31.12.2021.

Tab. 1: Number of pedagogical and research employees at the departments of FEEIT as of 31.12.2021

| Department | Pedagogical staff | | Research staff | |
|---|---|---|---|---|
| | Full-time | Part-time | Full-time | Part-time |
| DPh | 15 | 2 | 2 | 1 |
| DMAEE | 6 | 1 | - | - |
| DEBE | 8 | 2 | 1 | 1 |
| DME | 12 | 3 | 2 | 14 |
| DPSED | 11 | 1 | 2 | 1 |
| DCIS | 13 | 1 | 1 | - |
| DMICT | 20 | 4 | 4 | - |
| IAS | 6 | - | - | - |
| **Total** | **91** | **14** | **12** | **17** |

Number of employees at FEEIT according to the categories can be seen in the table 2.

Tab. 2: Number of employees at FEEIT according to the categories in 2015-2021

| Year | 2015 | | 2016 | | 2017 | | 2018 | | 2019 | | 2020 | | 2021 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Full-time / Part-time** | **FT** | **PT** | **FT** | **PT** | **FT** | **PT** | **FT** | **PT** | **FT** | **PT** | **FT** | **PT** | **FT** | **PT** |
| **Prof.** | 17 | - | 19 | - | 18 | - | 15 | - | 16 | - | 15 | - | 16 | - |
| **Assoc. Prof. in the position of Prof.** | - | - | - | - | - | - | - | - | - | - | 1 | - | 1 | - |
| **Guest Prof.** | - | 4 | - | 4 | - | 4 | - | 1 | - | 1 | - | 3 | - | 4 |
| **Assoc. Prof.** | 34 | 3 | 29 | 4 | 28 | 3 | 32 | 1 | 29 | 1 | 29 | 1 | 32 | 2 |
| **Senior Lecturer** | 51 | 8 | 53 | 5 | 57 | 6 | 53 | 9 | 53 | 8 | 48 | 10 | 42 | 9 |
| **Lector** | 4 | - | 4 | - | 2 | 3 | 2 | 2 | 1 | 2 | - | 2 | - | 3 |
| **Tech. Admin. Staff** | 27 | 2 | 26 | 3 | 27 | 2 | 22 | 2 | 25 | 2 | 23 | 2 | 23 | 1 |
| **Research Staff** | 12 | 6 | 14 | 4 | 16 | 6 | 18 | 8 | 13 | 14 | 13 | 15 | 12 | 17 |
| **Total** | **145** | **23** | **145** | **20** | **147** | **24** | **142** | **23** | **137** | **28** | **129** | **33** | **129** | **36** |

## Highlights

The most important events in 2021 can be summarized as follows:

- Implementation of the project SENSIBLE “SENSors and Intelligence in BuiLt Environment” Marie Skłodowska-Curie Actions (MSCA) Research and Innovation Staff Exchange (RISE) H2020-MSCA-RISE-2016;
- Building two top teams at FEEIT in the field of electrical engineering and IT. The areas of research in electrical engineering are: efficient conversion, supply and transfer of energy, use of unconventional resources, promising technologies, materials, thermal management, sustainability, space applications, energy storage and lighting technology. In the field of information technology - smart systems, localization in 5G and B5G networks, optical and radio communication networks, machine learning and computer vision;
- Approval of an international project within the ESA (European Space Agency) scheme in cooperation with industrial partners SPINEA Technologies (SK) and THALES Alenia Space (FR) for the development of advanced electronic systems for powering building blocks of space robotic arms;
- Successful completion of the European Regional Development Fund project OP Integrated Infrastructure 2014 - 2020: Call code: OPVaI-VA / DP / 2018 / 1.1.3-06, project: ITMS2014+ 313011X058: "Research of energy-optimal technologies and equipment for vehicles of the 21st century low carbon footprint ";
- Successful implementation and realization of national research projects (SRDA, VEGA, KEGA);
- Successful submission and realization of projects under the operational program Integrated Infrastructure and Innovation Research;
- Historically highest number of publications in the ADC category - Scientific papers in foreign journals (64 in total);
- Continuing graduation growth of the Faculty staff by appointment of two professors and five associate professors;
- Adoption of the FEEIT UNIZA Long-Term Plan for the period 2021-2027;
- Visit of the UNIZA and FEEIT management at the University of Catania (IT) aimed at deepening and developing further cooperation;
- Successful organization of ŠVOS for Doctoral degree students (March 11) and Bachelor and Master degree students (April 8) with online form at FEEIT UNIZA;
- Co-organization and participation in the Transcom conference (26 - 28 May 2021);
- Organization and realization of a physics and mathematics course (6 - 10 September 2021) for first-year students of the faculties FEEIT and FME;
- Active cooperation with industrial entities HAKO, a.s., Ineltech, s.r.o., Atelsys, s.r.o., A2B, s.r.o., Schaeffler, s.r.o., Siemens Mobility s.r.o.;
- Organization and co-organization of the events: Technical idea of the year, Trenčín Robotics Day, active participation in the MyMachine event, and others;
- Launching of the faculty *FEEIT shop* https://feit.uniza.sk/shop/;
- Organization of the Online Open Day at FEEIT 3x - spring, autumn;
- The third highest number of enrolled students in the 1st year of Bachelor study at FEEIT UNIZA in the history of the Faculty (427), since AR 2005/2006, when the two-level study began;
- Extension and further implementation of a marketing strategy aimed at promoting the study at FEEIT: (FEITstories, A word with the graduate ..., active participation in the European Researchers' Night and others;

- Creation of a portal for FEEIT students https://feitsity.sk, which should help 1st year students to easily adapt to university education;
- The Faculty regularly began producing FEEIT News from the Faculty's life through its youtube channel and selected operators;
- Reconstruction aimed at improving the energy parameters of the BA - BD buildings, in which the FEEIT dean's office and the DMICT, DPSED, DPh and DMAEE departments are located;
- Construction of a photovoltaic power plant representing an additional source of electricity of BA - BD buildings.

# EDUCATIONAL ACTIVITIES

- The courses in social sciences, psychology, economics and law are offered to the students in all study programs at Bachelor and Master degree study.
- In all study programs at Bachelor and Master degree study students are also offered courses focused on project teaching form through which students better acquire theoretical and practical aspects of their education.
- FEEIT increases the attention given to the adaptation of new 1st degree students to the university environment (information sessions, detailed monitoring of study results, support of mutual communication between students – teachers, support for solving common student activities).
- Considerable attention is paid to students of the 3rd degree study. FEEIT supports them mainly in preparing high quality publication outputs, fulfilment of curricula, preparation and defending the dissertation thesis in the standard length of study.
- The FEEIT is using complex software system for supporting e-learning, which enables access to electronic materials supporting the traditional form of teaching, testing and examination of students, and organizational provision of study. FEEIT claims from pedagogical staff and students to actively use the e-learning system and at the same time creates conditions for the development of e-learning, not only within FEEIT but also within the University. Due to the established preventive measures to reduce the spread of coronavirus Covid-19, full-time teaching at FEEIT during the summer semester of the academic year 2020/21 and the autumn semester of the academic year 2020/21 switched to distance learning, which made full use of a comprehensive software system to support e-learning.
- FEEIT participates in a student mobility system. Mobility of students to foreign universities, as well as to industrial environment are supported and fully integrated into the learning process of students. Students can thus part of their study take at leading foreign educational institutions or in major industrial enterprises or corporations.
- FEEIT supports the development of interdisciplinary, multidisciplinary, distance and lifelong learning; and education of foreign languages mainly for young employees and doctoral students.
- FEEIT has had the credit system for all study degrees. The system enables uniform evaluation of study results in the frame of EU and markedly makes the realization of mobility and acceptation of achieved results simpler.
- At FEEIT there is a contact person (vice-dean for education) responsible for help and life coordination of disabled students.
- In 2021, a successful generational exchange contunues in the position of guarantors and staffing in several study programs at all three levels of higher education.

Tab.3: Overview of accredited study programs (1st degree - Bachelor study programs, 2nd degree - Master study programs, 3rd degree - Doctoral study programs)

| Field of study | Study program | Form of study | Duration of study | Title awarded | Guaranteed by |
|---|---|---|---|---|---|
| **1st study degree** | | | | | |
| Cybernetics | Control Engineering | FT | 3 years | Bc. | Juraj Ždánsky |
| Electrical Engineering | Biomedical Engineering | FT | 3 years | Bc. | Ladislav Janoušek |
| Electrical Engineering | Autotronics | FT | 3 years | Bc. | Pavol Špánik |
| Electrical Engineering | Electrical Engineering | FT | 3 years | Bc. | Alena Otčenášová |
| Informatics | Digital Technologies | PT | 4 years | Bc. | Milan Dado (till 31. 8. 2021) |
| Informatics | Multimedia Technologies | FT | 3 years | Bc. | Roman Jarina |
| Informatics | Communication and Information Technologies | FT | 3 years | Bc. | Peter Počta |
| **2nd study degree** | | | | | |
| Cybernetics | Process Control | FT | 2 years | Ing. | Juraj Spalek (till 31. 8. 2021<br>Aleš Janota (from 1. 9. 2021) |
| Electrical Engineering | Biomedical Engineering | FT | 2 years | Ing. | Ladislav Janoušek |
| Electrical Engineering | Photonics | FT | 2 years | Ing. | Dušan Pudiš |
| Electrical Engineering | Electric Power Systems | FT | 2 years | Ing. | Juraj Altus |
| Electrical Engineering | Electric Drives | FT | 2 years | Ing. | Pavol Rafajdus |
| Electrical Engineering | Power Electronic Systems | FT | 2 years | Ing. | Pavol Špánik |
| Informatics | Multimedia Engineering | FT | 2 years | Ing. | Róbert Hudec |
| Informatics | Telecommunication and Radio-com. Engineering | FT | 2 years | Ing. | Peter Brída |
| **3rd study degree** | | | | | |
| Cybernetics | Process Control | FT | 3 years | PhD. | Karol Rástočný, Aleš Janota, Rastislav Pirník |
| Electrical Engineering | Electric Power Systems | FT | 3 years | PhD. | Juraj Altus, Alena Otčenášová, Peter Braciník |
| Electrical Engineering | Electric Power Systems | PT | 4 years | PhD. | Juraj Altus, Alena Otčenášová, Peter Braciník |
| Electrical Engineering | Electrotechnologies and Materials | FT | 3 years | PhD. | Dušan Pudiš, Ivan Martinček |
| Electrical Engineering | Electrotechnologies and Materials | PT | 4 years | PhD. | Dušan Pudiš, Ivan Martinček |
| Electrical Engineering | Power Electrical Engineering | FT | 3 years | PhD. | Pavol Špánik, Pavol Rafajdus, Michal Frivaldský |

| | | | | | |
|---|---|---|---|---|---|
| Electrical Engineering | Power Electrical Engineering | PT | 4 years | PhD. | Pavol Špánik, Pavol Rafajdus, Michal Frivaldský |
| Informatics | Telecommunications | FT | 3 years | PhD. | Peter Brída, Milan Dado, Róbert Hudec |
| Informatics | Telecommunications | PT | 4 years | PhD. | Peter Brída, Milan Dado, Róbert Hudec |
| Electrical Engineering | Theory of Electrical Engineering | FT | 3 years | PhD. | Ladislav Janoušek, Mariana Beňová, Milan Smetana |
| Electrical Engineering | Theory of Electrical Engineering | PT | 4 years | PhD. | Ladislav Janoušek, Mariana Beňová, Milan Smetana |

Tab. 4: Number of the faculty students (as of 31. 10.2021)

| **Field of study/Study program** | **Number of students** | | | |
|---|---|---|---|---|
| | **Full-time study** | | **Part-time study** | |
| | **Nationals** | **Foreigners** | **Nationals** | **Foreigners** |
| **1st study degree** | | | | |
| Control Engineering | 132 | 3 | 0 | 0 |
| Autotronics | 60 | 1 | | |
| Biomedical Engineering | 91 | 3 | | |
| Electrooptics | 5 | | | |
| Electrical Engineering | 212 | 4 | | |
| Multimedia Technologies | 167 | 21 | | |
| Communication and Information Techn. | 118 | 4 | | |
| **Total** | **785** | **36** | | |
| **2nd study degree** | | | | |
| Applied Telematics | 0 | | | |
| Biomedical Engineering | 38 | | | |
| Electric Power Systems | 46 | | | |
| Electric Drives | 15 | | | |
| Photonics | 4 | | | |
| Multimedia Engineering | 68 | 3 | | |
| Process Control | 40 | 1 | | |
| Telecomm. and Radio-comm. Eng. | 24 | 1 | | |
| Power Electronic Systems | 28 | 5 | | |
| **Total** | **263** | **10** | | |
| **3rd study degree** | | | | |
| Electric Power Systems | 0 | | 2 | |
| Electrotechnologies and Materials | 2 | | | |
| Process Control | 7 | | | |
| Power Electrical Engineering | 20 | 1 | 2 | |
| Telecommunications | 16 | | 3 | |
| Theory of Electrical Engineering | 7 | | 2 | |
| **Total** | **52** | **1** | **9** | |

Tab. 5 and 6: Overview of the faculty students' number since 2017 (as of 31.10.2021)

| Full-time study | | | | |
|---|---|---|---|---|
| **2017** | **2018** | **2019** | **2020** | **2021** |
| | | | | |
| 634 | 578 | 639 | 741 | 785 |
| | | | | |
| 346 | 317 | 295 | 288 | 263 |
| | | | | |
| 48 | 48 | 53 | 54 | 52 |

| Part-time study | | | | |
|---|---|---|---|---|
| **2017** | **2018** | **2019** | **2020** | **2021** |
| | | | | |
| 21 | 10 | 18 | 8 | 0 |
| | | | | |
| | | | | 0 |
| | | | | |
| 8 | 5 | 4 | 3 | 9 |

## Admission for study

a) Form of the admission procedure in 2021 and a brief assessment:

The basic condition for admission to bachelor study (1st level study programme) was the acquisition of a full secondary education or completed secondary vocational education. The admission procedure takes place in two forms: without an entrance examination and with an entrance examination. Applicants (except for applicants for the study program of *Multimedia Technology*) were admitted to the study without an entrance examination, if they meet the basic conditions for the bachelor's study. If the applicant provided all required annexes to the study application, the admission procedure takes place without the personal participation of the applicants. Applicants for the study program in multimedia technology have passed an entrance examination consisting of three parts:

- presentation of the motivation of the applicant for the study program,
- evaluation of achieved study results of the applicant and the general outlook of the applicant,
- presentation of the applicant's multimedia activities and secondary school knowledge, including anexplanation of the procedures and techniques used.

The selection process for the 2nd study degree is based on results from previous Bachelor study of an applicant. Those applicants who completed the Bachelor degree with honours, or reached the required weighted average are accepted without the selection procedure. The other applicants are accepted according to a ranking list established on the basis of weighted averages for the whole Bachelor study.

The selection procedure for the 3rd study degree takes the form of a personal interview with each applicant individually in front of an admission committee. One part of the interview is focused on mapping the overview of the applicant in the professional field related to the chosen topic of the doctoral study. The next part aims to verify the knowledge of foreign languages and the assumptions for individual scientific work. The order of applicants is drawn up by the committee in the form of the secret voting.

b) Faculty activities that promote learning:

FEEIT devoted considerable effort to promote the study programs to students of secondary schools. Representatives of the Faculty participated in the Open Days at selected secondary schools. FEEIT organized for secondary schools its own Open Day in Žilina and also at the IAS in Liptovský Mikuláš, also organized special exercises for students of selected secondary schools. FEEIT representatives took part in various promotional events organized at university level (Researcher's Night, Christmas at the University, ...). At the same time, the online promotion of FEEIT study opportunities intensified on social networks (Facebook, Instagram, Youtube, ...).

Number of applicants for study and number of enrolled students can be seen in the following Tables.

Tab.7: Statistical review of the admission procedure in 2021

| Field of study/Study program | Number of applicants for study | | | | | |
|---|---|---|---|---|---|---|
| | Full-time study | | | Part-time study | | |
| | S | P | E | S | P | E |
| **1st study degree** | | | | | | |
| Control Engineering | 101 | 86 | 52 | | | |
| Autotronics | 52 | 49 | 30 | | | |
| Biomedical Engineering | 82 | 72 | 42 | | | |
| Electrooptics | 12 | 12 | 3 | | | |
| Electrical Engineering | 192 | 168 | 94 | | | |
| Multimedia Technologies | 129 | 98 | 79 | | | |
| Communication and Information Techn. | 122 | 101 | 46 | | | |
| **Total** | **690** | **586** | **346** | | | |
| **2nd study degree** | | | | | | |
| Biomedical Engineering | 24 | 22 | 22 | | | |
| Electric Drives | 6 | 6 | 6 | | | |
| Electric power systems | 28 | 28 | 25 | | | |
| Photonics | 3 | 3 | 1 | | | |
| Multimedia Engineering | 39 | 37 | 32 | | | |
| Process Control | 12 | 11 | 12 | | | |
| Telecomm. and Radio-comm. Eng. | 11 | 11 | 9 | | | |
| Power Electronic Systems | 14 | 14 | 13 | | | |
| **Total** | **137** | **132** | **120** | | | |
| **3rd study degree** | | | | | | |
| Electric Power Systems | | | | 2 | 2 | 2 |
| Electrotechnologies and Materials | 1 | | | | | |
| Process Control | 4 | 4 | 3 | | | |
| Power Electrical Engineering | 3 | 2 | 2 | | | |
| Telecommunications | 3 | 3 | 3 | 2 | 2 | 2 |
| Theory of Electrical Engineering | 3 | 3 | 3 | 2 | 2 | 2 |
| **Total** | **14** | **12** | **11** | **6** | **6** | **6** |

S - Subscribers, P - Participation in the admission procedure, E - Enrolled

Tab.8: Number of graduates of the Faculty in the academic year 2020/2021

| Field of study/Study program | Number of graduates in 2020/2021 | | | |
|---|---|---|---|---|
| | Full-time study | | Part-time study | |
| | Nationals | Foreigners | Nationals | Foreigners |
| **1st study degree** | | | | |
| Control Engineering | 11 | | | |
| Autotronics | 13 | | | |
| Biomedical Engineering | 22 | | | |
| Electrical Engineering | 33 | | 1 | 0 |
| Multimedia Technologies | 15 | 1 | | |
| KIT | 8 | | | |
| **Total** | **102** | **1** | **1** | **0** |
| **2nd study degree** | | | | |
| Biomedical Engineering | 16 | | | |
| Electric Power Systems | 16 | | | |
| Electric Drives | 5 | | | |
| Photonics | 2 | | | |
| Multimedia Engineering | 25 | | | |
| Process Control | 24 | | | |
| Telecomm. and Radio-comm. Eng. | 18 | | | |
| Power Electronic Systems | 6 | 3 | | |
| **Total** | **112** | **3** | | |
| **3rd study degree** | | | | |
| Electric Power Systems | 2 | | | |
| Electrotechnologies and Materials | 1 | | | |
| Process Control | 1 | | | |
| Power Electrical Engineering | 2 | | | |
| Telecommunications | 2 | | | |
| Theory of Electrical Engineering | 2 | | | |
| **Total** | **10** | | | |

Tab. 9: Overview of graduates of the Faculty since 2015/2016 (as of 31.12.2021)

| **Full-time study** | | | | | |
|---|---|---|---|---|---|
| **2015/16** | **2016/17** | **2017/2018** | **2018/2019** | **2019/2020** | **2020/2021** |
| 1st study degree | | | | | |
| 196 | 167 | 165 | 140 | 134 | 102 |
| 2nd study degree | | | | | |
| 198 | 161 | 163 | 153 | 124 | 112 |
| 3rd study degree | | | | | |
| 12 | 18 | 17 | 13 | 14 | 10 |
| **Part-time study** | | | | | |
| **2015/16** | **2016/17** | **2017/2018** | **2018/2019** | **2019/2020** | **2020/2021** |
| 1st study degree | | | | | |
| | | 4 | | 9 | 1 |
| 2nd study degree | | | | | |
| | 31 | | | | 0 |

| 3rd study degree | | | | | |
|---|---|---|---|---|---|
| 3 | 1 | 2 | 1 | 1 | 0 |

## Graduates' employment

### Bachelor study programmes

*Control Engineering*
*(Field of study Control Engineering)*

The graduate will acquire education in the field of control engineering and process control with the support of information and communication technologies. He/she has also practical experience in application of safety critical control and communication systems performed mainly based on PLC and industrial networks. He/she will successfully apply in the operation of control and information systems at the process and operative level. Theoretical knowledge acquired during the bachelor study will create good prerequisites for further education, either within the further forms of university study or within lifelong education.
*Software skills: C language, C++, MATLAB, PLC, ATMEL, MS ACCESS, HTML, CSS, Tia Portal.*

*Autotronics*
*(Field of study Electrical Engineering)*

The graduate will acquire basic and general knowledge required in wide spectrum of electrical proficiency especially in areas of automobile electronics, hybrid vehicles and electromobility. The gained knowledge is needed for the second degree study programs in this study program or affinitive ones. Even if a graduate would not continue in the next level of the university studies, he/she will gain required wide professional profile and he/she is able to adapt in different technical or other businesses. The graduates of Autotronics study program should be professionals who are able to identify various electronic faults in cars. They can successfully apply mainly in car services and repair workshops, car selling shops and in education institutions.
*Software skills: C language, C++, MATLAB, Simulink, CodeWarrior, CodeComposer, Asembler, AVR Studio, Vissim, PLECS.*

*Biomedical Engineering*
*(Field of study Electrical Engineering)*

The graduate will acquire knowledge in the subjects of theoretical and technical basis, as well as in theoretical basis of medical disciplines with emphasis on the structure and functioning of biological objects, biochemical, physiological and pathophysiological processes. He/she will gain knowledge of medical technique and its applications, modern tools of biomedicine, principles of their activities, conditions for operation and their safe for diagnostic and treatment purposes. He/she is able to evaluate functionality of technical and computer aided equipment under given conditions of a health care facility or other operations and laboratories and at the same time able to lead qualified communication with the health care staff. He/she will successfully apply as an expert in medical and biological laboratories, in the operation of biomedical technique, in business and service organisations.
*Software skills: C language, MATLAB, EAGLE.*

*Electrical Engineering*
*(Field of study Electrical Engineering)*

The graduate will acquire knowledge from the subjects of theoretical base applied in the fields of power electronics, utilisation of applied microprocessor technique and programming, electric drives, electrical traction, electric power systems and mechatronics. He/she will gain knowledge in the field of quality

management and reliability in a production company, marketing and trade, electrical standards, rights and legal regulations related to the field of study. Graduates may further specialise in the field of automobile electrical engineering, electrical traction, electric drives, electric power systems, power electronic systems and mechatronics systems. Graduates obtain theoretical knowledge and practical experience in order to acquire the principles, installations, operations, functions, service and repairs of electrical products, devices and equipment in compliance with international standards. He/she will successfully apply in all fields of power electrical engineering, in the field of mechatronics, robotics, applied microprocessor technique, electronics, optoelectronics, power electronics, computer design and construction in organisations of administrative, production, operation or repair character.
*Software skills: MS Office, MATLAB, SIMULINK, FEMM, MOTORSOLVE, SICHR, DIALUX, DSPACE, CODE WARIOR, LABWIEV, EMPT-ATP, MODES, GE-PSLF, RUPLAN, RS Logix, RS Link, RS View, Assembler, AVR Studio, EAGLE, OrCAD-PSPICE, PLECS.*

*Electrooptics*
*(Field of study Electrical Engineering)*

Electrooptics is a field at the interface of physical and several technical sciences, which is mainly connected to optics and electronics. It is a young field that has already found a firm place in the study programmes at many universities around the world. Graduates of the bachelor's degree study programme Electro-optics are able to continue their study in the engineering study programme Photonics that has a close connection and thus the application especially in telecommunications, information technology, medicine, industrial technologies, aviation, military technology, construction industry, but it is also used in consumer devices and entertainment industry. Graduates of Electro-optics should be able to orientate themselves in the following areas: geometric optics; optical radiation properties; principles of fibre optics; electronics and microprocessors; principles of nanotechnologies; principles of photonics; analysis and testing of fibre optic lines; testing of laser devices and components for telecommunications, medicine and other purposes; testing of optical, photonic or imaging prototypes and devices; determination of commercial, industrial or scientific use of electro-optical applications or elements.

*Multimedia Technologies*
*(Field of study Informatics)*

The graduate will acquire knowledge in acquisition, processing and presentation of digital signal at an adequate technical, aesthetical, ethical and art levels. The synergy of technical and art education will make the graduate a specialist in creating multimedia presentations. The graduate will gain knowledge and practical experience in working with the screen and the sound element of multimedia that predetermines him/her for working in organisations focused on information technologies, advertising and counselling activities, in public administration institutions, in studios producing multimedia products.
*Software skills: C language, C++, MATLAB, Java, JSP, Blender, Cinema 4D, Adobe Premiere, Adobe Audition, Adobe Photoshop, Adobe Illustrator, Adobe InDesign, Protools, HW, SQL, PSpice, Microsim, Corel Draw, QuarkxPress, LaTex.*

*Communication and Information Technologies*
*(Field of study Informatics)*

Graduates of the bachelor's degree study programme - Communication and Information Technologies in the field of study - Informatics will acquire the ability to specialize and adapt to the latest and future needs and requirements of practice in manufacturing companies of network operators and in service companies in the field of electronic communications. They will be prepared for a continuous deepening of knowledge from the field. They can work as qualified workers for the operation and design of technology of communication networks and services and will be able to solve the tasks of practice in team. They can work at the positions

of executives, operators of electronic communications, network specialists in enterprises and institutions and developers of communication services and in companies developing technologies of Industry 4.0. Graduates can work as designers, system designers or specialists for various areas of ICT.

## Master study programmes

*Biomedical Engineering*
*(Field of study Electrical Engineering)*

The graduate has an overview of modern technical tools of biomedicine, diagnostic, therapeutic and rehabilitation devices, their safe use and the world trend in their development. He/she gains knowledge in theoretical and selected clinical medical disciplines in order to understand the purpose of technical tool application, ability to assess functionality and ability to create conditions for qualified communication with medical doctors. He/she has wide knowledge of existing information systems and technologies. He/she gains knowledge in the field of management in health care, bioethics, medical ethics and psychology of management. The graduate can successfully apply in all fields of technical and information provision of health care facilities, in institutes and laboratories of biomedical research and development, in the field of information systems and in technical management of mainly health care operations. He/she will also operate as managerial employee in the management of health care facilities, as well as a pedagogue and researcher at universities.
*Software skills: C language, HTML, PHP, MATLAB, Simulink, CST-studio suite.*

*Electric Power Systems*
*(Field of study Electrical Engineering)*

The graduate has knowledge in the subjects of theoretical base developed in the field of power and applied electronics, programming and utilisation of computer technology, electric drives, electrical traction, electric power systems, management of electricity transmission systems and information systems in electric power systems, has basic knowledge of economic methods for operation of systems, has knowledge of law, psychology and quality management. The graduate is capable of independent projection, constructional and design works, is able to decide on concept issues and management of large organisational units. The graduate may successfully operate in projecting, management, construction and operation of industrial companies, railways, city public transport, in all areas of electric power systems, in projection and research institutes and other organisations of administrative, production, operation or repair character.
*Software skills: MATLAB, EMTP-ATP, MODES, GE-PSLF, MS OFFICE, PTOLEMY, SICHR, LABVIEW, EAGLE, ASSEMBLER, VISUAL STUDIO, C++, C, RUPLAN.*

*Electric Drives*
*(Field of study Electrical Engineering)*

The graduate has knowledge in the subjects of theoretical base developed in the field of power and applied electronics, programming and utilisation of computer technology, electric drives, electrical traction, electric power systems, management of electricity transmission systems and information systems in electric power systems, he/she has basic knowledge of economic methods for operation of systems, has knowledge of law, psychology and quality management. The graduate is capable of independent projection, constructional and design works, is able to decide on concept issues and management of large organisational units. The graduate may successfully operate in projecting, management, construction and operation of industrial companies, railways, city public transport, in all areas of electric power systems, in projection and research institutes and other organisations of administrative, production, operation or repair character.

*Software skills: FEMM, MATLAB, OPERA-3D, COMSOL Multiphysics, MS Office, Code Warrior, EAGLE, Altium Desinger, Visual Studio, Python, Step 7, Micro win, WinCC.*

*Photonics*
*(Field of study Electrical Engineering)*

The application of graduates has close connection especially with telecommunications, information technologies, medicine, industrial technologies, aeronautics, military technologies, and civil engineering as well as in consumer goods and entertainment industry. The graduate should know to creatively, analytically and in details orient in the following technical areas: design, modification and testing of laser equipment and components for telecommunications, medicine and for other purposes; utilization and enhancing quality and design of optical fibres technologies; development and testing of optical, photonic or imaging prototypes and equipment; design of electro-optical sensor systems; application of new photonic technologies and equipment into different industrial areas; optical design of standard lighting; definition of commercial, industrial or scientific utilization of electro-optical applications; creation, analysis and testing of optical fibres lines.
*Software skills: Code Block (C, C++), LabVieW.*

*Power Electronic Systems*
*(Field of study Electrical Engineering)*

Universality of this study programme guarantees very wide application of graduates on the labour market. The acquired knowledge may be applied in the most lucrative areas of electrical engineering, machinery and energetic industry, as well as in transportation. In the future their application in the services field is also expected. These are mainly areas of development, design, projection and application of power and control electronic systems, mechatronic and automotive systems, their control nodes, superior control systems, industrial automatic machines and robots and equipment of industrial automation. With regard to significant representation of subjects oriented to programming and development of control software, the graduate may operate successfully in very interesting jobs. The graduates from this study programme may apply for jobs at companies dealing with projects, production and application of power electronic and/or mechatronic systems and industrial automation. They may successfully apply also in specialised machinery companies working in the fields of automobile industry, chemical and petrochemical industry, gas industry, paper mill and transportation.
*Software skills: Freescale ARM, Texas Instruments DSP, ANSI C language, EAGLE, OrCADPSpice, PLECS, LabVieW, Simulink, COMSOL, VHDL ISE Desing Suite, dSpace, Texas Instruments Education Modules.*

*Process Control*
*(Field of study Cybernetics)*

The graduate gains education in the field of analysis and synthesis of automated control and information systems mainly for the area of information processing and transmission in the control of safety critical processes. Graduates from the study programme Process Control specialize in safe control of transportation process with emphasis on intelligent transport systems and signalling systems. They handle support telematic systems and safe control of industrial processes with emphasis on complex technologies, safe critical production applications, intelligent buildings, security systems for personal and property protection, security of information systems and modern computer networks.
*Software skills: Ethernet, PLC, Jazyk PHP, MySQL, Jazyk HTML, UML, Jazyk OCL, MATLAB, Jazyk PYTHON, SCADA/HMI systems.*

*Telecommunication and Radiocommunication Engineering*
*(Field of study Informatics)*

The education is focused on the topic of telecommunication and information networks with direction on digital communication networks, i.e. optic and metallic systems and networks, intelligent networks, terrestrial mobile networks, microwave radio and satellite communication, network management, architecture of signalling systems and communication protocols, applications of multimedia and multimedia services, reliability and diagnostics of systems and networks. The graduate will successfully apply as a creative employee in research, technical development, telecommunication design and management, as well as in all fields of applications of telecommunication, radiocommunication and information and communication technologies and services.
*Software skills: ADOBE, HTML, PHP, MySQL, Blender, 3dMax, Cinema 4D, Android, JAVA, Microsoft Direct3D, OpenGL, MATLAB, After Effect, ZScan, Geomagic, MS Office, MATLAB, SIMULINK, from SPICE family – simulation programs oriented in analyses and syntheses of electronic circuits, VPIphotonics, ASEMBLER.*

*Multimedia Engineering*
*(Field of study Informatics)*

The student of the Multimedia Engineering study programme in the informatics field of study will enhance his/her knowledge to the necessary extent in the subjects of theoretical base of the field of study and gain detailed knowledge of media communication, networks and services, their convergences and also their securities. By selection of optional subjects he/she may more closely specialize in the field of processing image, graphic or audio information. A significant element of knowledge is understanding of web technologies, mainly as far as the design of web services is concerned, knowledge of 2D and 3D graphic and animation systems and applications and digital processing of the multimedia contents. The student of this study will also acquire knowledge of aesthetics and creative attitude in the design of multimedia products, legal regulations in the field of electronic communication, their management, economics and marketing. The graduate from master study will be able to specialise and to adapt to different levels depending on the needs of practice, research and development, as well as the ability of permanent knowledge enhancement in the field. The students will obtain knowledge and skills that enable them to work independently as well as in teams in solving projects integrating the technical and creative level into one, or even to lead such teams.
*Software skills: ADOBE, HTML, PHP, MySQL, Blender, 3dMax, Cinema 4D, Android, JAVA, Microsoft Direct3D, OpenGL, After Effect, ZScan, Geomagic, MS Office, MATLAB, SIMULINK, from SPICE family – simulation programs oriented in analyses and syntheses of electronic circuits.*

## Doctoral study programmes

*Electric Power Systems*
*(Field of study Electrical Engineering)*

The doctoral study in the field of Electric power systems is designed for graduates of the second degree of university study (Master/Master of Science) who tend to the original solutions of engineering and scientific problems in the electrical engineering/electric power systems. For solving of these challenges the doctoral student utilises the latest findings of modern analytical and numerical methods, methods of mathematical and physical modelling, informatics, measurements of electric and non-electric variables, microelectronics, electric power systems, automatic and discrete control up to the level of artificial intelligence, including the implementation of control by corresponding processors, as well as knowledge of other disciplines. Prerequisites for successful completion of the doctoral degree studies are the PhD student´s ability of abstract thinking and his/her ability to apply and implement acquired knowledge when solving technical problems. The PhD student learns how to properly characterize and understand physical phenomena and experimental

observations on them; he/she searches for their adequate models and is able to implement new applications in the above specified disciplines in science, research and practice. During his/her doctoral studies the PhD student acquires comprehensive theoretical knowledge, experimental skills and practical experience. He/she masters methodology of scientific work and is prepared for independent scientific work.

*Electro-technologies and Materials*
*(Field of study Electrical engineering)*

The graduates in the doctoral degree study in the field of Electro-technologies and materials master scientific methods of evaluation of material structures and systems in terms of process technology, structure, durability, reliability, intermediate and final diagnostics and control, both in terms of determination their basic physical properties of the substrate material and their final structure. The graduate is able to use the obtained in-depth knowledge in a wide range of production technologies in electronics, in the design, as well as in the organization and optimisation of various technological processes.
The graduate acquires abilities to predict changes of material properties in various conditions of their use as well as in terms of utilising various technological procedures in production of electrical components, structures, systems and equipment.
The graduates of the third degree of university studies in the field of study Electrotechnologies and materials acquire deep theoretical and methodological knowledge of technologies and materials applied in electrical and electronics industry, of properties of materials and processes running in them that create the object of the scientific research and development at the state-of-the-art level of scientific research in the world.

*Power Electrical Engineering*
*(Field of study Electrical Engineering)*

The doctoral study in the field of Power electrical engineering is designed for graduates of the second degree of university study (Master/Master of Science) who tend to the original solutions of engineering and scientific problems in the field of power electrical engineering, i.e. electric drives, power electronics, electric traction, electrical machinery and equipment and traction electric power systems. For solving of these challenges the doctoral student utilises the latest findings of modern analytical and numerical methods, methods of mathematical and physical modelling, informatics, measurements of electric and non-electric variables, microelectronics, electric power systems, automatic and discrete control up to the level of artificial intelligence, including the implementation of control by corresponding processors, as well as knowledge of other disciplines. Prerequisites for successful completion of the doctoral degree studies are the PhD student´s ability of abstract thinking and his/her ability to apply and implement acquired knowledge when solving technical problems. The PhD student learns how to properly characterize and understand physical phenomena and experimental observations on them; he/she searches for their adequate models and is able to implement new applications in the above specified disciplines in science, research and practice. During his/her doctoral studies PhD student acquires comprehensive theoretical knowledge, experimental skills as well as practical experience. He/she masters methodology of scientific work and is prepared for independent scientific work. The graduates in the doctoral study in Power electrical engineering acquire knowledge based on the state-of-the-art scientific knowledge in the field and by their own creative work they will contribute to their development as well as to new findings in the respective field.

*Theory of Electrical Engineering*
*(Field of study Electrical engineering)*

The doctoral study in the field of Theory of electrical engineering is designed for graduates of the second degree of university study (Master/Master of Science) who tend to the original solutions of engineering and scientific problems in the field of electrical engineering and its applications. For solving of these challenges the doctoral student utilises the latest findings of modern analytical and numerical methods, methods

ofmathematical and physical modelling, informatics, measurements of electric and non-electric variables, interdisciplinary methodologies, biomedical applications, as well as knowledge of other disciplines.
Prerequisites for successful completion of the doctoral degree studies are the PhD student´s ability of abstract thinking and his/her ability to apply and implement acquired knowledge when solving technical problems. The PhD student learns how to properly characterize and understand physical phenomena and experimental observations on them; he/she searches for their adequate models and is able to implement new applications in the above specified disciplines in science, research and practice. During his/her doctoral studies the PhD student acquires comprehensive theoretical knowledge, experimental skills as well as practical experience. He/she masters methodology of scientific work and is prepared for independent scientific work.

*Process Control*
*(Field of study Cybernetics)*

The doctoral study in the field of Cybernetics is designed for graduates of the second degree of university study (Master/Master of Science) who tend to the original solutions of engineering and scientific problems in management and control of transport and technological processes. For solving of these challenges the doctoral student utilises the latest findings of modern analytical and numerical methods, methods of mathematical and physical modelling, informatics, measurements of electric and non-electric variables, microelectronics, electric power systems, automatic and discrete control up to the level of artificial intelligence, including the implementation of control by corresponding processors, as well as knowledge of other disciplines. Prerequisites for successful completion of the doctoral degree studies are the PhD student´s ability of abstract thinking and his/her ability to apply and implement acquired knowledge when solving technical problems. The graduates in the field of study Automation gain knowledge based on the state-of-the-art scientific knowledge in the field and by their own creative work they will contribute to their development as well as to new findings in the respective field. The aim of the doctoral study is to educate such a specialist who will not only possess complex knowledge but will be able to enrich the science and knowledge in the field of process control.
The graduates acquire in-depth theoretical and methodological knowledge and practical experience in the main areas of process control (including processes related to security) such as the theory of automatic control, system theory, process control, control systems, logic and event systems and also in the field of secure communication and information processing.

*Telecommunications*
*(Field of study Informatics)*

The aim of the doctoral degree studies is to prepare skilled professionals focused on the development, implementation, management and operation of complex telecommunication systems of the new generations that virtually permeated all spheres of human activity. The study programme is built on the previously accredited field of study Telecommunications / doctoral degree study programme. Research activities of the Department of Telecommunications and Multimedia of the Faculty of Electrical Engineering UNIZA aim in the field of telecommunications at optical communication systems, broadband networks, mobile radio networks and digital signal processing. The PhD graduates in the field of Telecommunications gain deep theoretical and methodological knowledge and practical experience in key areas of telecommunications at the current state of research in the world, acquire principles of individual and team research work, research exploration, scientific formulation of problems, solutions of complex scientific problems and presentation of scientific results. They are able to analyse and solve complex and non-standard tasks in the field of telecommunications and to provide original, new solutions, to apply acquired knowledge in practice in a new, creative way. They are able to apply the acquired knowledge in various fields of science, research, industry and services in the public as well as in private sectors. The graduates are capable of following the latest scientific and research trends in telecommunications and of adding and updating their knowledge through lifelong learning process.

Tab. 10: Information about final thesis

| Number of submitted thesis | Number of defended theses | Physical number of tutors of final thesis | Physical number of tutors of final thesis (without PhD.) | Physical number of tutors of final thesis (experts from practice) |
|---|---|---|---|---|
| Bachelor thesis | | | | |
| 107 | 106 | 79 | 19 | 5 |
| Master thesis | | | | |
| 120 | 118 | 94 | 8 | 10 |
| Doctoral thesis | | | | |
| 10 | 10 | 10 | 0 | 0 |

## Students' awards

Awards of students within the university

- Dean's prize was in 2021 awarded to the following students of the 1st degree study:
  - Ján Švec (study program Electrical Engineering)
  - Iveta Mjartanová (study program Multimedia Technologies)
  - Martina Šelingová (study program Biomedical Engineering)
  - Filip Kalus (Process Control)
- Dean's prize was in 2021 awarded to the following students of the 2nd degree study:
  - Marek Bajtoš (study program Biomedical Engineering)
  - Adam Hlaváč (study program Electric Drives)
  - Samuel Antoška (study program Multimedia Engineering)
  - Kristína Kasperová (study program Process Control)
  - Ján Václavík (study program Telecommunications and Radiocommunication Engineering)
- Rector's prize was awarded in 2021 to:
  - Daniel Mrena (study program Control Engineering, 1st degree study)
  - Patrik Prôčka (study program Biomedical Engineering, 2nd degree study)
  - Andrej Kovalíček for diploma thesis (study program Power Electronic Systems, 2nd degree study)
  - Petra Maniaková for excellent study results (study program Electrotechnologies and Materials, 3rd degree study)
  - Tadeáš Bednár - Rector's Award in the category of doctoral studies in 2021.
- Student awards for works presented at ŠVOS:
  - 1st place: Daniel Mrena (1st degree study)<br>Patrik Miček (3rd degree study)
  - 2nd place: Juraj Kekelák (1st degree study)<br>Boris Cucor (3rd degree study)
  - 3rd place: Jakub Kubíček (1st degree study)<br>Michal Vidlák (3rd degree study)

## Support for students in 2021

### Scholarships (motivation, faculty)

For excellent study results the Faculty provides the scholarships to students. These scholarships were allocated in 2021:

- merit scholarships - the number of students: 89, the amount paid: 45 793 EUR,
- special scholarships - the number of students: 4, the amount paid: 710 EUR,
- social scholarships - the average number of recipients/students: 28,7, the amount paid: 49 385 EUR,
- trade scholarships - number 379, the amount paid: 161 099,35 EUR,
- from own resources - the number of students: 33, the amount paid: 13 015 EUR.

### Consultation and advice

Students have the opportunity to consult issues related to the study with student advisors and the vice dean for education, what they are actively using.

### Level of students' satisfaction with the services (accommodation, food, availability of administrative staff, library, learning environment, ICT ...)

Students expressed their satisfaction/dissatisfaction with the services through the questionnaires that are continuously processed and evaluated. Positive suggestions are used for improving the quality of the services.

# SCIENTIFIC RESEARCH ACTIVITIES

Together with education, the scientific and research activities are the primary mission of the Faculty and its further growth is a necessary assumption of the future development since it is closely related to the quality of education. Scientific and research activities are at FEEIT realized especially in the form of projects and are mainly based on individual activities at departments and their co-operation. One of the major outputs of scientific and research activities are scientific publications indexed in major international databases such as Web of Science and SCOPUS and international conferences supported by major professional organizations, in particular the IEEE, SPIE, IFAC, IFIP, ACM, SEFI, etc.

The most important types of projects are international ones together with projects financed from the Structural Funds as well as projects supported from national resources through the Slovak Research and Development Agency (SRDA), the Scientific Grant Agency of the Slovak Ministry of Education, Science, Research and Sport and the Slovak Academy of Sciences (VEGA) and the Cultural and Educational Grant Agency of the Ministry (KEGA). Cooperation with industrial partners in the field of applied research is also of high importance.

## Grant projects and cooperation with practice

In total 13 projects of international cooperation, 36 projects financed from national sources, 7 projects of Structural Funds and 35 other projects have been realized at FEEIT in 2021. The most important information about the projects is summarized in the following subsections. The contract-based expertise activities are also listed.

## Projects of International Programmes

### Horizon 2021

| **MSCA-RISE-2016: SENSors and Intelligence in BuiLt Environment SENSIBLE** | |
|---|---|
| | The goal of this project is to develop novel information sensing research and innovation approaches for acquiring, communicating and processing a large volume of heterogeneous datasets in the context of smart buildings, by building an international, inter-disciplinary and inter-sectoral collaboration network through research and innovation staff exchanges and seamless exchange of ideas, expertise, data, testbeds, and know-how. The need to sense and process ever increasing amount of data requires novel engineering that goes far beyond conventional centralised methods, where signal acquisition, communications and data processing are performed centrally and independently. Building on integrating signal acquisition, communications and information extraction into an overarching smart sensing approach, the project will provide a holistic decision support framework for non-residential buildings of the future.<br>The key challenges of providing intelligence to the building lie in ubiquitous sensing, inside and outside the building, and connecting the sensing technology to people and outside world via meaningful decision support. Though significant research has been dedicated to developing novel sensing and instrumentation technologies, further research and innovation advances are needed to integrate physical sensing to data processing via distributed estimation and fusion approaches, giving actionable meaning to the suite of collected data. In that context, it is necessary not only to continuously monitor the environment, |

| | |
|---|---|
| | equipment, systems and processes, but also to sense occupants' behaviour inside and outside the building and provide timely response and feedback. |
| Realization: | 01/2017 – 12/2021 |
| Coordinator: | Vladimir Stankovic, University of Strathclyde, Glasgow, UK |
| Sub-Coordinator from FEEIT: | Juraj Machaj (DMICT) |
| Co-operators: | Milan Dado (DMICT), Stanislav Jurečka, Gabriel Cibira (IAS), Peter Holečko, Michal Gregor, Vojtech Šimák (DCIS), Peter Braciník (DPSED) |

COST projects

| **Action CA16212: Impact of Nuclear Domains On Gene Expression and Plant Traits (INDEPTH)** | |
|---|---|
| Summary: | Plants are vital to human life and health and are essential to mitigate the effects of climate change. Due to their sessile lifestyle, plants have developed the ability to rapidly adapt their genome expression in response to environmental challenges. Multiple lines of evidence indicate that spatial (3D) organization of nuclear DNA is critical in this adaptation process and the Impact of Nuclear Domains On Gene Expression and Plant Traits (INDEPTH) network will decipher how nuclear architecture, chromatin organization and gene expression are connected and modified in response to internal and external cues. To address this challenge, the INDEPTH Action gathers a pan-European network addressing this by bringing state-of-the-art technologies and fostering multidisciplinary approaches at research, training, education and industrial levels in high- and super-resolution microscopy, 3D image analysis and software development, chromatin domain mapping, genomics, bioinformatics and plant phenotyping. Standard protocols and procedures will be defined in these fields of competence and relevant -omics and 3D images datasets will be deposited in a public repository for inter-laboratory benchmarking and teaching. INDEPTH will promote early career investigators and foster exchange of skills, techniques and know-how between partners through Short Term Scientific Missions and Training Schools. Industrial partners developing software for microscopic devices, new expression technologies or plant varieties with enhanced yield adapted to climate change will integrate INDEPTH outputs for commercial developments. INDEPTH will ultimately lead to a better understanding of agriculturally relevant challenges such as complex plant traits and their interactions with the environment in the context of climate change. |
| Realization: | 11/2017 – 11/2021 |
| Coordinator: | Patrik Kamencay (DMICT) |

| **Action CA17136: INDAIRPOLLNET** | |
|---|---|
| Summary: | INDAIRPOLLNET (INDoor AIR POLLution NETwork) will improve our understanding of the cause of high concentrations of indoor air pollutants. It will assemble experts in laboratory and chamber experiments, modelling studies and measurements of relevance to indoor air quality (IAQ), including outdoor air chemists. Our network includes experts in chemistry, biology, standardisation, particulate matter characterisation, toxicology, exposure assessment, building materials (including those manufactured specifically to improve IAQ such as green materials), building physics and engineering (including ventilation and energy) and building design. This Action aims to significantly advance the field of indoor air pollution science, to highlight future research areas and to bridge the gap between research and business to identify appropriate mitigation strategies that |

| | |
|---|---|
| | optimise IAQ. The findings will be disseminated to relevant stakeholders such as architects, building engineers and instrument manufacturers. |
| Realization: | 09/2018 – 09/2022 |
| Coordinator: | Peter Brída (DMICT) |

| **Action CA19121: Network on Privacy-Aware Audio- and Video-Based Applications for Active and Assisted Living** | |
|---|---|
| Summary: | The aim of GoodBrother is to increase the awareness on the ethical, legal, and privacy issues associated to audio- and video-based monitoring and to propose privacy-aware working solutions for assisted living, by creating an interdisciplinary community of researchers and industrial partners from different fields (computing, engineering, healthcare, law, sociology) and other stakeholders (users, policy makers, public services), stimulating new research and innovation. GoodBrother will offset the "Big Brother" sense of continuous monitoring by increasing user acceptance, exploiting these new solutions, improving market reach. |
| Realization: | 09/2020 – 09/2024 |
| Coordinator: | Peter Počta (DMICT) |

| **Action CA20120 INTERACT – Intelligence-Enabling Radio Communications Dro Seamless Inclusive Interactions** | |
|---|---|
| Summary: | The Action aims to achieve scientific breakthroughs by introducing novel design and analysis methods for making future radio communication networks intelligent, meaning aware, adaptive and parsimonious, and contributing to the creation of intelligent environments. |
| Realization: | 10/2021 – 10/2025 |
| Coordinator: | Juraj Machaj (DMICT) |

| **Action CA15213: Theory of hot mater and relativistic heavy-ion collisions** | |
|---|---|
| Summary: | This COST Action „Theory of hot mater and relativistic heavy-ion collisions" (THOR) creates a theoretical community platforma counterpart to the ongoing vigorous exceptional potential in this field of theoretical research. THOR will pioneer novel approaches to the theoretical understanding of the properties of QCD from first principles and on the interpretations of these properties by effective models and numerical simulations of the system`s evolution. By this, THOR will provide new insights on the paramount questions of the field. Therefore THOR aims at bringing together excellent researchers in order to pinpoint and discuss the challenges that the field meets currently and in the near future for creating a vibrant, innovative and world-leading pan-European research environment. |
| Realization: | 10/2016 - 04/2021 |
| Coordinator: | Marcus Bleicher, Frankurt |
| Co-operators: | Ivan Melo (DPh) |

| **CA17124: Digital forensics: evidence analysis via intelligent systems and practices** | |
|---|---|
| Summary: | The objective of the COST action is to form a network for the exploration of artificial intelligence and automated reasoning applications in the field of digital forensics and creating a synergy between these areas. |
| Realization: | 09/2018 – 09/2022 |
| Coordinator: | Jesus Medina (Facultad de Ciencias, Campus Río San Pedro, Spain) |
| Co-operators: | Peter Holečko (DCIS) |

## ERASMUS Projects

| **2020-1-PL01-KA226-SCH-096354 (2021 – 2023): Erasmus + program: A lexicon of educational films on the subject of STEM for primary and secondary school students - films4edu** | |
|---|---|
| Summary: | The goal is to create a set of physics educational videos for pupils of elementary and secondary/high schools in Europe. |
| Realization: | 01/2021 – 12/2023 |
| Coordinator: | Peter Hockicko (DPh) |
| Co-operators: | Tarjányiová Gabriela, Vaculík Martin, Uhrina Miroslav, Bienik Juraj, Kúdelčík Jozef, Hardoň Štefan, Šinko Martin, Holešová Anna (DPh) |

## Other International Research Projects

| **22010345: Engineering platform and cooperation in area of nanocomposites** | |
|---|---|
| Summary: | We are in an era of nanocomposites that can be used in almost any area and help conserve natural resources. In the field of electrical engineering, nanoparticles improve the electrical parameters of materials for the use of high-voltage cable lines and powerful direct current transformers (HVDC). The development of cooperation is based on pillars, exchange lectures of experts at each partner and the division of diagnostic methods and analyzes according to the equipment and focus of the workplace. The team's knowledge in this area will be applied in the industrial area. |
| Realization: | 06/2020 – 10/2021 |
| Coordinator: | Jozef Kúdelčík (DPh) |
| Co-operators: | Štefan Hardoň (DPh) |

| **Study of short-range correlations in a few nucleon systems** | |
|---|---|
| Summary: | Short-range correlations are studied in a few nucleon systems in reactions produced with polarized and unpolarized deuteron beams in the region of medium energies, in particular investigation of an elastic dp scattering and deuteron fragmentation on proton. |
| Realization: | 01/2021 - 12/2021 |
| Coordinator: | Marián Janek (DPh) |
| Co-operators: | Gabriela Tarjányiová, Marek Veveričík (DPh) |

## Other International Non-research Projects

| **EPPCN Agreement KE3202** | |
|---|---|
| Summary: | The EPPCN Member (Ivan Melo) acts as CERN`s communications point of contact in the Member State or Associate Member State in which he/she resides and cooperates in the promotion of CERN`s mission and the demonstration of its importance at the national level. |
| Realization: | 01/2021-12/2024 |
| Coordinator: | Ana Godinho, CERN |
| Co-operators: | Ivan Melo (DPh) |

| **Project of the European physical society international physics MASTERCLASSES 2020** |
|---|

| | |
|---|---|
| Summary: | High school students spend one day with physicists of elementary particles during which they learn to evaluate real experimental data from the LHC accelerator. |
| Realization: | 01/2021-12/2021 |
| Coordinator: | Ivan Melo (DPh) |
| Co-operators: | Gabriela Tarjányiová, Mikuláš Gintner, Jozef Kúdelčík, Juraj Remenec (DPh) |

| **PLSK.03.01.00-24-0181/18: GAME JAM as new didactic method. Improvement of quality of teaching in area of new technologies in region of polish-Slovak border** | |
|---|---|
| Summary: | The goal of the project is to improve cross border teaching in the area of multimedia technologies by the creation of a forum for the presentation of the gaming industry and companies in the given area from the region around Polish-Slovak border. The main contribution of the project is the organisation of joint GAME JAMs, i.e. events where students from both universities can form teams and compete in game design, exchange experience and meet experts from the gaming industry. |
| Realization: | 10/2019 – 09/2021 |
| Coordinator: | Agnieszka Maj, Silesian university, Katowice |
| Sub-Coordinator from FEEIT: | Miroslav Benčo (DMICT) |
| Co-operators: | Peter Sýkora, Patrik Kamencay, Olga Kovalčiková (DMICT) |

## Projects of National Programmes

### Slovak Research and Development Agency (SRDA)

| **APVV-20-0528: New semiconductors and catalysts for green hydrogen production** | |
|---|---|
| Summary: | Photoelectrochemical hydrogen production has the potential to achieve efficiencies above 10-15 % and stability for more than 10 years. These goals can be achieved by several architectures of photovoltaic and photoelectrochemical systems for controlled splitting of water molecules. The n-type Eg semiconductor photoanode (1.8–2.4 eV) is used for oxygen evolution and the smaller Eg (1.0–1.5 eV) semiconductor photocathode initiates hydrogen production. This tandem configuration allows for more efficient utilization of solar radiation, leading to higher efficiency and better adaptation to fluctuations in lighting levels. In addition to the issue of electrode formation, the project also addresses the problem of long-term protection and stability of photoelectrochemical processes for hydrogen production. |
| Realization: | 07/2021 – 12/2024 |
| Coordinator: | Peter Čendula (IAS) |
| Co-operators: | Stanislav Jurečka, Gabriel Cibira, Martin Králik (IAS) |

| **APVV-19-0214: Biocompatibility and objectification of the grid frequency electromagnetic field in densely populated areas (LIFE)** | |
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| Summary: | The modern age is characteristic with rapid expansion of new technologies and increasing densification of specific geographic locations. These features result in increased demands pertaining to power energy grids that bring also negative environmental impacts. Rapidly increasing electromagnetic background in the |

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| | living environment and elevated awareness of general public evoke reasonable concerns connected to the potential health risks.<br>International Agency for Research on Cancer (IARC) classified electromagnetic field as carcinogen type 2B in 2013. European Union policies call on national governments to ensure simple and feasible public access to information regarding the potential risks of electromagnetic field and environmental impact thereof and to apply the principle of "reasonable prevention" according to the international standard ALARA - "as low as reasonably achievable".<br>In Slovakia, up to this day, there do not exist any verified and publicly available information on the levels (magnitudes) of artificial electromagnetic fields, any assessment of possible biological effects and impact thereof on population health, and any effective preventive measures.<br>Implementation of the present multidisciplinary project expressively contributes to the realisation of the European policies at national level. The activities are focused on: 1) objectification of the 50 Hz electromagnetic background levels in select, densely populated areas, also extending beyond the designated protection zones; 2) a qualitative and quantitative analysis of potential biological effects of grid frequency electromagnetic field and 3) suggestion of effective preventive measures for decreasing the effects. Keystone for the project realization is synergy of research capacities of partners' institutions, complementarity of their competences and unique research infrastructure. The main project outcome is creating a unique web portal that will provide information pertaining to the levels of artificial electromagnetic low-frequency background in selected densely populated areas, to the related potential health risks and to the recommendations for appropriate preventive measures. |
| Realization: | 07/2020 – 06/2023 |
| Coordinator: | Milan Smetana (DEBE) |
| Co-operators: | Ján Barabáš, Mariana Beňová, Daniela Gombárska, Ladislav Janoušek, Zuzana Judáková, Zuzana Pšenáková, Roman Radil, Maroš Šmondrk (DEBE) |

| **APVV-19-0290: Research and development of lower limb prosthetic sockets manufactured by additive technologies (PSAMBS)** | |
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| Summary: | The aim of the present project is the digitisation and improvement of the current empirical procedure for the design of sockets in the technological process of the current orthopaedic practice using the digital of amputation stump, modelling of sockets in the system CAD/CAM, analysis of the performance of the socket at different settings in thickness and the fill and finally the manufacture of sockets of the lower limbs using additive technology of 3D printing. |
| Realization: | 07/2020 – 06/2023 |
| Coordinator: | Jozef Žifčák (Technical University of Košice) |
| Co-operators: | Ladislav Janoušek, Branko Babušiak, Štefan Borik, Michal Gála (DEBE) |

| **APVV-17-0631: Co-existence of photonic sensor systems and networks within the Internet of things** | |
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| Summary: | With the development of Internet of Things (IoT) technology and systems, signal collection, processing and transmission requirements are increasing in virtually all areas of society. Photonic solutions play an important role in this. This is important both on the side of signal transmission - especially in backbone networks, as well as on the side of data collection systems, especially for machine to machine (M2M). The project is focused on the coexistence of photonic sensor systems and photonic communication networks with an emphasis on more efficient use of existing communication infrastructure for the purpose of sensing |

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| | and detecting various physical quantities. The scientific knowledge from this part of the project will be used in the design of advanced photonic sensors and sensor systems and networks applicable in IoT solutions based on integrated sub-wave photonics and fiber optic systems. |
| Realization: | 08/2018 – 06/2021 |
| Coordinator: | Milan Dado (DMICT) |
| Co-operators: | Michaela Holá, Gabriel Cibira (IAS), Jozef Dubovan, Miroslav Markovič, Ján Litvik, Michal Kuba (DMICT) |

| **APVV-17-0345: Research of the optimization procedures for improvement of transfer, safety and reliability characteristics of WET system** | |
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| Summary: | The project focuses on the research of the optimization methodology of the WET (Wireless energy transfer) operating parameters, representing a progressive solution for the transfer of energy to mobile and industrial equipment. The main aim of the project is the research of properties that influence it:<br>• technical and hygienic properties (investigation of negative impact on living and non-living objects) and<br>• relevant parameters of WET systems, such as efficiency, action radius, reliability, and environmental safety. The main reason for this research is the fact that the use of WET systems in terms of a variety of application uses can be expected within the power infrastructure of electric vehicles, cars (contactless charging, dashboard power supply, infotainment power supply, non-contact entertainment charging - smartphones, tablets etc. ...) in smart-grid systems in homes, industrial chargers for mobile and service robots, medical applications ... In the first step the solution will identify the interaction phenomena that affect the negative interference of WET systems with the environment. This is mainly about:<br>• radiating EMI into the environment - modification of coil geometry and layout,<br>• optimization of topology of the main circuit and compensating elements,<br>• an appropriate way to manage energy transfer. Based on the results obtained, optimization of properties through multi-physical analyses and multi-level simulations will be carried out in order to significantly improve the efficiency of the process of receiving and controlling the flow of energy on the load side. Another task will be to investigate interactions of WET systems with biological systems. A very important step will be to suppress undesirable impacts by topological optimization of the WET system, while the primary method will be computer simulation realized through circuit and block simulators, respectively. 3D Field Analysis Systems (COMSOL) using models with a wide range of validity |
| Realization: | 08/2018 – 06/2022 |
| Coordinator: | Pavol Špánik (DME) |
| Co-operators: | Michal Frivaldský, Viliam Jaroš, Miroslav Pavelek, Marek Paškala, Ján Morgoš, Michal Pipíška, Branislav Hanko (DME) |

| **APVV-17-0218: Investigation of biological tissues with electromagnetic field interaction and its application in the development of new procedures in the design of electrosurgical instruments** | |
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| Summary: | The aim of this research is to investigate the interaction of the radio frequency electromagnetic field with biological tissues, with an emphasis on the investigation of the effects of vaporization, fulgurisation and desiccation of tissues. These tissue effects will be investigated in connection with the design of the optimal electrosurgical unit, which is one of the most commonly used devices in medical practice.. The aim of the project will be to investigate the |

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| | phenomena of a major impact on the effectiveness of electrosurgical instruments. An important aspect will be the implementation and correct interaction of progressive solutions to assess the frequency and temperature dependence of tissue impedance with different dielectric properties. |
| Realization: | 07/2017 – 06/2022 |
| Coordinator: | Dagmar Faktorová (DMAEE) |
| Co-operators: | Pavol Špánik, Miroslav Pavelek, Marek Paškala, Michal Frivaldský, Rastislav Štefún (DME) |

| **APVV-20-0500: Research of methodologies to increase the quality and lifetime of hybrid power semiconductor modules** | |
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| Summary: | The presented project deals with a high-current topic in the field of power semiconductor systems, specifically power semiconductor hybrid modules. The penetration of these components within industrial applications is continuously more pronounced, to which the considerable development of electrification of transport systems also contributes. It is the power semiconductor modules that represent the basic building block that enables an increase in the degree of electrification of transport systems. At this point, it should be noted that the reliability, durability, and efficiency of the modules are primary aspects for achieving ecological mobility. From the above facts, the project deals with the problems of elimination of adverse phenomena related to the production of power semiconductor hybrid modules. The solution consists of research and development of progressive inspection systems for fault detection during the production process. |
| Realization: | 07/2021 – 06/2025 |
| Coordinator: | Michal Frivaldský (DME) |
| Co-operators: | Libor Hargaš, Dušan Koniar, Kristián Takács, Jakub Škorvaga (DME) |

| **APVV-19-0602 3D photonic polymeric microsensors integrated with optical fibers** | |
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| Summary: | The main goal of the project is to acquire latest knowledge in design, preparation and characterization of polymer photonic microsensors, which will be designed to integrate with optical fibers for the preparation of optical fiber microsensors for measuring pressure, temperature, elongation, magnetic and electric fields. Utilizing innovative design approaches for specific 3D photonic structures, simulating their optical transmission properties and changing of the properties depending on changes in the structural parameters and properties of the external environment, in which the structures will be placed, will provide a competitive advantage and potential of commercial use. |
| Realization: | 07/2020 – 06/2023 |
| Coordinator: | Ivan Martinček (DPh) |
| Co-operators: | Daniel Káčik, Norbert Tarjányi, Matej Goraus, Daniel Jandura, Ľuboš Šušlik, Petra Maniaková (DPh) |

| **APVV-20-0264: Nano-optical probes and sensors integrated on optical fiber** | |
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| Summary: | The goal is the research and development of nanostructures and their integration on optical fibers for probes with high resolution for the near-field characterization and optical scanning. Research is based on the preparation of semiconductor and conductor-dielectric nanostructures using 3D technologies, which will be in the end implemented on an optical fiber. |
| Realization: | 08/2021 – 12/2024 |
| Coordinator: | Dušan Pudiš |

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| Co-operators: | Matej Goraus, Daniel Jandura, Ľuboš Šušlik, Petra Maniaková, Jana Ďurišová, Ivana Lettrichová, Patrik Miček, Tomáš Mizera |

| **APVV-18-0167: Smart clothing for E-health applications (E-clothing)** | |
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| Summary: | The intent of the project is reacting to long-term forecasts of social development in Slovakia and Europe over the next 20-30 years. It is clear that cardiovascular diseases are among the top 21st century civilization diseases and the percentage of people with this disease type will increase steadily. Health impacts of cardiovascular diseases can be reduced through early diagnosis, appropriate disease management, rehabilitation and prevention. The main goal of this project is to contribute to the specific prevention and diagnostics of cardiovascular diseases via multifunctional biotelemetric intelligent clothing for E-health applications. The project is intended to prepare and verifying the production of these garments with centralized integrated circuit and own mobile application designed for sensing, transmitting, recording and evaluating bioelectric signals in the form of an electrocardiogram (ECG), body temperature and real-time human position monitoring. |
| Realization: | 07/2019 – 06/2021 |
| Coordinator: | Ladislav Janoušek (DEBE) |
| Co-operators: | Branko Babušiak, Štefan Borik, Michal Gála, Maroš Šmondrk (DEBE), Hudec Róbert, Markovič Miroslav, Paralič Martin (DMICT) |

| **APVV-17-0014: Smart tunnel: telematic support for emergencies in the traffic tunnel** | |
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| Summary: | The objective of the project is to design of a unique and competitive system, which will enable to decrease safety risks resulting from the operation of a road tunnel. The system design and functional specification will be provided in a proper form for realisation of commercial solutions. The consumer will be provided by integrated UML software specification with focus on identification and classification of safety critical events in tunnels. |
| Realization: | 07/2018 – 12/2021 |
| Coordinator: | Rastislav Pirník (DCIS) |
| Vice-coordinator | Jozef Svetlík (Faculty of Security Engineering UNIZA) |
| Co-operators: | Emília Bubeníková, Peter Holečko, Aleš Janota, Peter Nagy, Juraj Spalek (until 08/2021), Kamila Kršíková, Marek Bujnák (DCIS), Lenka Siváková, Vladimír Mózer, Tomáš Loveček, Stanislava Gašpercová (FBI UNIZA) |

| **APVV-20-0626 HuDyM - Biofidelic human body surrogate to increase the objectivity within the forensic analysis of road traffic accidents.** | |
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| Summary: | Forensic analysis of road traffic accidents (TA) within the expert department "03 03 01 Road traffic accidents" is complex and interdisciplinary problematics with potentially extensive volume of input parameters within the axis “vehicle-human-road”. Input parameters are often of partial character and with technical uncertainties. This has a negative influence with respect to unambiguity of technical reconstruction and analysis of TA, that serves as a basis for decision making in criminal justice system. Within the forensic analysis of TA with vulnerable road users (pedestrians, cyclists), influence of the element “human” is significant for reconstruction and analysis of this subset of TA. This is valid particularly regarding using the human body injuries as a basis for determining the course of TA. Suggested research deals with current problematics of virtual and real-world surrogates of human body that will serve primarily for interdisciplinary objective forensic analysis of TA with vulnerable road users, but |

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| | with application in other fields that use knowledge of injury biomechanics. Mathematical-physical models and real-world surrogates of human body that currently exist do not provide level of commonly available and universally applicable tools for wide spectrum of applications. This argument is valid in international context. The goal of suggested project is integrated research and construction of simulation mathematical-physical model and real-world surrogate of adult human body with increased biomechanical fidelity for multidirectional mechanical loading with focus on dynamic impact loading of vulnerable road users within TA. Project outputs will be applied directly in traffic accident analysis, but also in analysis of human body movement in forensic reconstruction of criminal cases, analysis of other accident events (work injury) and biomechanical research of injury mechanisms in human body dynamic loading. |
| Realization: | 07/2021 – 12/2024 |
| Coordinator: | Eduard Kolla (UZVV) |
| Co-operators: | Peter Vestenický (DCIS) |

| **APVV SK-IL 2018-0005: ICT and smart cars for efficient emergency response and traffic management SENECA** | |
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| Summary: | The role of efficient emergency response systems is critical for supporting speedy rescue actions and improvement of citizens lifesaving rates. Typically, actions that are taken in the first minutes following the emergency event have the largest impact. Thus, quick and safe arrival of emergency vehicles to the affected destination is of utmost importance. The goal of the project is to evaluate how ICT installed in smart vehicles and road infrastructure will eliminate unnecessary transport delays and the risk of incidents that are either experienced by emergency vehicles or induced by emergency response. The focus will be on urban areas, which are particularly vulnerable, not only because of the concentration of population but also due to the interplay between humans, vehicles, infrastructure and technological systems. The nature of delays will be analysed using available data and video recordings. Requirements coming from the emergency management to the traffic management will be defined and used as an input for dynamic management of urban traffic flows. In the next step, optimization algorithms for traffic signal control will be developed to evaluate the likely future scenario of mixed traffic flow generated by conventional vehicles, Connected and Autonomous vehicles (CAVs). Three main inputs for algorithms will be considered: requirements of the emergency response system, situational data gathered by CAVs and sensors built-in traffic management infrastructure. To ensure feasibility of the proposed solutions, selected scenarios will be assessed by a federated simulator that combines realistic simulation of road traffic flows with realistic simulation of communication protocols. The project will combine the expertise of the Slovak partner in the traffic incident management methods, emergency response systems and ICT with the unique expertise of the Israeli partner in transport modelling and in developing the traffic signal control and navigation algorithms. |
| Realization: | 2018 – 2021 |
| Coordinator: | Milan Dado (DMICT) |
| Co-operators: | Peter Počta (DMICT) |

| PP-COVID-20-0100: DOLORES.AI: The pandemic guard system | |
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| Summary: | The main idea of the project proposal is to create an intelligent guard system for conditional access to monitored locations in critical virologic situations. The system will be able to analyze three states of facemask (no facemask, face mask, incorrect facemask), contactless temperature measurement with real body temperature estimation based on a deep learning model that will analyze temperatures from forehead, eyes and other face parts in combination with actual weather conditions. Furthermore, the count of incoming and outcoming people will be implemented. All data processing and analysis will be provided by developed hardware. The main aim is to develop cheap and affordable solutions even for small businesses. An extension to the hardware solution and another benefit in the project will be the creation of a centralized system for the collection, evaluation, and visual display of the collected data. |
| Realization: | 09/2020-12/2021 |
| Coordinator: | Patrik Kamencay (DMICT) |
| Co-operators: | Miroslav Benčo, Róbert Hudec, Roman Jarina, Peter Sýkora, Martina Radilová, Slavomír Matúška,. Martin Paralič, Daniel Benedikovič, Miroslav Markovič, Jozef Dubovan, Michal Chmulík, Lukáš Ševčík, Dáša Tichá (DMICT) |

Scientific Grant Agency of the Slovak Ministry of Education, Science, Research and Sport and the Slovak Academy of Sciences (VEGA)

| VEGA 1/0069/19: Polymeric photonic structures for sensor applications | |
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| Summary: | Project aims to apply theoretical knoledge towards the design, preparation and characterization of polymeric photonic structures integrated with optical waveguides or with optical fibres for sensor applications. |
| Realization: | 01/2019 – 12/2022 |
| Coordinator: | Ivan Martinček (DPh) |
| Co-operators: | Dušan Pudiš, Daniel Káčik, Norbert Tarjányi, Ivana Lettrichová, Jana Ďurišová, Peter Gašo, Daniel Jandura, Ľuboš Šušlik, Matej Goraus (DPh) |

| VEGA 1/0348/18: Theory of ultrarelativistic nuclear collisions and matter in extreme conditions | |
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| Summary: | The goal is a theoretical study of matter created in nucleus-nucleus collisions. A Monte Carlo generator will be improved to take into account spacial anisotropy and a possibility of fragment formation. |
| Realization: | 01/2018 – 12/2021 |
| Coordinator: | Kolomeytsev Evgeny, UMB Banská Bystrica |
| Co-operators: | Ivan Melo (DPh) |

| VEGA 2/0043/21: Self-assembly processes in soft hybrid mixtures of liquid crystals and nanoparticles | |
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| Summary: | The goal is to study self-assembly processes in liquid crystals doped with various nanoparticles. We will focus on the self-assembly induced in these composites by electric/magnetic fields at micro and nano levels and on the investigation of this process in various phases – isotropic, nematic and cholesteric. |
| Realization: | 01/2021 – 12/2021 |
| Coordinator: | Natália Tomašovičová, Institute of Experimental Physics SAS |
| Sub-Coordinator from FEIT: | Peter Bury (DPh) |
| Co-operators: | Jozef Kúdelčík, Marek Veveričík, Štefan Hardoň (DPh) |

| VEGA 1/0471/20: Degradation analysis of insulating elements of high-voltage transformers | |
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| Summary: | The aim of the project will be to analyze the insulation state of various high-voltage transformers with respect to the degradation effects of operation and environment. The main attention will be devoted to diagnostics of insulating state of transformer, where for the dry devices they are mainly epoxy resins and in the oil devices it is oil-paper insulation. The effects of short-circuit and inrush currents, overload, overvoltage, environmental effects and other operating factors on the degradation effects of insulating elements will be analyzed. Subsequently, the effect of partial discharges in the transformer insulation, which has a direct impact on the degradation of the insulating state, will be analyzed. The process of their formation, extension and influence on the insulation of the transformer will be described. New measurement procedures, diagnostic methods and systems will be proposed, the results of which will be used to determine the degree of degradation of insulating elements of the transformers. |
| Realization: | 01/2020 – 12/2022 |
| Coordinator: | Miroslav Gutten (DMAEE) |
| Co-operators: | Milan Chupáč, Daniel Korenčiak, Matej Kučera, Milan Šebök, Milan Šimko (DMAEE) |

| VEGA 1/0626/19: Research of mobile object localization in IoT environment | |
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| Summary: | The number of Location Bases Services is growing rapidly with the deployment of IoT networks, however, these services have various requirements on localization accuracy. Service providers should provide access to services in all environments. Therefore, positioning systems have to utilize all available technologies and data for position estimation. However, it is important to take into account the effectivity of the system. High accuracy localization is not required by all provided services. The goal of the project is to propose a localization system for IoT, which will integrate available data to estimate the position of devices and users. Data assumed to be used for positioning are signals from wireless networks and data from sensors implemented in devices connected to IoT. The project will be focussed on the research of algorithms based on fingerprinting as well as ad-hoc networks with the use of data from sensors. Proposed algorithms will allow optimal use of data for localization while securing the required quality of service. |
| Realization: | 01/2019 – 12/2021 |
| Coordinator: | Brída Peter (DMICT) |
| Co-operators: | Juraj Machaj, Darina Jarinová, Peter Počta, Bohumil Adamec, Roman Jarina, Veronika Hromadová, Peter Kasák (DMICT) Peter Vestenický (DCIS) |

| VEGA 1/0540/18: 3D photonics based on polymers for integrated optics and optoelectronics prepared by laser lithography | |
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| Summary: | Project is focused on preparation of photonic structures and elements for integrated optics and optoelectronics using maskless optical lithographic techniques. The key technology is the 3D laser litography. The goal is to prepare original 3D photonic structures with a period of the order of a few hundred nanometers and various functional 3D photonic elements (Mach-Zehnder interferometer and a circular resonator in 3D arrangement). |
| Realization: | 01/2018 – 12/2021 |
| Coordinator: | Dušan Pudiš (DPh) |

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| Co-operators: | Ivan Martinček, Daniel Káčik, Ľuboš Šušlik, Daniel Jandura, Ivana Lettrichová, Peter Gašo, Jana Ďurišová, Matej Goraus, Petra Urbancová, Tomáš Mizera (DPh) |

| **VEGA 1/0593/20: Research of energy flow control in the network using a smart transformer** | |
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| Summary: | The project is focused on the design of the topology and control system of an electronic "smart transformer" in a smart grid network. The primary area of application is within small and medium-sized networks, consisting of households, renewable energy sources and storage. The aim of the project is to select the topological configuration and design the energy flow control of the electronic intelligent transformer. The smart transformer will be designed to control the flow of energy between renewable energy sources, load (batteries), micro grid systems and the distribution network. The methodology will be divided into several parts, the first part will be the selection of a suitable topology for the electronic transformer, the second step is the design of active control of the smart transformer with emphasis on minimizing power supply back to the distribution system and maximizing energy use within the node with smart transformer. In order to obtain information about the state of the network and individual elements, a detailed design of methods and systems for measuring energy flow will be needed. |
| Realization: | 01/2020 – 12/2022 |
| Coordinator: | Peter Drgoňa (DME) |
| Co-operators: | Michal Frivaldský, Ondrej Hock, Pavol Špánik, Peter Šindler, Ján Morgoš, Peter Sojka (DME) |

| **VEGA 1/0085/21: Research of methods for increasing the efficiency of electric multiphase motor drive systems for automotive applications** | |
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| Summary: | The project is focused on the optimization of drives efficiency with multiphase motors in the field of automotive applications. The content will be an analysis of inverters and their control for multiphase motors. Firstly, it will be a specification of the converter in terms of efficiency. The classic solutions of multi-phase inverters are compared with prospective options such as matrix converters. The second area of research will be the investigation of minimizing the impact on the network. The basic parameter will be to achieve the power factor close to one. An important part will be the research of a suitable method of motor connection to the effective use of the input supply voltage. The primary research method will be computer simulations realized by circuit and block simulators. The result of the synthesis will be the converter and the control method. A real sample of the converter will be used for verification. Finally, the control of two multiphase motors with one inverter will be investigated. |
| Realization: | 01/2021 – 12/ 2023 |
| Coordinator: | Slavomír Kaščák (DME) |
| Co-operators: | Dobrucký Branislav,Praženica Michal, Jozef Šedo, Koňarik Roman, Kellner Jakub, Resutík Patrik, Zelník Richard (DME) |

| **VEGA 1/0063/21: Research of methodologies to increase the quality and lifetime of hybrid power semiconductor modules** | |
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| Summary: | The presented project deals with a high-current topic in the field of power semiconductor systems, specifically power semiconductor hybrid modules. The penetration of these components in industrial applications is continuously more pronounced, to which the considerable development of electrification of transport systems also contributes. It is the power semiconductor modules that |

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| | represent the basic building block that enables an increase in the degree of electrification of transport systems. At this point, it should be noted that the reliability, durability, and efficiency of the modules are primary aspects of achieving ecological mobility. From the above facts, the project deals with the problems of elimination of adverse phenomena related to the production of power semiconductor hybrid modules. The solution consists of research and development of progressive inspection systems for fault detection in the production process. |
| Realization: | 01/2021 – 12/2023 |
| Coordinator: | Michal Frivaldský (DME) |
| Co-operators: | Špánik Pavol, Drgoňa Peter, Praženica Michal, Jozef Šedo, Matúš Danko, Ďurana Peter, Šimčák Marek, Zelník Richard (DME) |

| **VEGA 1/0615/19: Scientific research of high-speed drive with minimal torque ripple** | |
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| Summary: | The presented project deals with the scientific research of high-speed drive from point of view of reducing torque ripple and minimizing vibrations. The entire electric drive consists of three important components: a high-speed motor, a power inverter and a control system with a suitable control structure. Base on this, the project is divided into the design and optimization of a high speed motor and a power inverter with a suitable control algorithm for sensor and sensorless control of the electric drive. The project will deal with the electromechanical motor design in terms of minimizing the torque ripple, designing and checking the mechanical strength and stiffness of the rotor. Another part of the project solves the power supply of an electric motor via a power inverter. The last part of the project focuses on the design and implementation of high speed drive control. |
| Realization: | 01/2019 – 12/2021 |
| Coordinator: | Pavol Rafajdus (DPSED) |
| Co-operators: | Pavol Makyš, Valéria Hrabovcová, Vladimír Vavruš, Lukáš Gorel, Pavel Lehocký, Marek Štulrajter, Juraj Makarovič, Martin Sumega, Patrik Varecha, Simon Zoššák (DPSED) |

| **VEGA 1/0371/19: Societal vulnerability assesment due to the failure of important systems and services in electricity sector** | |
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| Summary: | Reducing the level of social vulnerability is one of the main principles of the functioning of society. Social vulnerability is part of the disaster risk assessment and key information needed to assess relevant threats and measures to mitigate their adverse effects. Identifying key dimensions of vulnerability forms the basis for reducing risk and improving the society's preparedness for various risk and crisis situations. Part of the vulnerability assessment is the identification of the resources necessary to deal with an adverse event. The project focuses on research into the possibilities of quantifying the vulnerability of a society due to the failure of important systems and services in the electricity sub-sector. The main output of the project will be a hierarchical model and methodology of assessing social vulnerability, with practical application for a particular selected area, considering the failure of a part of the electricity system. |
| Realization: | 01/2019 – 12/2021 |
| Coordinator: | Mária Lusková (FBI, UNIZA) |
| Co-operators: | Peter Braciník (DPSED) |

| VEGA 1/0795/21: Research of side effect of modern control techniques on efficiency of electrical drive | |
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| Summary: | The presented project is focused on research in the field of electric drive control with application in the automotive industry, but not only in it, but in every area in which the implementation of electric drive places great emphasis on the overall efficiency of the drive. However, the uniqueness of this project will not be that it will address efficiency as such, but will address how other progressive algorithms of today's control techniques affect efficiency. These various algorithms include special techniques for reducing vibration and noise, sensorless algorithms, control techniques for various winding designs, algorithms requiring high sampling and switching frequencies. In its final evaluation, the project will clearly define what benefits but also negative impacts on the effectiveness of individual modern control techniques. Modifications of existing algorithms or new algorithms will be created, minimizing the impact on efficiency. This part will be the main benefit of the project. |
| Realization: | 01/2021 – 12/2023 |
| Coordinator: | Pavol Makys (DPSED) |
| Co-operators: | Pavol Rafajdus, Vladimir Vavrus, Lukas Gorel, Marek Stulrajter, Pavel Lehocky, Matej Pacha, Stefan Kocan, Michal Kovacik, Martin Sumega, Patrik Varecha, Simon Zossak (DPSED) |

Cultural & Education Grant Agency of the Slovak Ministry of Education, Science, Research and Sport (KEGA)

| KEGA 018ŽU-4/2021: Modern education methods in analysis, modeling and control of Power Semiconductor Systems | |
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| Summary: | The project focuses on the use of state-of-the-art research and educational methods aimed at developing the issue of Power Semiconductor Systems (VPS) at technical schools specializing in electrical engineering to support the development of the knowledge and skills of technical school graduates.<br>The priority goal of the project is the development of modern research and educational aids in the creation of study materials, university textbooks/lecture notes, and supporting educational resources for the needs of teaching VPS. An essential condition is the integration of the content of education into the real environment of the labor market, i.e., the connection of modern technologies from practice and the teaching process. Based on the results of the project, further innovative research in the given scientific field is expected. |
| Realization: | 01/2021 – 12/2023 |
| Coordinator: | Michal Praženica (DME) |
| Co-operators: | Peter Drgoňa, Anna Simonová, Marek Paškala, Slavomír Kaščák, Jozef Šedo, Roman Koňarik (DME) |

| KEGA 005ZU-4/2020: Creation of modern supporting mechanisms aimed at the development of pedagogicalpsychological competences of university teachers (beginners) at the technical and economical faculties at the University of Žilina. | |
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| Summary: | Project is based on the need to set up a systematic process at the University of Žilina for the education of university teachers at technical and economical faculties. This education will be focused on the area of development of their pedagogical-psychological competences. In the research phase, the project focuses on the study of contemporary professional information and comparison of the actual contents of education focused on the development of university |

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| | teachers in the field of their pedagogical activities. In the implementation of qualitative and quantitative research, we will focus on identifying individual stages in the professional life cycle of university teachers and identifying the current educational needs of university teachers in the field of engineering pedagogy. It implements the acquired knowledge in a monograph containing the results of the research and the creation of the proposal for new university teachers adaptation education. We will verify the updated content, forms and teaching instructions. We will continue by developing a modern electronic textbook and the necessary modern textbooks that are not currently available to UNIZA teachers. It will include a database of best practice - examples of the use innovative teaching strategies that activate students in teaching technical and economic subjects. These will be methodically prepared and will contain methodological sheets for teachers and students. We will share the project outputs on the website. Our goal is to stimulate formation of a learning professional community of professionals (university teachers) in the field of education and to find room for the exchange of experience and know-how, as co-researchers will actively participate in the implementation of each phase. |
| Realization: | 01/2020– 05/2022 |
| Coordinator: | Jana Trabalikova (ÚCV) |
| Co-operators: | Marek Roch (DPSED) |

| **KEGA 023ŽU-4/2021: Developing intellectual competences and manual skills in STEM education** | |
|---|---|
| Summary: | The goal is to develop manual skills and intellectual competences of students at all levels of education via summer courses, creation of new labaratory exercises for university students, lectures and demonstrations in Physics for elementary, secondary and high school students. |
| Realization: | 01/2021 – 12/2023 |
| Coordinator: | Peter Hockicko (DPh) |
| Co-operators: | Jozef Kúdelčík, Gabriela Tarjányiová, Štefan Hardoň (DPh) |

| **KEGA 008ŽU-4/2021: Integrated teaching for artificial intelligence methods at the University of Žilina** | |
|---|---|
| Summary: | In the last few years, a significant acceleration of progress in the sphere of artificial intelligence and machine learning has taken place. We have been witness to several ground-breaking discoveries, which have considerably increased the overall interest in the area. Artificial intelligence and machine learning methods can no longer be considered a thing of the distant future – quite on the contrary, many of them are already commonly applied in practice and bring immense added value. In consequence of this, companies in Slovakia have recently started to integrate such methods into their processes, services, and products – however, they labor at a serious competitive disadvantage in that there has been a long-term shortage of highly qualified alumni in technical fields of study in general and programs focused on artificial intelligence and machine learning in particular.<br>The main goal of the proposed project is to create a commonly integrated initiative in education for artificial intelligence and machine learning, which would be open to the wider community and which would ensure efficient common use of educational and research capacities so as to achieve the maximum final benefit. |
| Realization: | 04/2021 – 12/2023 |
| Coordinator: | Michal Gregor (DCIS) |
| Co-operators: | Aleš Janota, Dušan Nemec, Alžbeta Kanáliková, Michal Skuba, Branislav Malobický (DCIS) |

| KEGA 008KU-4/2020: Comprehensive Innovation and Educational Support of Study Program "Teaching Informatics" with the "Internet of Things" | |
|---|---|
| Summary: | The basic aim of the project is to fundamentally innovate and modernize the current study program "Teaching Informatics" for the 1st and 2nd degree of higher education based on the content integration of the "Internet of Things" issue across the program and with close links to creative use in practical life. By introducing the issue of "Internet of Things" into the teaching process, the support of creativity and analytical thinking of students is monitored, which is reflected in the meaningful integration of new information into already acquired skills and habits in accordance with current development trends. At the same time, the curriculum will become more attractive, the profile will be improved and the graduates' ability to work in practice in a difficult to predict future. |
| Realization: | 01/2020 – 12/2022 |
| Coordinator: | Daša Tichá (DMICT) |
| Co-operators: | Darina Jarinová (DMICT) |

| KEGA 016ŽU-4/2018: Modernization of teaching methods of management of industrial processes based on the concept of Industry 4.0 | |
|---|---|
| Summary: | The project is primarily focusing on the modernisation of education in the field of automation a process control with the use of the Industry 4.0 concept. A workplace will be created integrating the latest object identification technologies used in industrial praxis and object scanning technologies based not only on classic sensors, but also on image information. Using object identification and by providing the data to cloud, it will be possible to evaluate the data from distinct aspects. |
| Realization: | 01/2018 – 3/2021 |
| Coordinator: | Emília Bubeníková (DCIS) |
| Co-operators: | Karol Rástočný, Aleš Janota, Juraj Spalek, Peter Holečko, Alžbeta Kanáliková, Rastislav Pirník, Dušan Nemec, Milan Medvedík (DCIS) |

| KEGA 008ŽU-4/2019: Modernization and expansion of educational possibilities in the field of safe controlling of industrial processes using the safety PLC | |
|---|---|
| Summary: | The project is focused on building and modernizing of the laboratory allowing the safe industrial process control using the safety PLC. The laboratory was successfully built within the previous KEGAproject. It includes six full-featured workplaces with safety PLC and physical models allowing the simulation of real situations from industry. The aim of the present project is to extend this laboratory to enable the realization of the complex distributed control systems with safety PLC and safe control of actuators. This will allow the extension of the related subject "Control Systems with Safety PLC" and the subsequent solution of bachelor, diploma and dissertation works, as well as the realization of workshops, the creation of teaching materials and sample examples. Due to the great interest of practice in this area, the aim of the project is to maintain and develop well-functioning co-operation with practice, particularly in the field of consultation on achieving the required safety integrity level (SIL) of realized applications. |
| Realization: | 01/2019 – 12/2021 |
| Coordinator: | Juraj Ždánsky (DCIS) |
| Co-operators: | Karol Rástočný, (vice-coordinator), Jozef Hrbček, Peter Nagy, Vojtech Šimák, Milan Medvedík, Jozef Valigurský (DCIS) |

| KEGA 026ZU-4/2019: Implementation of GPS specification of products into the teaching process of mechanical engineering study programs and into the technical practice | |
|---|---|
| Summary: | The goal of the project is modernization, improving, and supplementing of teaching content and form within the study programs of bachelor's and master's studies at the technical universities. The project deals with the implementation of the knowledge's introduced in the latest International Technical Standards from the field of Geometric Product Specification (GPS) into the teaching plans of such subjects as Technical/Engineering Drawing, Methodology of Design, Engineering Metrology, Quality Management in Engineering and Measuring Methods and Instruments. The outcome of the project will be the creation of an educational program that will include the publication of two university textbooks. The project is also focused on internationalization in education, increasing skills and flexibility in technical specializations as well as on increasing university student's linguistic skills. |
| Realization: | 2019 – 2021 |
| Coordinator: | Jozef Bronček (FME UNIZA) |
| Co-operators: | Ivan Litvaj (DPSED) |

| KEGA 011ZU-4/2020: Implementation of on-line education in the field of bearing production technologies with emphasis on the educational process to increase the skills and flexibility of mechanical engineering students | |
|---|---|
| Summary: | The amount of information that needs to be mastered by students is constantly growing. The processing of teaching material into multimedia courses and their interactive study increases the quality and speed of acquiring knowledge and skills, allows the student to move from the passive role of the listener to the role of an active participant in the educational process. Learning through e-learning is an increasingly preferred method, which is also the focus of the present project. It focuses on the modernization of education and the online approach to the teaching of bearing production technologies, which are an integral part of mechanical engineering. The outputs of the project in the form of multimedia and internet applications in the form of websites can be used not only for the active education of students at the university but also on a national scale and for the general public. In addition, the outputs of the project should serve as important materials in solving research projects and final theses of students in bachelor's and master's study programs. |
| Realization: | 2020 – 2022 |
| Coordinator: | Dana Stancekova, (FME UNIZA) |
| Co-operators: | Ivan Litvaj (DPSED) |

| KEGA 014ŽU-4/2018: Broadening the content in a field of study with respect to the current requirements of the industry as regards artificial intelligence methods and IT | |
|---|---|
| Summary: | The objective of the project is to facilitate implementation of high-quality education it these areas – i.e. in the area of AI, ML and IT – with regard to the actual requirements of the industry. The second goal is to promote the transfer of progressive and innovative methods into industrial practice. The project reflects a feedback from the commercial sector (primarily within the Ready for Continental initiative and from other department industrial partners) and the feedback from international academic partners such as University of Patras, Greece; UC Berkeley, California, USA; Tongji University, Shanghai and others. The output of the project include new study materials, proper HW/SW education support and a catalogue of AI tasks and methods. |

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|---|---|
| Realization: | 01/2018 – 3/2021 |
| Coordinator: | Aleš Janota (DCIS) |
| Co-operators: | Michal Gregor, (vice-coordinator), Juraj Spalek, Alžbeta Kanáliková, Emília Bubeníková, Vojtech Šimák, Jozef Hrbček, Marián Hruboš, Rastislav Pirník, Roman Michalík, Kamila Kršíková (DCIS) |

| **KEGA 045ŽU-4/2019: Innovation of the educational process by modernization of Electrical Machines Laboratory** | |
|---|---|
| Summary: | The aim of the project is a complex modernization of the Electrical Machines Laboratory, where the measurements of electrical machines are done by the Department of Power Electrical Systems at the Faculty of Electrical Engineering of the University of Žilina in bachelor and master studies. The result of the modernization of the laboratory is to reach the national and international standards and industrial standards in terms of further application of graduates. Innovative studding texts on measuring points will be introduced and automated measurements on electric machines will be created. It can be said that study of the field of electric machines is not easy. This subject is an integral part of the study fields for which this issue is a complete foundation without which the understanding of other contexts is very problematic. Its quite clear, that the most proper way how to be success, is to work in practice and various measurements, to simulate different operating states at test benches. For this purpose, three modern measuring instruments will be constructed as a result of the project, where each station includes electrical machine able to work as a motor or generator, variable power sources with appropriate power levels, variable electronic loads, measuring instruments, recording and computing equipment, mechanical equipment for appropriate fixation and mechanical attachment of the measured electrical machine. This technical part of the project will be complemented by lecture scripts - guides for each measurements, which will be processed according to relevant applicable standards and international standards. The measurement test benches thus allow to individual students to realistically measure the relevant electrical machines, and apply the theoretical knowledge in practice where is a huge request for so skilled and erudite experts in the field of electric machines and drives. |
| Realization: | 01/2019 – 12/2021 |
| Coordinator: | Pavol Rafajdus (DPSED) |
| Co-operators: | Pavel Lehocký, Juraj Makarovič, Rudolf Madaj, Stefan Kocan, Marek Furmanik (DPSED) |

| **KEGA 053ZU-4/2021: Innovation of MSc. study programme Electric Power Engineering at FEIT UNIZA in the context of new requirements for power network automation and management** | |
|---|---|
| Summary: | However, nowadays the power systems have to face significant changes, mainly connected with a massive implementation of information and communication technologies and computer technology, which are increasingly coming to the forefront in the management of the electricity system. One of the key elements ensuring the operational safety of the power system are modern power substations equipped with digital protection relays. However, building and design of such complex systems requires from the future designers, technicians and operators of these systems not only a profound knowledge of the construction and functions of all the individual elements, but also, in particular, obtaining a comprehensive view of all aspects of the distribution system an it's operation as a whole - the interactions of individual power apparatus, intelligent control devices, control system and |

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|---|---|
| | operators. This change requires a redesign of the method and especially the approach to education of future graduates of the study program electric power engineering. The main goal of future education must be education focused on the ability of graduates to connect the classic areas of education in power system engineering (such as power flow, equipment of power substation, power network management, electricity generation, ...) with their equivalents in cyberspace, which already creates and provides space and tools for more efficient and economical operation of physical energy facilities as well as more reliable realisation of electricity system management objectives. Therefore, it is necessary to bring this connection closer to the students of electric power systems in an understandable way and in a form that is close to the current generation of students. |
| Realization: | 01/2021– 12/2023 |
| Coordinator: | Peter Bracinik |
| Co-operators: | Marek Hoger, Martina Kajanova, Michal Regula, Marek Siranec, Alena Otcenasova, Marián Tomasov, Marek Roch |

## Structural Funds

| **ITMS 313012N944: Research and development of the new PLASMABIT BHA plasma milling system for efficient and ecological closure of wells and introduction of a new product into the production process** | |
|---|---|
| Summary: | The main objective of the project is to carry out research and development of the PLASMABIT BHA plasma milling system (Bottom Hole Assembly), to perform functional tests of the prototype and subsequently to introduce a new product into the production process. BHA refers to a device that is located in a borehole and is intended for a specific activity or operation (milling, drilling, cleaning, etc.). Our new product is designed for plasma milling of production pipes (steel pipes) with the aim of a more efficient, economical and especially environmentally friendly way of tight closing of exhausted oil and gas wells. PLASMABIT BHA will be able to remove contactless parts of the production line intended to close the well and thus prevent leakage of residual oil fractions or gas. In order to eliminate environmental impacts, there is a growing demand for new efficient technologies used in oil and gas extraction. Tight closure of wells encounters problems such as clean removal of the production line, tightness and seal life, which will make our product significantly eliminate. A comprehensive system that will solve these problems and meet market requirements has a highly export character with a global reach and would significantly increase the competitiveness of Slovakia. The project is divided into several activities that logically follow up. Their mission is to research the plasma milling system together with the research of a new power supply system and a new generation of high-resistance electrodes for the plasma milling system. The research will be followed by a development phase where the prototype will be intensively tested until the final parameters are debugged. The applicant shall also carry out the activity of protection of the rights of created intellectual property. In the innovative part of the project, we plan to purchase the infrastructure needed to introduce the new PLASMABIT BHA product into the production process. |
| Realization: | 6/2019 – 2/2022 |
| Coordinator: | Pavol Špánik (DME) |
| Co-operators: | Pavol Rafajdus, Vladimír Vavruš, Marek Höger (DPSED), Branislav Dobrucký, Michal Frivaldský, Michal Praženica, Slavomír Kaščák (DME) |

| ITMS 313011V334 Innovative Solutions for Propulsion, Power and Safety Components of Transport Vehicles | |
|---|---|
| Summary | Industrial research into the service life of automotive components of the next generation of vehicles. Research and development of hydrodynamic converters for streamlining the hybridization of propulsion systems. Research of electric drive control methods and development of new topological arrangements of traction converters. Research in optimizing the dynamics and energy of electric traction. Research and development in the field of optimal operation of battery systems. Development of ICT for increasing the safety of operational characteristics and increasing intelligence through self-learning algorithms. Analysis of mechanical properties of modern systems for vehicles in the form of HIL and PIL simulations and through test benches. |
| Realization: | 09/2019 – 12/2023 |
| Coordinator: | Pavol Špánik (DME), Pavol Rafajdus (DPES) |
| Co-operators: | Daniel Káčik, Ivan Martinček (DPh), Pavol Špánik (DME), Pavol Makyš, Vladimír Vavruš, Pavel Lehocký, Michal Reguľa, Martina Kajanová, Pavol Rafajdus (DPES) Michal Frivaldský (DME) |

| ITMS 312011BFJ9: Support of the internal quality system for higher education at the University of Zilina in Zilina | |
|---|---|
| Summary: | The long-term plan of the University of Zilina also sets out the goals and objectives for the quality of education to be achieved through a functioning and effective internal quality system. The project supports the fulfillment of these key objectives in the review of the internal quality system. The priority areas of this system that the project objectives are focused on are the area of setting up processes and their debureaucratization, the area of creating and establishing structures taking over responsibility for the functionality and efficiency of the internal quality system, and the area of preparation of specific target groups to master tasks of quality assurance. |
| Realization: | 01/2021 – 12/2022 |
| Coordinator: | Renata Švarcová (UNIZA) |
| Co-operators: | Ivan Litvaj, Marek Roch (DPES) |

| ITMS 313010ASK8: Independent research and development of technological kits based on wearable electronics products as a tool for raising hygienic standards in a society exposed to the virus causing the COVID-19 disease | |
|---|---|
| Summary: | As part of the project, a ring will be designed to detect and signal the degree of surface contamination of the integrated sensor, which signals the achievement of the selected limit level of surface contamination of the sensor. This sensor is part of a detection unit that is integrated into the component. The ring for detecting and signalling the degree of surface contamination of the integrated sensor consists of a component, a signalling unit, a detection unit, a power supply and a module for communication with the external environment. The technical solution is watertight sealed to ensure protection against moisture. The signalling unit, a detection unit, power supply and communication module with the external environment are interconnected by electrical supply and communication circuits. Upon reaching the selected contamination limit of the sensor integrated with the pollutant detection unit, the signalling unit informs about this state, the information being transmitted via electrical communication circuits installed in or on the component. The communication module with the external environment |

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| | communicates wirelessly outside the technical solution with the environment, which is a computer, mobile phone or tablet. |
| Realization: | 04/2021 – 06/2023 |
| Coordinator: | Peter Brída (DMICT) |
| Co-operators: | Juraj Machaj, Roman Jarina, Slavomír Matúška, Lukáš Ševčík (DMICT), Jozef Kúdelčík, Peter Hockicko, Dušan Pudiš, Daniel Jandura, Petra Maniaková, Matej Goraus (DPh) |

| **NFP304010Y497, Interreg V-A Slovenská republika - Česká republika 2014-2020: Optical fiber sensors with photonic elements for innovative applications** | |
|---|---|
| Summary: | Goal of the project is research and development of the photonic sensor elements for industrial applications with unique properties. |
| Realization: | 03/2020-03/2022 |
| Coordinator: | Ľuboš Šušlik (DPh) |
| Co-operators: | Ľuboš Šušlik, Dušan Pudiš, Jana Ďurišová, Peter Gašo, Ivana Lettrichová (DPh) |

| **313011AFG4 – DIGIBIOBANK: Creation of a Digital Biobank to support the systemic public research infrastructure** | |
|---|---|
| Summary: | The project is focused on the so-called digital banking of medical data that will be related to a specific sample of biological material. |
| Realization: | 06/2020 – 06/2023 |
| Co-operators: | Miroslav Benčo, Róbert Hudec, Peter Sýkora, Martin Paralič, Patrik Kamencay (DMICT) |

| **313011AFG5 – BIOFORD: Systemic public research infrastructure - biobank for cancer and rare diseases** | |
|---|---|
| Summary: | Expansion and completion of research and innovation infrastructure and capacities for the development of excellence in research and innovation through the establishment of a biobanking system for cancer and rare diseases and its integration into the international network of research infrastructures. |
| Realization: | 06/2020 – 06/2023 |
| Co-operators: | Róbert Hudec (DMICT) |

## Other National Research Projects

| **Name** | **Coordinator** |
|---|---|
| Agreement between the Ministry of Education of the Slovak Republic and the University of South Bohemia on the provision of funds for co-financing of cooperation with the EPPCN Phenomenology and Popularization (FEPO) | Ivan Melo, DPh |
| KOR / 7478/2019: Demo of an autonomously controlled car | Adam Hlaváč, DPSED |
| KOR / 7477/2019: Design of an electric drive for testing dental equipment | Peter Kormaňák, DPSED |
| KOR / 3889/2021: Design and implementation of a control algorithm for expanding operating areas and increasing the efficiency of the synchronous motor | Michal Vidlák, DPSED |
| KOR / 3895/2021: Design of a power element for powering high-speed motors | Daniel Konvičný, DPSED |
| KOR / 3888/2021: Research of control techniques for multi-phase electric drives in the automotive industry | Marek Furmanik, DPSED |
| 12707: DS2000: DualShunter - research and development of drive and concept of shunting locomotive with dual power supply | Matěj Pácha, DPSED |

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| 2677/2021: Electric scooter upgrade to 2x2 mode to improve ride quality | Andrej Blaško, DPSED |
| UNIZA grant system: Research into the possibility of using electric vehicle batteries in the form of electricity storage for the electricity system with regard to the preferences and needs of electric vehicle owners | Martina Kajanová, DPSED |
| UNIZA grant system: Procurement and creation of educational, training and representative aids | Michal Staňo, DPSED |
| UNIZA grant system: Sound modulated Tesla transformer for presentation purposes | Marián Tomašov, DPSED |
| UNIZA grant system: Stratospheric balloon | Peter Sýkora, DMICT |
| UNIZA grant system: Compressor for 3D printed cryocooler | Róberta Vršková, DMICT |
| UNIZA grant system: Internet of Things technology towards a connected university | Slavomír Matúška, DMICT |
| UNIZA grant system: Classification of undesirable artifacts degrading perceived image quality | Anna Holešová, DMICT |
| UNIZA grant system: Database of 4K video sequences with content for smart cities and smart transport | Ševčík Lukáš, DMICT |
| UNIZA grant system: AUDIO module research | Veronika Hromadová, DMICT |
| UNIZA grant system: Research into the separability of hearing aids and cochlear implants for the field of musical signals | Peter Kasák, DMICT |
| UNIZA grant system: Use of virtual reality for promotion and teaching | Peter Sýkora, DMICT |
| UNIZA grant system: Use of gaming peripherals for promotion and teaching | Martina Radilová, DMICT |
| UNIZA grant system: Classification of image behavioral dynamics | Róberta Vršková, DMICT |
| UNIZA grant system: Autonomous E tricycle | Michal Mihálik, DCIS |
| UNIZA grant system: Control of the position of a loose ball on a vertically positioned disc using a PLC | Milan Medvedík, DCIS |
| UNIZA grant system: Parallel robot controlled by PLC and its digital copy | Roman Michalík, DCIS |
| UNIZA grant system: Security functions in the force testing process | Marián Hruboš, DCIS |
| UNIZA grant system: Spherical robot to support the solution of extraordinary events in tunnel constructions. | Marek Bujňák, DCIS |
| UNIZA grant system: Robotic system for mapping safety-critical areas | Marián Hruboš, DCIS |
| UNIZA grant system: Photoplethysmographic imaging as a tool for non-invasive non-contact cardiovascular diagnostics | Štefan Borik, DEBE |
| UNIZA grant system: ECG monitoring using active electrodes | Tadeáš Bednár, DEBE |
| UNIZA grant system: Pacemaker test equipment | Filip Vaverka, DEBE |
| UNIZA grant system: Multi-channel EMG for the purpose of determining the mapping and monitoring of local muscle load | Michal Labuda, DEBE |
| UNIZA grant system: Targeted to the cell by electromagnetic signal II | Zuzana Judáková, DEBE |

Other National Non-research Projects

| **Hybrid education in area of artificial intelligence, machine learning and cybernetics at UNIZA** | |
|---|---|
| Summary: | Development project in area of support of education in artificial intelligence and cybernetics in English language at UNIZA. |
| Realization: | 12/2020 – 12/2022 |
| Coordinator: | Róbert Hudec (DMICT) |
| Co-operators: | Patrik Kamencay, Peter Sýkora, Miroslav Benčo, Miroslav Uhrina, R. Jarina (DMICT), Michal Gregor, Aleš Janota, Dušan Nemec, Jozef Hrbček, Vojtech Šimák (DCIS) |

| **V3 Žilina Childrens University 2021 - online** | |
|---|---|
| Summary: | Goal of the project is to focus the attention of school age children from Žilina area on STEM subjects and show them applications of research for everyday life. |
| Realization: | 02/2021 – 11/2021 |
| Coordinator: | Peter Hockicko (DPh) |
| Co-operators: | Teachers from UNIZA |

| **S-103-0012/17: Transformer coil tests** | |
|---|---|
| Summary: | Transformer coil measurement, thermal shock test for transformer class C3 according to STN EN 60076-11. |
| Realization: | 01/2017– 12/2030 |
| Coordinator: | Vladimir Vavrus (DPSED) |

## Submitted Proposals of International Research Projects in 2020

| **Type / call** | **Name of the project** | **Outcome of evaluation** |
|---|---|---|
| International Visegrad Fund | Use of Modern Simulation Tools in Logistics and Transport in context of HMI in V4 Countries | Not supported |

## Research for Practice; the Most Important Realized Outputs

**DMICT:**
Name of the project: Implementation of new generation communication systems for improved safety in rail transport
Coordinator: Vladimír Wieser
Summary / Achievement:
The project was granted Ministry of Transport and Construction of the Slovak republic as a national project in operation programme integrated infrastructure 2014-2020. The project is implemented by the Slovak Rail operator. Within the project study "Štúdia pokrytia terénu signálom LTE na úseku železničnej trate GALANTA - ŠTÚROVO" was prepared. The study was realised based on a request from the University Science Park at the University of Zilina as a tool for placement of e-NodeB transmitters of LTE system on rails track between Galanta and Štúrovo.

**DPES:**
Project number: S-103-0016/19
Name of the project: Laboratory work PPV Valve
Coordinator: prof. Ing. Peter Palček, PhD., FME UNIZA
Summary / Achievement: The aim of this project was to determine the effect of hydrogen on the properties of materials used in the construction of PPV valves. The tested samples of valves were subjected to a load switching test in a hydrogen-free and hydrogenated state. At the end of the test, the tested valve samples were subjected to a detailed analysis in order to determine the effect of hydrogen on the change in their mechanical and electrical properties. Based on the results, recommendations were proposed that will reduce the effect of hydrogen on the change in properties of the valves. Additional tests have been specified that will focus on problem areas and confirm the results obtained from the initial test trials.

**DME:**
Name of the project: "Ciliary analysis" software package
Coordinator: Libor Hargaš
Summary / Achievement: The product was created based on the project APVV-15-0462 - Research of sophisticated methods of analysis of dynamic properties of microscopic parts of the respiratory system for the Department of Children and Adolescents JLF UK in Martin. It was a reaction to the absence of means to diagnose respiratory epithelial pathologies in Slovakia, especially in the field of pediatric clinical practice. The unique software enables high-speed video recording of living biological tissue from a light microscope, automated segmentation of monitored structures, statistical evaluation of monitored parameters and damage determination, as well as storage of records and analysis results in a specific database according to medical regulations.

**DEBE:**
Output type: Prototype of multifunctional intelligent bio-telemetric clothing
Output description: Prototype of multifunctional intelligent bio-telemetric clothing is designed for sensing, transfer, storage and evaluation of bioelectric electrocardiograph signal and body temperature in real-time. It is equipped with centralized integrated circuit and its own mobile application. The clothing is developed for the electronic health system, and it covers wide application area.

## Conferences and seminars

The Faculty of Electrical Engineering organized, or participated in preparation of the following scientific events in 2021:

- ADEPT 2021, international conference, 20. 9. – 23. 9. 2021, Podbanské, High Tatras, SK – Chair of the Programme Committee: Dušan Pudiš
- International Masterclasses 2021 (MC) for high schools, 4. 3. – 5. 3. 2021, online on facebook www.svetcastic.sk, organizer: Ivan Melo
- Progress in Applied Surface, Interface and Thin Film Science SURFINT 2021, 22. 11. – 25. 11. 2021, IP SAS Bratislava, Organizer: Stanislav Jurečka, Emil Pinčík (FÚ SAV)
- Alternative energy resources, 16. 9. – 17. 9. 2021, Hotel Mních, Bobrovec, Organizer: Pavel Šimon

## Publication activities

The permanent task of the Faculty is to increase the publication activity in quality journals which are indexed in international professional databases.

Tab. 11: Publication activities at FEEIT (based on registration at the University Library up to February/March of the relevant year)

| Year | Monographs and university textbooks | Scientific works in journals | Scientific publications in Conference pub. | Patents, Utility Models | Others (Scripts, etc.) |
|---|---|---|---|---|---|
| 2010 | 4 | 76(12*) | 246 | 3 | 49 |
| 2011 | 4 | 86 (13*) | 219 | 2 | 70 |
| 2012 | 4 | 76 (12*) | 223 | 8 | 65 |
| 2013 | 12 | 107 (18*, 36**) | 198 | 1 | 94 |
| 2014 | 5 | 89 (24*, 23**) | 257 | 7 | 28 |
| 2015 | 10 | 84 (16*, 45**) | 209 | 3 | 25 |
| 2016 | 4 | 61 (24*, 27**) | 243 | 12 | 36 |
| 2017 | 6 | 98 (52*, 24**) | 175 | 8 | 52 |
| 2018 | 5 | 78 (34*, 22**) | 218 | 5 | 32 |
| 2019 | 4 | 94 (28*, 31**) | 227 | 14 | 21 |
| 2020 | 7 | 91 (43*, 32**) | 159 | 26 | 24 |
| 2021 | 3 | 75 (64*, 18**) | 99 | 14 | 19 |

* out of which indexed in Current Contents Connect database

** out of which indexed in SCOPUS or Thomson Scientific Master Journal

In the following Tab. 12 we present in detail the publishing activities of the Faculty in 2021 (based on registration at the University Library up to February, 2021)

| Category | Category name | Number |
|---|---|---|
| AAA | Scientific monographs published by foreign publishers | 2 |
| AAB | Scientific monographs published by domestic publishers | 1 |
| ACB | University textbooks published by domestic publishers | 1 |
| ADC | Scientific papers in foreign journals | 64 |
| ADF | Scientific papers in other domestic journals | 3 |

| | | |
|---|---|---|
| ADM | Scientific papers in foreign journals registered in the WoS or SCOPUS databases | 12 |
| ADN | Scientific papers in domestic journals registered in the WoS or SCOPUS databases | 6 |
| AEC | Scientific works in foreign peer-reviewed scientific proceedings, monographs | 2 |
| AFC | Published papers at foreign scientific conferences | 48 |
| AFD | Published papers at domestic scientific conferences | 45 |
| AFG | Abstracts of contributions from foreign conferences | 3 |
| AFH | Abstracts of papers from domestic conferences | 1 |
| AGJ | Applications of patents, utility models, … | 14 |
| BCI | Scripts and textbooks | 4 |
| BEF | Professional work in unrecognized domestic proceedings (both conference and non-conference) | 2 |
| DAI | Dissertation and habilitation works | 10 |
| FAI | Editorial and compilation work | 2 |
| GII | Various publications and documents that cannot be included in any of the previous categories | 1 |

**Monographs (Chapters in monographs)**

| | |
|---|---|
| [1] | KINDL,Vladimir – FRIVALDSKÝ, Michal – ŠKORVAGA, Jakub – ZAVŘEL, Martin l: Theoretical and Practical Design Approach of Wireless Power Systems, In: IntechOpen, 2021, DOI: 10.5772/intechopen.95749 |
| [2] | ČÁP, Ivo – ČÁPOVÁ, Klára – SMETANA, Milan – BORIK, Štefan: Electromagnetic and acoustic waves in bioengineering applications, IntechOpen: Londýn, 2021, ISBN 978-1-78985-348-3, 210 s. https://www.intechopen.com/books/10168 |
| [3] | KAMENCAY, Patrik – HUDEC, Róbert – BENČO, Miroslav – RADIL, Roman – RADILOVÁ, Martina: 3D rekonštrukcia a lokalizácia biomedicínskych dát v 3D priestore, EDIS: Žilina, 2021, ISBN 978-80-554-1787-5, 233 s. |

**Books, Textbooks and Lecture Notes**

| | |
|---|---|
| [1] | ĎURIŠOVÁ, Jana – MIZERA, Tomáš: Optika pre fotoniku, EDIS, 2021 ISBN 978-80-554-1802-5, 100 pp |
| [2] | KONIAR, Dušan – ŠTEFÚNOVÁ, Silvia: Základy spracovania obrazu s praktickými úlohami, 1. vydanie, Žilina (Slovensko) - Žilinská univerzita v Žiline, 2021. – 237 s. [16,70 AH], ISBN 978-80-554-1796-7 |
| [3] | LITVAJ, Ivan: Manažment a ekonomika podniku, Žilina: Žilinská univerzita v Žiline, 2021, ISBN 978-80-554-1762-2, 76 s. |
| [4] | ALTUS, Juraj – BRACINÍK, Peter: Výpočty ustáleného chodu sietí, Žilina: Žilinská univerzita v Žiline, 2021, ISBN 978-80-554-1810-0, 143 s. |
| [5] | DOSTÁL, Zdenek – CIBIRA, Gabriel – HOLÁ, Michaela – ŠIMON, Pavel: Prúd energie okolo nás, EDIS-vydavateľské centrum UNIZA, 2021, ISBN 978-80-554-1788-2, 227 s. |

**Current Content Journals**

| | |
|---|---|
| [1] | TARJÁNYI, Norbert – VEVERIČÍK, Marek – KÁČIK Daniel – TIMKO Milan – KOPČANSKÝ Peter: Birefringence dispersion of 6CHBT liquid crystal determined in VIS-NIR spectral range, In: Applied Surface Science, Vol. 542, 2021, ISSN 0169-4332, p. 1-7. |
| [2] | TARJÁNYI, Norbert – KÁČIK, Daniel: Dichromatic properties of a magnetic fluid thin layer. In: Optik, Vol. 244, 2021, ISSN 0030-4026, p. 1-9. |

| | |
|---|---|
| [3] | BURY, Peter – VEVERIČÍK, Marek – ČERNOBILA, František – MOLČAN, Matúš – ZAKUŤANSKÁ, Katarína – KOPČANSKÝ, Peter – TIMKO, Milan: Effect of liquid crystalline host on structural changes in magnetosomes based ferronematics [electronic] In: Nanomaterials [electronic]. - ISSN 2079-4991 (online). - Roč. 11, č. 10 (2021), s. [1-16] [online]. |
| [4] | BURY, Peter – VEVERIČÍK, Marek – KOPČANSKÝ, Peter – TIMKO, Milan – LACKOVÁ Veronika: Structural changes in liquid crystals doped with spindle magnetic particles [electronic] In: Physica E [print, electronic] : Low-Dimensional Systems & Nanostructures. - ISSN 1386-9477. - Roč. 134 (2021), s. [1-8] [print, online]. |
| [5] | MORAVEC, Ján – BURY, Peter – ČERNOBILA, František: Investigation of forging metal specimens of different relative reductions using ultrasonic waves [electronic] / In: Materials [electronic]. - ISSN 1996-1944 (online). - Roč. 14, č. 9 (2021), s. [1-11] [online]. |
| [6] | GORAUS, Matej – MARTINČEK, Ivan – MANIAKOVÁ, Petra – JANDURA, Daniel – PUDIŠ, Dušan: Highly-resolved scanning of magnetic surfaces by FPR integrated on optical fiber [electronic] [Skenovanie magnetických povrchov pomocou FPR integrovaného na optickom vlákne s vysokým rozlíšením] / Matej Goraus ... [et al.]. In: Applied Surface Science [print, electronic] : a journal devoted to applied physics and chemistry of surfaces and interfaces. - ISSN 0169-4332. - č. 560 (2021), s. [1-7] [print, online]. |
| [7] | MANIAKOVÁ, Petra – PUDIŠ, Dušan – GORAUS, Matej – KOVÁČ, Jaroslav: IP-Dip-Based SPR structure for refractive index sensing of liquid analytes [electronic. In: Nanomaterials [electronic]. - ISSN 2079-4991 (online). - Roč. 11, č. 5 (2021), s. [1-10] [online]. |
| [8] | PUDIŠ, Dušan – MANIAKOVÁ, Petra – NOVÁK, Jozef – KUZMA, Anton – LETTRICHOVÁ, Ivana – GORAUS, Matej – ELIÁŠ, Peter – LAURENČÍKOVÁ, Agáta – JANDURA, Daniel – ŠUŠLIK, Ľuboš – HASENÖHRL, Stanislav: Near-field analysis of GaP nanocones [electronic] In: Applied Surface Science [print, electronic] : a journal devoted to applied physics and chemistry of surfaces and interfaces. - ISSN 0169-4332. - Roč. 539 (2021), s. [1-6] [print, online]. |
| [9] | GAŠO, Peter – PUDIŠ, Dušan – SERINGER, Dana – KUZMA, Anton – GAJDOŠOVÁ, Lenka – MIZERA, Tomáš – GORAUS, Matej: 3D polymer based 1x4 beam splitter [electronic] In: Journal of Lightwave Technology [print] = IEEE journal of lightwave technology. - ISSN 0733-8724. - Roč. 39, č. 1 (2021), s. 154-161 [print]. |
| [10] | MARTINČEK, Ivan – KÁČIK, Daniel – HORÁK, Jakub: Interferometric optical fiber sensor for monitoring of dynamic railway traffic [electronic]. In: Optics & Laser Technology [print]. - ISSN 0030-3992. - č. 140 (2021), s. [1-6] [print]. |
| [11] | KÚDELČÍK, Jozef – HARDOŇ, Štefan – HOCKICKO, Peter – KÚDELČÍKOVÁ, Mária – HORNAK, Jaroslav – PROSR, Pavel – TRNKA, Pavel: Study of the complex permittivity of a polyurethane matrix modified by nanoparticles [electronic nIn: IEEE Access : practical innovations, open solutions. - ISSN 2169-3536 (online). - Roč. 9 (2021), s. 49547-49556 [online]. |
| [12] | KÚDELČÍK, Jozef – HARDOŇ, Štefan – TRNKA, Pavel – ONDŘEJ, Michal – HORNAK, Jaroslav: Dielectric responses of polyurethane/Zinc Oxide blends for dry-type cast curing resin transformers [electronic] In: Polymers [electronic]. - ISSN 2073-4360 (online). - Roč. 13, č. 3 (2021), s. [1-12] [online]. |
| [13] | FRIVALDSKÝ, Michal – PAVELEK, Miroslav – DONIČ, Tibor: Modeling and Experimental Verification of Induction Heating of Thin Molybdenum Sheets, In: Applied sciences MDPI, 2021, 11(2), 647, eISSN 2076-3417, DOI 10.3390/app11020647. |
| [14] | ŠKOVIEROVÁ, Henrieta – PAVELEK, Miroslav – OKAJČEKOVÁ, Terézia – PÁLEŠOVÁ, Janka – STRNÁDEL, Ján – ŠPÁNIK, Pavol – HALAŠOVÁ, Erika – FRIVALDSKÝ, Michal: The Biocompatibility of Wireless Power Charging System on Human Neural Cells, In: Applied sciences MDPI, 2021, Roč. 11, č. 8 (2021), art. no. 3611, s. 1-18, eISSN 2076-3417, DOI 10.3390/app11083611. |
| [15] | FRIVALDSKÝ, Michal – PIPÍŠKA, Michal – ŠPÁNIK, Pavol: Evaluation of the perspective power transistor structures on efficiency performance of PFC circuit, In: Electronics MDPI, Roč. 10, č. 13 (2021), s. 1-18, eISSN 2079-9292, DOI 10.3390/electronics10131571. |
| [16] | KELLNER, Jakub – KAŠČÁK, Slavomír – PRAŽENICA, Michal – RESUTÍK, Patrik: A comprehensive investigation of the properties of a five-phase induction motor operating in hazardous states in |

| | |
|---|---|
| | various connections of stator windings, In: Electronics MDPI, Roč. 10, č. 5 (2021), s. 1-26, eISSN 2079-9292, DOI 10.3390/electronics10050609. |
| [17] | FRIVALDSKÝ, Michal – MORGOŠ, Ján – PRAŽENICA, Michal – TAKÁCS, Kristián: System Level Simulation of Microgrid Power Electronic Systems, , In: Electronics MDPI, Roč. 10, č. 6 (2021), 644, eISSN 2079-9292, DOI 10.3390/electronics10060644. |
| [18] | SKALA, Bohumil – KINDL, Vladimir – FRIVALDSKÝ, Michal: Design, construction and calibration of the current sensor for medium frequency high-power electronic applications, In: Electrical Engineering, 2021, DOI 10.1007/s00202-021-01429-9. |
| [19] | DANKO, Matus – HANKO, Branislav – DRGOŇA, Peter – HOCK, Ondrej: Energy flow control of electric vehicle based on GNSS, In: Electrical Engineering, 2021, DOI 10.1007/s00202-021-01272-y. |
| [20] | KAŠČÁK, Slavomír – RESUTÍK, Patrik: Method for estimation of power losses and thermal distribution in power converters, In: Electrical Engineering, 2021, DOI 10.1007/s00202-021-01303-8. |
| [21] | DRGOŇA, Peter – ŠTEFÚN, Rastislav – KAŠČÁK, Slavomír – MORGOŠ, Ján: Recursive–iterative identification method for power converters, In: Electrical Engineering, 2021, DOI 10.1007/s00202-021-01266-w. |
| [22] | DOBRUCKÝ, Branislav – KAŠČÁK, Slavomír – FRIVALDSKÝ, Michal – PRAŽENICA, Michal: Determination and compensation of non-active torques for parallel HEV using PMSM/IM motor(s), In: Energies MDPI, Roč. 14, č. 10 (2021), s. 1-26, eISSN 1996-1073, DOI 10.3390/en14102781. |
| [23] | DRGONA, Peter – DURANA, Peter – BETKO, Tibor: Research of the Negative Influence of Dimmed LED Luminaires in Context of Smart Installations, In: Sustainability MDPI, 2021, 13, 9753, eISSN 2071-1050, DOI 10.3390/ su13179753. |
| [24] | RESUTÍK, Patrik – KAŠČÁK, Slavomír: Compact 3 × 1 Matrix Converter Module Based on the SiC Devices with Easy Expandability, In: Applied sciences MDPI, 2021, 11, 9366, eISSN 2076-3417, DOI 10.3390/app11209366. |
| [25] | TAKÁCS, Kristán – FRIVALDSKÝ, Michal: System level simulation of micro grid power electronic system, In: Journal of Physics: Conference Series, Volume 2022, 2021, eISSN 1742-6596, ISSN: 1742-6588, DOI 10.1088/1742-6596/2022/1/012003. |
| [26] | BABUŠIAK, Branko – HAJDUČÍK, Adrián – MEDVECKÝ, Štefan – LUKÁČ, Michal – KLARÁK, Jaromír: Design of smart steering wheel for unobtrusive health and drowsiness monitoring, In: Sensors, Vol. 21, No. 16, 2021, ISSN 1424-8220, p. 1-20. |
| [27] | BABUŠIAK, Branko – HOSŤOVECKÝ, Marián – ŠMONDRK, Maroš – HURAJ, Ladislav: Spectral analysis of electroencephalographic data in serious games, In: Applied sciences, Vol. 11, No. 6, 2021, ISSN 2076-3417, p. 1-20. |
| [28] | BEDNÁR, Tadeáš – BABUŠIAK, Branko – LABUDA, Michal – SMETANA, Milan – BORIK, Štefan: Common-mode voltage reduction in capacitive sensing of biosignal using capacitive grounding and DRL electrode, In: Sensors, Vol. 21, No. 7, 2021, ISSN 1424-8220, p. 1-17. |
| [29] | BERETA, Martin – TEPLAN, Michal – CHAFAI, Djamel E. – RADIL, Roman – CIFRA, Michal: Biological autoluminescence as a noninvasive monitoring tool for chemical and physical modulation of oxidation in yeast cell culture, In: Scientific Reports, Vol. 11, No. 1, 2021, ISSN 2045-2322, p. 1-11. |
| [30] | BEDNÁR, Tadeáš – BABUŠIAK, Branko – ŠMONDRK, Maroš – ČÁP, Ivo – BORIK, Štefan: The impact of active electrode guard layer in capacitive measurements of biosignals, In: Measurement: Journal of International Measurement Confederation, Vol. 172, 2021, ISSN 0263-2241, p. 1-13. |
| [31] | TIOTSOP, L.F. – MIZDOS, T. – UHRINA, M. – BARKOWSKY, M. – POČTA, P. – MASALA, E.: Modeling and estimating the subjects' diversity of opinions in video quality assessment: a neural network based approach, V: Multimedia Tools and Applications, vol. 80, No. 3, pp. 3469-3487, ISSN 1380-7501. |
| [32] | CINAR, Yusuf – POCTA, Peter – CHAMBERS, Desmond – MELVIN Hugh: Improved Jitter Buffer Management for WebRTC, V: ACM Transactions on Multimedia Computing, Communications and Applications, vol. 79, No.1, article 30, ISSN 1551-6857. |

| | |
|---|---|
| [33] | PETROV, Tibor – SEVCIK, Lukas – POCTA, Peter – DADO, Milan: A Performance Benchmark for Dedicated Short-Range Communications and LTE-Based Cellular-V2X in the Context of Vehicle-to-Infrastructure Communication and Urban Scenarios, In: Sensors, vol. 21, No.15, ISSN 1424-8220. |
| [34] | MIZDOS, Tomas – BARKOWSKY, Marcus – UHRINA, Miroslav – POCTA, Peter: How to reuse existing annotated image quality datasets to enlarge available training data with new distortion types, In: Multimedia Tools and Applications, vol. 21, No.8, pp. 28137-28159, ISSN 1380-7501. |
| [35] | UHRINA, Miroslav – HOLESOVA, Anna – BIENIK, Juraj – SEVCIK, Lukas: Impact of scene content on high resolution video quality, In: Sensors, vol. 80, No.18, ISSN 1424-8220 |
| [36] | MACHAJ, Juraj – BRIDA, Peter – MAJER, Norbert – SČEHOVIČ, Roman: Impact of GPS Interference on Time Synchronization of DVB-T Transmitters, V: Mobile Information Systems 2021 (2021). |
| [37] | BRIDA, Peter – MACHAJ, Juraj – RACKO, Jan – KREJCAR, Ondrej: Algorithm for Dynamic Fingerprinting Radio Map Creation Using IMU Measurements, V: Sensors 21, no. 7 (2021): 2283. |
| [38] | MACHAJ, Juraj – BRIDA, Peter – MATUSKA, Slavomir: Proposal for a Localization System for an IoT Ecosystem, V: Electronics 10, no. 23 (2021): 3016. |
| [39] | BRIDA, Peter – KREJCAR, Ondrej – SELAMAT, Ali – KERTESZ, Attila: Smart sensor technologies for IoT, V: Sensors, 2021, 21(17), 5890. |
| [40] | SEVCIK, Lukas – VOZNAK, Miroslav: Adaptive Reservation of Network Resources According to Video Classification Scenes, V: Sensors 2021, 21, 1949. https://doi.org/10.3390/s21061949. |
| [41] | VAN, Hoang, Thien – VAN, Quyet, Nguyen – LE, Danh, Hong – SEVCIK, Lukas – DUY, Nguyen, Hoang – NGUYEN, Hoang, Sy – VOZNAK, Miroslav: Threshold-based Wireless-based NOMA Systems over Log-Normal Channels: Ergodic Outage Probability of Joint Time Allocation and Power Splitting Schemes, V: Elektronika Ir Elektrotechnika, 2021, 27(3), 78-83. https://doi.org/10.5755/j02.eie.28971. |
| [42] | KAJANOVÁ, Martina – BRACINÍK, Peter: Definition of discrete choice models of EV owners based on different socio-economic aspects, In: Applied Sciences, Vol. 11, No. 8, 2021, ISSN 2076-3417, p. 1-21. |
| [43] | ŠIRANEC, Marek – HÖGER, Marek – OTČENÁŠOVÁ, Alena: Advanced power line diagnostics using point cloud data-possible applications and limits. In: Remote Sensing, Vol. 13, No. 10, ISSN 2072-4292, p. 1-29. |
| [44] | VIDLÁK, Michal – GOREL, Lukáš – MAKYŠ, Pavol – STAŇO, Michal: Sensorless speed control of brushed DC motor based at new current ripple component signal processing. In: Energies, Vol. 14, No. 17, ISSN 1996-1073, p. 1-25. |
| [45] | ŤAŽKÝ, Matej – REGUĽA, Michal – OTČENÁŠOVÁ, Alena: Impact of changes in a distribution network nature on the capacitive reactive power flow into the transmission network in Slovakia. In: Energies, Vol. 14, No. 17, ISSN 1996-1073, p. 1-16. |
| [46] | FURMANIK, Marek – GOREL, Lukáš – KONVIČNÝ, Daniel – RAFAJDUS, Pavol: Comparative study and overview of field-oriented control techniques for six-phase PMSMs. In: Applied Sciences, Vol. 11, No. 17, ISSN 2076-3417, p. 1-16. |
| [47] | DEŽELAK, KLEMEN – BRACINÍK, PETER – SREDENŠEK, Klemen – SEME, Sebastian: Proportional-integral controllers performance of a grid-connected solar PV system with particle swarm optimization and Ziegler-Nichols tuning method. In: Energies, Vol. 14, No. 9, ISSN 1996-1073, p. 1-15. |
| [48] | KUCHÁR, Pavol – PIRNÍK, Rastislav – TICHÝ, Tomáš – RÁSTOČNÝ, Karol - SKUBA, Michal – TETTAMANTI, Tomás.: Noninvasive Passenger Detection Comparison Using Thermal Imager and IP Cameras. In: Sustainability, Vol.13, No. 22, ISSN 2071-1050, p. 1-17. |
| [49] | TICHÝ, Tomáš – Brož, Jiří – BĚLINOVÁ, Zuzana – PIRNÍK, Rastislav: Analysis of predictive maintenance for tunnel systems. In: Sustainability, Vol: 13, Issue: 7, ISSN 2071-1050, p. 1-17. |
| [50] | NEMEC, Dušan – HRUBOŠ, Marián – JANOTA, Aleš – PIRNÍK, Rastislav – GREGOR, Michal: Estimation of the speed from the odometer readings using optimized curve-fitting filter. In: IEEE Sensors Journal: a Publication of the IEEE Sensors Council, Vol. 21, No. 14, ISSN 1530-437X, p. 15687-15695. |

| | |
|---|---|
| [51] | MICHALÍK, Roman – JANOTA, Aleš – GREGOR, Michal – HRUBOŠ, Marián: Human-Robot Motion Control Application with Artificial Intelligence for a Cooperating YuMi Robot. In: Electronics 2021, Vol. 10, No. 16, ISSN 2079-9292, p. 1-13. |
| [52] | PŘIBYL, Pavel – JANOTA, Aleš – SPALEK, Juraj – FALTUS, Vladimír: Knowledge System Supporting its Deployment. In: Sustainability, 2021, Vol. 13, No. 11, ISSN 2071-1050, p. 1-20. |
| [53] | GLOWACZ, Adam – TADEUSIEWICZ, Ryszard – LEGUTKO, Stanislaw – CAESARENDRA, Wahyu – IRFAN, Muhammad – LIU, Hui – BRUMERČÍK, František – GUTTEN, Miroslav – SULOWICZ, Maciej – ANTONINO, Daviu Jose Alfonso – SARKODIE-GYAN, Thompson – FRACZ, Pawel – KUMAR, Anil – XIANG, Jiawei: Fault diagnosis of angle grinders and electric impact drills using acoustic signals, In: Applied Acoustics, Vol. 179, 2021, ISSN 0003-682X, p. 1-14. |
| [54] | ZUKOWSKI, Pawel – ROGALSKI, Przemyslaw – KOLTUNOWICZ, Tomasz – KIERCZYNSKI, Konrad – SUBOCZ, Jan – SEBOK, Milan: Influence of temperature on phase shift angle and admittance of moistened composite of cellulose and insulating oil, In: Measurement, Vol. 185, No. 5, ISSN 0263-2241, p. 1-13. |
| [55] | CENDULA, Peter – SANCHETI, Anmol – SIMON, Pavel: Model-based investigation of trap-assisted recombination in photoelectrodes for water splitting, In: Advanced theory and simulations, Vol. 4, No. 1, 2021, ISSN 2513-0390, p. 1. |
| [56] | FRNDA, Jaroslav – PAVLIČKO, Michal – ĎURICA, Marek – ŠEVČÍK, Lukáš – VOZNAK, Miroslav – FOURNIER-VIGER, Philippe – LIN, Jerry, Chun–Wei: A new perceptual evaluation method of video quality based on neural network, V: Intelligent data analysis, 2021, IOS Press, ISSN 1 088-467X., ISSN (online) 1571-4128. |
| [57] | JAKUBEC, Maroš – JARINA, Roman – CHMULÍK, Michal: A review on speech emotion recognition using deep learning and attention mechanism, V: Electronics, 2021, ISSN (online) 2079-9292, Roč. 10, č. 10 (2021), art. no. 1163, s. [1-29] |
| [58] | HUDEC, Róbert – MATÚŠKA, Slavomír – KAMENCAY, Patrik – BENČO, Miroslav: A smart IoT system for detecting the position of a lying person using a novel textile pressure sensor, V: Sensors, 2021, Multidisciplinary Digital Publishing Institute., ISSN 1424-3210, ISSN (online) 1424-8220, Roč. 21, č. 1 (2021), s. [1-21] |
| [59] | DRUSA, Marián – KAIS, Ladislav – DUBOVAN, Jozef – MARKOVIČ, Miroslav – BAHLEDA, František – MEČÁR, Martin: Measurement of axial strain of geogrid by optical sensors, V: Sensors, 2021, Multidisciplinary Digital Publishing Institute, ISSN 1424-3210., ISSN (online) 1424-8220., Roč. 21, č. 19 (2021), s. [1-15] |
| [60] | BENEDIKOVIČ, Daniel – VIROT, Léopold – AUBIN, Guy – HARTMANN, Jean-Michel – AMAR, Farah – LE ROUX, Xavier – ALONSO-RAMOS, Carlos – CASSAN, Éric – MARRIS-MORINI, Delphine – FÉDÉLI, Jean-Marc – BOEUF, Frédéric – SZELAG, Bertrand – VIVIEN, Laurent: Silicon–germanium receivers for short-wave-infrared optoelectronics and communications : high-speed silicon–germanium receivers, V: Nanophotonics, ISSN 2192-8606, ISSN (online) 2192-8614., Roč. 10, č. 3 (2021), s. 1059-1079 |
| [61] | KOČAN, Štefan – RAFAJDUS, Pavol – BAŠŤOVANSKÝ, Ronald – LENHARD, Richard – STAŇO, Michal: Design and optimization of a high-speed switched reluctance motor. In: Energies [elektronický dokument] . Bazilej (Švajčiarsko) : Multidisciplinary Digital Publishing Institute. ISSN (online) 1996-1073. Roč. 14, č. 20 (2021), s. [1-23] [online]<br>DOI 10.3390/en14206733. – WOS CC ; SCOPUS ; CCC. |
| [62] | BURY, Peter – VEVERIČÍK, Marek – KOPČANSKÝ, Peter – Timko, Milan – STUDENYAK, Ihor P. – POGODIN, Artem I.: Influence of X7GeS5I (X = Ag, Cu) superionic nanoparticles on structural changes in nematic liquid crystal [Vplyv superiónových nanočastíc X7GeS5I (X = Ag, Cu) na štrukturálne zmeny v nématickom kvapalnom kryštáli]. In: Crystals. Bazilej (Švajčiarsko) : Multidisciplinary Digital Publishing Institute. ISSN 2073-4352. Roč. 11, č. 4 (2021), s. [1-10] [tlačená forma] [online] DOI 10.3390/cryst11040413. WOS CC ; SCOPUS ; CCC. |
| [63] | MIČEK, Patrik – PUDIŠ, Dušan – GAŠO, Peter – ĎURIŠOVÁ, Jana – JANDURA, Daniel: Microring zone structure for near-field probes [Mikrokruhová štruktúra pre sondy mikroskopie blízkeho poľa]. In: |

| | |
|---|---|
| | Coatings [elektronický dokument] . Bazilej (Švajčiarsko) : Multidisciplinary Digital Publishing Institute. ISSN (online) 2079-6412. Roč. 11, č. 1 (2021), s. [1-13] [online]<br>DOI 10.3390/coatings11111363. – WOS CC ; SCOPUS ; CCC. |
| [64] | GREGOR, Michal – HUANG, Isabella – VILLEGAS, Ismael – KURILLO, Gregorij – BAJCSY, Ruzena – NASCIMENTO, Erickson R.: On the development of an acoustic-driven method to improve driver's comfort based on deep reinforcement learning [O vývoji akusticky riadených metód na zvyšovanie komfortu vodiča na základe hlbokého učenia s odmenou]. In: IEEE transactions on intelligent transportation systems. Pistacaway (USA) : Institute of Electrical and Electronics Engineers. ISSN 1524-9050. ISSN (online) 1558-0016. – Roč. 22, č. 5 (2021), s. 2923-2932 [tlačená forma] [online]<br>DOI 10.1109/TITS.2020.2977983. – WOS CC ; SCOPUS ; CCC |

**Patents, Utility Models, Designs, Trade Marks**

*Submitted patents and industrial designes in 2021:*

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|---|---|
| [1] | Category: patent<br>Application number: 12-2021<br>Authors: Ivan Martinček, Matej Goraus, Tatiana Kováčiková<br>Title: Polymeric extension for optical fiber for scanning applications |
| [2] | Category: patent<br>Application number: 84-2021<br>Authors: Róbert Hudec, Slavomír Matúška,Martina Radilová<br>Title: Electroconductive connection with magnetic bond |
| [3] | Category: patent<br>Application number: PP 65-2019, 2021<br>Authors: Michal Praženica, Slavomír Kaščák, Patrik Resutík<br>Title: Hardware protection of modular inverter systems |
| [4] | Category: patent<br>Application number: PP 67-2019, 2021<br>Authors: Michal Praženica, Slavomír Kaščák, Miriam Jarabicová<br>Title: Connection for two-way current measurement |
| [5] | Category: patent<br>Application number: PP 163-2019, 2021<br>Authors: Michal Praženica, Slavomír Kaščák<br>Title: Involvement in a complementary way of managing multi-phase two-way DC/DC inverter |
| [6] | Category: patent<br>Application number:<br>Dátum zverejnenia prihlášky: PP 164-2019, 2021<br>Authors: Michal Praženica, Slavomír Kaščák<br>Title: Engagement to control traction power flow |
| [7] | Category: patent<br>Application number: PP 166-2019, 2021<br>Authors: Michal Praženica, Slavomír Kaščák<br>Title: Involvement in direct way of managing multi-phase two-way DC/DC inverter |
| [8] | Category: industrial design<br>Application number: 151-2021<br>Authors: Maroš Šmondrk, Branko Babušiak, Štefan Borik, Ladislav Janoušek<br>Title: Finger motion sensing device |
| [9] | Category: industrial design<br>Application number: 99-2021<br>Authors: Branko Babušiak, Maroš Šmondrk |

| | |
|---|---|
| | Title: Miniature electrocardiograph |
| [10] | Category: industrial design<br>Application number: 108-2021<br>Authors: Štefan Borik<br>Title: Circuitry for the biosignals' transmission in the audio band |
| [11] | Category: industrial design<br>Application number: 177-2021<br>Authors: Róbert Hudec, Slavomír Matúška, Martina Radilová<br>Title: Electroconductive connection with magnetic bond |

*Granted patents and industrial designes in 2021:*

| | |
|---|---|
| [1] | Category: industrial design<br>Application number: 9405<br>Authors: Ivan Martinček, Matej Goraus<br>Title: Optical interferometer with conical and cyllindrical reflecting surface |
| [2] | Category: industrial design<br>Application number: 9038, 2021<br>Authors: Michal Praženica, Dušan Koniar, Libor Hargaš, Peter Šindler, František Jablončík<br>Title: Involvement for non-contact measurement of parameters of microscopic objects offline |
| [3] | Category: industrial design<br>Application number: 9039, 2021<br>Authors: Michal Praženica, Dušan Koniar, Libor Hargaš, Peter Šindler, Jaroslav Bulava<br>Title: Wiring for diagnostics of rotating objects using low frame rate camera |
| [4] | Category: industrial design<br>Application number: 9049, 2021<br>Authors: Michal Praženica, Miroslav Pavelek, Michal Frivaldský<br>Title: Device for testing wireless transmission of electrical energy with position adjustment |
| [5] | Category: industrial design<br>Application number: 9076, 2021<br>Authors: Michal Praženica, Slavomír Kaščák<br>Title: Wiring of the universal protective circuit of the multiphase inverter |
| [6] | Category: industrial design<br>Application number: 9093, 2021<br>Authors: Michal Praženica, Dušan Koniar, Libor Hargaš, Miroslav Pavelek<br>Title: Heating the table of the inverse microscope |
| [7] | Category: industrial design<br>Application number: 9168, 2021<br>Authors: Michal Praženica, Ondrej Hock, Jozef Šedo, Matúš Danko<br>Title: Involvement of a robotic hand controlled by movements |
| [8] | Category: industrial design<br>Application number: 9267, 2021<br>Authors: Michal Praženica, Miroslav Pavelek, Michal Frivaldský<br>Title: Device for reconfigurable electromagnetic shielding of wireless transmission of electricity |
| [9] | Category: industrial design<br>Application number: 9273, 2021<br>Authors: Dušan Koniar, Jozef Volák, Jakub Bajzík, Silvia Janišová, Libor Hargaš<br>Title: Parallel multi-vis spatial scanning system with conventional cameras |
| [10] | Category: industrial design<br>Application number: 9290, 2021 |

| | |
|---|---|
| | Authors: Michal Praženica, Michal Frivaldský, Ján Morgoš, Slavomír Kaščák<br>Title: Involvement of two-way modular inverter system |
| [11] | Category: industrial design<br>Application number: 9377, 2021<br>Authors: Michal Praženica, Michal Frivaldský, Slavomír Kaščák, Ján Morgoš<br>Title: Involvement of modular inverter with voltage control on output capacitors |
| [12] | Category: industrial design<br>Application number: 9378, 2021<br>Authors: Ján Morgoš, Karol Hrudkay, Peter Klčo, Michal Praženica<br>Title: Photovoltaic system using maximum power estimator |
| [13] | Category: industrial design<br>Application number: 56-2020<br>Authors: Štefan Medvecký, Adrián Hajdučík, Branko Babušiak, Jaromír Klarák, Rudolf Madaj<br>Title: Steering wheel monitoring the driver's vital functions |
| [14] | Category: industrial design<br>Application number: 180-2020<br>Authors: Marián Hruboš, Rastislav Pirník, Dušan Nemec, Michal Gregor, Marek Bujňák<br>Title: Equipment for measuring critical environmental parameters |
| [15] | Category: industrial design<br>Application number: 229-2020<br>Authors: Marián Hruboš, Dušan Nemec, Rastislav Pirník, Aleš Janota, Tomáš Tichý, Emília Bubeníková<br>Title: Emergency telematics support equipment |
| [16] | Category: industrial design<br>Application number: 119-2020<br>Authors: Michal Gregor, Marián Hruboš, Aleš Janota, Dušan Nemec<br>Title: Intelligent audiovisual interface of a flexible robot |

## Awards

- Michal Frivaldský: UNIZA Award for Outstanding Contribution to Science and Research
- Peter Hockicko:Award of the Czech Association of the Distance University Education for contribution Videoanalyses of real physical phenomena at the 20th edition of the competition eLearning, Prague 3rd September 2021
- Štefan Hardoň: 2nd place in the Competition of Scientific Works of Young Physicists of the Slovak Physical Society

## Habilitations and Inaugurations

Tab. 13: Number of habitations and inaugurations within last twelve years

| Year | Habilitation | | Inauguration | |
|---|---|---|---|---|
| | Internal | External | Internal | External |
| 2008 | 2 | 5 | | 3 |
| 2009 | | | 1 | 1 |
| 2010 | | | 2 | |
| 2011 | 3 | | 2 | |
| 2012 | 5 | | | |
| 2013 | 2 | | | 1 |

| | | | | |
|---|---|---|---|---|
| 2014 | 6 | 1 | 3 | |
| 2015 | | | 2 | |
| 2016 | 2 | | 1 | |
| 2017 | 1 | | 1 | |
| 2018 | 2 | | 2 | |
| 2019 | 1 | | 1 | |
| 2020 | 8 | | | |
| 2021 | 5 | | 2 | |

# FOREIGN ACTIVITIES

Foreign activities at the Faculty of Electrical Engineering and Information Technology in 2021 continued to be unfavourably affected by the pandemic situation caused by the coronavirus COVID-19. In particular, activities related to the realization of international projects summarized in the previous section developed, mutual mobility of teachers, researchers and students at foreign institutions was weakened, as well as active participation in foreign scientific events.

The Faculty successfully continues in the participation in the "Double degree program" in the study field "Electrical Engineering" for the study programs "Power Electronic Systems" and "Electric Drives" with the partner University of Catania in Sicily, Italy. Students from the partner university studied at FEEIT also in the academic year 2020/2021.

Dean's office gets information from various agencies and institutions about offered study stays, government scholarships, summer schools, excursions, work offers, foundations and so on. The information is effectively disseminated using modern communication means to the faculty staff as well as to the students.

## Programmes supporting educational activities

### Program ERASMUS+

Within the frame of Erasmus+ programme, bilateral agreements with 67 foreign universities were approved for students / teachers / other staff exchanges for the academic year 2020/2021, as follows:

1. TU Wien (AT)
2. Todor Kableshkov Higher School of Transport (BG)
3. University of Telecommunications and Post (BG)
4. "NikolaVaptsarov" Naval Academy (BG)
5. University of Hradec Králové (CZ)
6. University of West Bohemia (CZ)
7. Czech Technical University in Prague (CZ)
8. VŠB-Technical University in Ostrava (CZ)
9. Technical University of Liberec (CZ)
10. Brno University of Technology (CZ)
11. Silesian University in Opava (CZ)
12. Tomas Bata University in Zlín (CZ)
13. Czech University of Life Sciences Prague (CZ)
14. University of Central Lancashire (CY)
15. RWTH Aachen (DE)
16. TU Dresden (DE)
17. Hochschule für Technik und Wirtschaft Dresden (DE)
18. Hochschule fuer Telekommunikation Leipzig (DE)
19. RUHR Bochum (DE)
20. University of Applied Sciences Aschaffenburg (DE)
21. Technische Universität Ilmenau (DE)
22. Deggendorf Institute of Technology - Technische Hochschule Deggendorf (DE)
23. Universitat Autonoma de Barcelona (ES)
24. Tampere University of Technology (FIN)
25. Tampere University of Applied Sciences (FIN)
26. University of Jyväskylä (FIN)

27. Aalto University (FIN)
28. University of Vaasa (FIN)
29. Lappeenranta University of Technology (FIN)
30. Télécom SudParis (FR)
31. Télécom Ecole de Management (FR)
32. Université de Picardie “JulesVerne“ (FR)
33. Université de Technologie de Compiègne (FR)
34. Polytech Orléans (FR)
35. Lille 1 University Science and Technology, Polytech Lille (FR)
36. Ecole d'ingénieurs ECE Paris (FR)
37. Pole Universitaire Leonard De Vinci (FR)
38. University of Patras (GR)
39. University of Zagreb (HR)
40. Budapest University of Technology and Economics (HU)
41. University of Catania (IT)
42. Universita degli Studi di Palermo (IT)
43. Dublin Institute of Technology (IRL)
44. Transport and Telecommunication Institute (LV)
45. Riga Technical University (LV)
46. Kaunas University of Technology (LT)
47. Universidade da Beira Interior (PT)
48. Universidade de Lisboa (PT)
49. Universidade do Porto (PT)
50. Polytechnic Institute od Beja (PT)
51. Kazimierz Pulaski University of Technology and Humanities in Radom (PL)
52. Lublin University of Technology (PL)
53. Silesian University of Technology (PL)
54. West Pomeranian University of Technology (PL)
55. Gdansk University of Technology (PL)
56. Uniwersitet Technologiczno Przyrodniczy w Bydgoszczy (PL)
57. Warsaw University of Technology (PL)
58. Gdynia Maritime University (PL)
59. Wroclaw University of Science and Technology (PL)
60. Transilvania University of Brasov (RO)
61. Universitatea Technica din Cluj-Napoca (RO)
62. Universitatea “POLITEHNICA” din Bucuresti (RO)
63. University of Maribor (SI)
64. Uludağ University (TR)
65. Istanbul Arel University (TR)
66. Biruni University (TR)
67. Karabuk University (TR)

*Erasmus+ stays*

In the academic year 2020/2021 8 students (thence 5 students for Erasmus+ practical placement) participated in the Erasmus+ programme, 8 prepared Erasmus+ mobilities were due to COVID-19 finaly cancelled, and 9 teachers from FEEIT participated in the Erasmus+ programme.

The Faculty accepted 5 students and 3 teachers from partner universities.

## Other activities

The Faculty of Electrical Engineering cooperates in the frame of bilateral agreements with the following institutions:

- Ryazan State Radio Engineering University (RU),
- Universita degli Studi di Catania (IT),
- Tohoku University, School of Engineering (JP),
- Fakulta dopravní ČVUT Praha (CZ),
- Univerzita Pardubice (CZ),
- ELTODO EG, a. s., Praha (CZ),
- ELTODO dopravní systémy s. r. o., Praha (CZ),
- Výzkumný ústav železničný, a. s., Praha (CZ),
- VÚKV, a. s., Praha (CZ),
- Technický a zkušební ústav stavební Praha, s. p. (CZ),
- Fraunhofer IWU Chemnitz (DE),
- University of Strathclyde (UK),
- Agencia Estatal Consejo Superior de Investigaciones Cientificas (ES),
- Ramboll UK Ltd. (UK),
- PanonIT (RS),
- Universityu of Sydney (AU),
- Tongji University (CN),
- MC Gill University (CA),
- Simon Fraser University (CA),
- York University (CA).

Purpose of these agreements is to enhance academic exchange and co-operation in the field of education and research. The co-operation programme involves especially the following activities:

- exchange of students,
- exchange of faculty members and staff,
- exchange of scientific materials, publications and information,
- joint research and research meetings,
- cooperation within the Doctoral study (mainly with University of Catania (IT)).

In addition, FEEIT cooperates with many other international institutions, in particular:

- University of Strathclyde, Glasgow (UK),
- National Research Council, Ottawa (CA),
- Technische Universitaet Ilmenau, Faculty of Computer Science and Automation (DE),
- University of Novi Sad (RS),
- Moscow Technical University of Communications and Informatics (RU),
- Moscow Power Engineering Institute (RU),
- Budapest University of Technology and Economics (HU),
- Tokyo University, Tokio (JP),
- Tohoku University, Sendai (JP),
- Silesian University of Technology (PL),
- Politechnika Lubelska, Faculty of Electrical Engineering and Informatics (PL).

A detailed list of institutions is presented in the annual reports of departments.

## Foreign stays, visits and conferences

Employees and doctoral students of the Faculty performed in 2021 several short or long stays in foreign countries at partner universities or institutions, and on the contrary, FEEIT and its departments accepted students and teachers from abroad. Compared to previous years, e.g. in 2019, when the Faculty accepted 36 and sent 75 employees, the years 2020 and 2021 was much weaker in this respect, which was caused by the situation caused by COVID-19.

Employees of the FEEIT published and/or took part in some international conferences, workshops and symposiums. Detailed information about particular names of employees, titles of papers and conferences, activities performed during the study stays and purposes of foreign visits are presented in annual reports of the departments of FEEIT for 2021.

Picture of mobility at FEEIT within foreign stays, conferences and visits can be seen in the following table. The data are summarized according to countries and departments.

Tab. 14: Foreign stays, conferences and visits in 2021

| IN/OUT | DPh | DMAEE | DEBE | DME | DPSED | DCIS | DMICT | IAS |
|---|---|---|---|---|---|---|---|---|
| Czech Republic | 1 / 0 | | | | | 2 / 1 | | |
| Greece | | | | | | | 0 / 0 | |
| Poland | | | | 2 / 0 | | | | |
| Italy | 0 / 1 | | | 0 / 1 | | | | |
| **Total** | **1 / 1** | **0 / 0** | **0 / 0** | **2 / 1** | **0 / 0** | **2 / 1** | **0 / 0** | **0 / 0** |
| **Total all** | **5 / 3** | | | | | | | |

## Membership in International Institutions/Committees

Employees of the Faculty of Electrical Engineering and Information Technology, respectively the departments as a whole, are members of many national and international institutions/organizations/committees of international journals, conferences, in scientific boards and trade committees, and so on.

Detailed information about memberships are presented in annual reports of the departments of FEEIT for 2021.

# MAIN TASKS OF THE FACULTY FOR THE YEAR 2022

The development of FEEIT will continue in accordance with the Long-term plan of the Faculty for the period 2021-2027, which was approved by the Scientific Board of FEEIT on 15th Faberuary 2021, while in the process will be incorporated knowledge obtained from the practical implementation of the activities proposed in the framework program. The basic strategic goal is permanent developing of the Faculty as a prestigious educational and research institution with a prominent place among Slovak faculties, which has a significant international recognition in the most offered study programmes and fields of research and development.

The development of the Faculty will also include the improvement of the infrastructure by building a modern meeting room in the premises of the dean's office and the faculty ICT laboratory designed to support the teaching of IT subjects.

*Field of education*

- preparing for new accreditation standards and the resulting accreditation in provided fields of study;
- get better feedback from students about their satisfaction with the education provided at the Faculty;
- organize a meeting of the faculty management with the academic community of the faculty once a year;
- to continue with marketing activities towards primary and secondary schools to increase students' awareness of the possibilities of studying at FEEIT;
- within the marketing activities, continue the implementation of at least one action directed towards primary schools and twenty actions directed towards secondary schools in order to inform students of schools about study possibilities at FEEIT;
- organization of two open-door actions towards secondary school students;
- in the context of improving the cooperation with secondary schools, to offer individual visits of secondary school students to the Faculty in the form of specialized laboratory exercises.

*Field of science and research*

- active participation in the organization of conferences/seminars/events;
- in accordance with plans to realize the qualification growth of faculty members;
- organization and promotion of Student Scientific Competitions for all three study degrees and to focus attention on the possibility of participation of the faculty students at the organized national and international students' competitions;
- monitoring and at least twice a year evaluation of accreditation criteria;
- evaluation of the submitted project proposals to national and international funding agencies twice a year;
- improve the cooperation with industrial partners and other institutions;
- define areas of relevant scientific and research activities at the Faculty, including the staff;
- monitoring and control of scientific research activities and related outputs;
- Preparaton of grant calls for young researchers and other FEIT researchers.

*Field of international cooperation*

- development of tools for more efficient engagement of research groups in the EU Framework Programme for Research and Innovation HORIZON 2020 and other European programs as COST, cross-border cooperation and cooperation with foreign industrial partners;
- improve the propagation and support of students' and teachers' mobility within the framework of the internationalization of education in order to increase the quality and number of mobilities;
- create conditions for more effective international cooperation in terms of accreditation standards;
- attractiveness of the faculty's educational system for international students;
- more prominent presentation of study opportunities in Eastern European countries.

## Contacts and Address

### Academic Officials

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