UNIVERSITY OF ŽILINA

FACULTY OF ELECTRICAL ENGINEERING

ANNUAL REPORT 2018

FACULTY OF ELECTRICAL ENGINEERING

Foreword

The Faculty of Electrical Engineering 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 (1953; 1992),
- 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

As mentioned above, history of the Faculty of Electrical Engineering goes back to the year 1953. In 1959 it was merged with the Faculty of Mechanical Engineering and that symbiosis took 33 years. In 1992, after the split, the Faculty returned to its previous original name. 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, and 2013).

Structure of the Faculty

From a structure point of view, the Faculty of Electrical Engineering (FEE) 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 FEE'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 Electrical Systems (DPES),
- Department of Control and Information Systems (DCIS),
- Department of Multimedia and Information-Communication Technologies (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 FEE's departments as of 31.12.2018.

Tab. 1: Number of pedagogical and research employees at the departments of the FEE as of 31.12.2018

Department	Pedagogical staff		Research staff	
	Full-time	Part-time	Full-time	Part-time
DPh	16	-	3	-
DMAEE	7	1	-	-
DEBE	9	2	1	1
DME	14	1	2	3
DPES	13	3	1	3
DCIS	12	2	3	-
DMICT	24	4	4	1
IAS	7	-	2	-
Total	**102**	**13**	**16**	**8**

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

Tab. 2: Number of employees at the FEE according to the categories in 2012-2018

Year	2012		2013		2014		2015		2016		2017		2017	
Full-time / Part-time	**FT**	**PT**	**FT**	**PT**	**FT**	**PT**	**FT**	**PT**	**FT**	**PT**	**FT**	**PT**	**FT**	**PT**
Prof.	17	2	18	-	18	-	17	-	19	-	18	-	15	-
Guest Prof.	-	1	-	1	-	4	-	4	-	4	-	4	-	1
Assoc. Prof.	25	1	28	1	36	1	34	3	29	4	28	3	32	1
Senior Lecturer	55	6	54	6	49	6	51	8	53	5	57	6	53	9
Lector	2	-	3	-	5	-	4	-	4	-	2	3	2	2
Tech. Admin. Staff	32	1	32	3	31	3	27	2	26	3	27	2	22	2
Research Staff	26	3	21	5	16	6	12	6	14	4	16	6	18	8
Total	**157**	**14**	**156**	**16**	**155**	**20**	**145**	**23**	**145**	**20**	**147**	**24**	**142**	**23**

Highlights

The most important events in 2018 can be summarized as follows:

- Finalization of the process of renaming the faculty to "Faculty of Electrical Engineering and Information Technology";
- 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;
- Innovation of research infrastructure, modern technologies and laboratories;
- Successful organization of the international conference ELEKTRO 2018, including the indexation of accepted papers to relevant scientific databases (e.g. Scopus, IEEE);
- Continuation of the implementation of the international project “ERAdiate”, one of the largest 7th Framework Programme projects in Slovakia from financial point of view;
- Submission of four proposals of international research projects;
- Successful implementation and realization of national research projects (SRDA, VEGA, KEGA);
- Continuing graduation growth of the faculty staff by appointment of two full professors and two associate professors;
- Co-organization of a workshop on the theme "Industry 4.0, Internet of Things & ElectroMobility" which was part of the European Week of Regions and Cities in Brussels. Expert co-guarantors of the workshop were VSB - Technical University of Ostrava, Silesian University of Technology in Gliwice and Faculty of Electrical Engineering, UNIZA;
- Enhancement and further implementation of a marketing strategy aimed at promoting of studies at FEE UNIZA;
- Organization of a seminar entitled "Perspectives of the study of electrotechnical and informatics fields of study in Slovakia ", aimed at exchanging experience in the preparation of students for study at FEE UNIZA and creating a partnership between secondary schools and university environment;
- Signing the Framework Agreement on Cooperation between the Ningbo University of Technology, China and the University of Žilina.

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 the students better acquire theoretical and practical aspects of their education.
- The FEE 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). For this purpose, mentoring program continued at FEE in 2018.
- Considerable attention is paid to students of the 3rd degree study. The FEE supports them mainly in preparing high quality publication outputs, fulfilment of curricula, preparation and defending the dissertation thesis.
- The FEE is using complex software system for supporting e-learning, which enables access into e-learning blocks, test and examination, and organizational provision of study. The FEE claims from pedagogical staff active usage of e-learning system and at the same time it creates conditions for e-learning development, not only within the FEE but also within the university.
- The FEE 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.
- The FEE supports the development of interdisciplinary, multidisciplinary, distance and lifelong learning; and education of foreign languages mainly for young employees and doctoral students.
- The FEE 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 the FEE there is a contact person (vice-dean for education) responsible for help and life coordination of disabled students.

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					
Control Engineering	Control Engineering	FT	3 years	Bc.	Mária Franeková
Biomedical 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
Electrical Engineering	Electrical Engineering	PT	4 years	Bc.	Alena Otčenášová
Telecommunications	Digital Technologies	FT	3 years	Bc.	Jarmila Můllerová
Telecommunications	Digital Technologies	PT	4 years	Bc.	Jarmila Můllerová
Telecommunications	Multimedia Technologies	FT	3 years	Bc.	Roman Jarina
Telecommunications	Telecommunications	FT	3 years	Bc.	Peter Počta
2nd study degree					
Control Engineering	Applied Telematics	FT	2 years	Ing.	Aleš Janota

Control Engineering	Process Control	FT	2 years	Ing.	Juraj Spalek
Biomedical Engineering	Biomedical Engineering	FT	2 years	Ing.	Ladislav Janoušek
Electronics	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
Telecommunications	Multimedia Engineering	FT	2 years	Ing.	Vladimír Wieser
Telecommunications	Telecommunication and Radio-com. Engineering	FT	2 years	Ing.	Milan Dado
3rd study degree					
Control Engineering	Process Control	FT	3 years	PhD.	Karol Rástočný, Aleš Janota, Mária Franeková
Electric Power Systems	Electric Power Systems	FT	3 years	PhD.	Juraj Altus, Alena Otčenášová, Peter Braciník
Electric Power Systems	Electric Power Systems	PT	4 years	PhD.	Juraj Altus, Alena Otčenášová, Peter Braciník
Electrotechnologies and Materials	Electrotechnologies and Materials	FT	3 years	PhD.	Dušan Pudiš, Ivan Martinček, Jarmila Müllerová
Electrotechnologies and Materials	Electrotechnologies and Materials	PT	4 years	PhD.	Dušan Pudiš, Ivan Martinček, Jarmila Müllerová
Power Electrical Engineering	Power Electrical Engineering	FT	3 years	PhD.	Pavol Špánik, Pavol Rafajdus, Michal Frivaldský
Power Electrical Engineering	Power Electrical Engineering	PT	4 years	PhD.	Pavol Špánik, Pavol Rafajdus, Michal Frivaldský
Telecommunications	Telecommunications	FT	3 years	PhD.	Vladimír Wieser, Milan Dado, Róbert Hudec
Telecommunications	Telecommunications	PT	4 years	PhD.	Vladimír Wieser, Milan Dado, Róbert Hudec
Theory of Electrical Engineering	Theory of Electrical Engineering	FT	3 years	PhD.	Ladislav Janoušek, Mariana Beňová, Milan Smetana

Tab. 4: Number of the faculty students (as of 31.10.2018)

Field of study/Study program	Number of students			
	Full-time study		Part-time study	
	Nationals	Foreigners	Nationals	Foreigners
1st study degree				
Control Engineering	93	1		
Autotronics	43			
Biomedical Engineering	75	2		
Electrical Engineering	165		5	
Digital Technologies	27		5	
Multimedia Technologies	89	1		
Telecommunications	80	2		
Total	**572**	**6**	**10**	
2nd study degree				
Applied Telematics	7			
Biomedical Engineering	59			
Electric Power Systems	55	1		
Electric Drives	10	3		
Photonics	9	1		
Multimedia Engineering	55	1		
Process Control	49	1		
Telecomm. and Radio-comm. Eng.	37	1		
Power Electronic Systems	28			
Total	**309**	**8**		
3rd study degree				
Electric Power Systems	6		2	
Electrotechnologies and Materials	2		1	
Process Control	6			
Power Electrical Engineering	18	1	1	
Telecommunications	12		1	
Theory of Electrical Engineering	3			
Total	**47**	**1**	**5**	

Tab. 5 and 6: Overview of the faculty students' number since 2014 (as of 31.10.2018)

Full-time study				
2014	**2015**	**2016**	**2017**	**2018**
1st study degree				
864	778	654	634	578
2nd study degree				
428	381	356	346	317
3rd study degree				
58	62	51	48	48

Part-time study				
2014	**2015**	**2016**	**2017**	**2018**
1st study degree				

	16	23	21	10
2nd study degree				
31	31	31		
3rd study degree				
15	12	9	8	5

Admission for study

a) Form of the admission procedure in 2018 and a brief assessment:

The basic condition for admission to bachelor study (1st level study programme) is completed secondary education or completed secondary vocational education. The admission procedure is performed through the selection procedure. Within the selection procedure, the results from subjects Mathematics and Physics achieved during secondary school study are assessed while the type of the attended secondary school is taken into account. Personal participation of the applicant at the admission procedure is mandatory for the study program Multimedia Technologies. For all other study programmes no personal participation is required. Automatically are admitted applicants for study (except applicants for the study program Multimedia Technologies) who meet at least one of the following criteria:

- graduates of secondary grammar schools and secondary electro-technically oriented schools with average results from mathematics and physics at the final year-and/or school-leaving certificates up to 2.00,
- graduates of secondary grammar schools and secondary electro-technically oriented schools who passed the school leaving exam in Mathematics or in Physics with the final mark not worse than 2.00,
- if the applicant for study participates and succeeds at the Olympics in mathematics, physics, informatics and electrical engineering (district round), ŠVOS (relating to electrical engineering and informatics) and other competition in the field of electrical engineering, this will be taken into account in the selection procedure.

All other applicants not meeting the above criteria and all applicants for studying the study programme Multimedia Technologies will be included in the selection procedure. The applicants in the selection procedure are ranked according to the score for the achieved results exclusively from the subjects Mathematics and Physics at the secondary school. Details of the method of allocation of points are put on the website of the FEE.

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:

The FEE 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. The FEE organized for secondary schools its own Open Day, and also special exercises for students of selected secondary schools. Representatives of the Faculty participated in various promotional events organized at university level (Researcher night, Christmas at the university, ...). At the same time, the promotion of study opportunities at the FEE has been more intense on social networks (Facebook, Twitter, ...).

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 2018

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	63	60	37			
Autotronics	34	33	19			
Biomedical Engineering	62	59	40			
Digital Technologies	7	0	0			
Electrical Engineering	105	94	76			
Multimedia Technologies	79	61	54			
Telecommunications	73	70	52			
Total	**423**	**377**	**278**			
2nd study degree						
Applied Telematics	6	6	6			
Biomedical Engineering	25	23	23			
Electric Drives	10	10	8			
Electric power systems	26	26	26			
Photonics	7	6	6			
Multimedia Engineering	36	36	30			
Process Control	19	19	19			
Telecomm. and Radio-comm. Eng.	25	24	19			
Power Electronic Systems	12	12	11			
Total	**166**	**162**	**148**			
3rd study degree						
Electric Power Systems	2	2	2			
Electrotechnologies and Materials	2	1	1			
Process Control	3	3	3			
Power Electrical Engineering	7	5	5			
Telecommunications	7	5	4			
Theory of Electrical Engineering	2	2	2			
Total	**23**	**18**	**17**			

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

Tab.8: Number of graduates of the Faculty in the academic year 2017/2018

Field of study/Study program	Number of graduates in 2017/2018			
	Full-time study		Part-time study	
	Nationals	Foreigners	Nationals	Foreigners
1st study degree				
Control Engineering	20			
Biomedical Engineering	26			
Digital Technologies	20		4	
Electrical Engineering	59	3		
Multimedia Technologies	17	1		
Telecommunications	18	1		
Total	**160**	**5**	**4**	
2nd study degree				
Applied Telematics	4			
Biomedical Engineering	23			
Electric Power Systems	25			
Electric Drives	4			
Photonics	4			
Multimedia Engineering	32			
Process Control	29			
Telecomm. and Radio-comm. Eng.	31			
Power Electronic Systems	11			
Total	**163**			
3rd study degree				
Electric Power Systems	1		1	
Electrotechnologies and Materials	3			
Process Control	3			
Power Electrical Engineering	4		1	
Telecommunications	3			
Theory of Electrical Engineering	3			
Total	**17**		**2**	

Tab.9: Overview of graduates of the Faculty since 2012/2013 (as of 31.12.2018)

Full-time study					
2012/13	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/2018**
1st study degree					
246	208	186	196	167	165
2nd study degree					
194	233	197	198	161	136
3rd study degree					
17	14	14	12	18	17
Part-time study					
2012/13	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/2018**
1st study degree					
	47				4
2nd study degree					

				31	
3rd study degree					
2	7	3	3	1	2

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 Biomedical 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.

Digital technologies
(Field of study Telecommunications)

The graduate will acquire knowledge from the basic disciples in the field oriented to general professional knowledge in the area of digital technologies, electronics, optoelectronics, communication systems, networks and services, transmission media to be connected with obtaining practical experience in the field of digital technologies, mainly information processing, transmission and communication systems. He/she will gain experience and skills in the field of digital system operation. Apart from that, he/she will acquire basic legal, economic and managerial knowledge to be utilised in the field of digital system services, digital security and language skills including specific terms. The graduate will apply successfully as a technician, technologist or manager of technician team, administrator of digital devices and systems.
Software skills: C language, C++, PHP, JavaScript, MySQL, Flash animations, Code Blocks, LabView, PHPMyAdmin, MySQLWorkbench, ILEAD GIF Animator, XARA X, ADOBE Imagereak, Adobe After Effects, AVI 3d studio, DiagramDesigner, HTML Kit.

Multimedia technologies
(Field of study Telecommunications)

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.

Telecommunications
(Field of study Telecommunications)

The graduate will acquire necessary theoretical and specific knowledge, information on technologies and methods from the field of transmission and processing of all information types, on the structure and operation of respective equipment and systems of fixed and mobile networks. He/she has knowledge in information technology utilisation in the given field, as well as knowledge in economics, management, psychology and legal regulations. He/she may successfully operate in companies focused on the area of communication and information technologies as an executive and managing employee.

Software skills: C language, C++, MATLAB, Java, JSP, Blender, 3dMax, Cinema 4D, Audition, Protools, Premierepro, HW, Adobe InDesign, SQL, PSpice, Microsim, Adobe Illustrator, Corel Draw, QuarkxPress, LaTex, Blender, 3dMax, Cinema 4D, Photoshop, MS Office, MATLAB, SIMULINK, from SPICE family – simulation programs oriented on analyses and syntheses of electronic circuits, EAGLE, LabView, VPIphotonics.

Master study programmes

Applied telematics
(Field of study Control engineering)

The graduate will acquire education in the areas of design, modelling, application, implementation, inspection, service and maintenance of telematics systems and their components, especially intelligent transport systems, control systems of road and railway tunnels, complex transportation systems and telematics systems in health care. He/she will gain theoretical knowledge about sets of technical instruments utilized in selected application areas (primarily in the area of transport, additionally in other areas – health care, public services, etc.) that are required for understanding of telematics systems, their components, modern development trends, position of human factor in these systems as well as knowledge needed for design, control and assessment of those systems.
Software skills: Ethernet, PLC, PHP language, MySQL, HTML language, UML, OCL language, MATLAB, PYTHON language, SCADA/HMI systems.

Biomedical engineering
(Field of study Biomedical 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 Electronics)

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 Control engineering)

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 Telecommunications)

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 Telecommunications)

The student of the Multimedia Engineering study programme in the telecommunications 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 Electric power systems)

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 Electro-technologies and materials)

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.

Process control
(Field of study Control engineering)

The doctoral study in the field of Automation 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.

Power electrical engineering
(Field of study Power 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.

Telecommunications
(Field of study Telecommunications)

The aim of the doctoral degree studies in the field of Telecommunications 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.

Theory of electrical engineering
(Field of study Theory of 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 of mathematical 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.

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				
134	132	80	16	4
Master thesis				
165	163	94	14	15
Doctoral thesis				
18	18	18	0	0

Students' awards

Awards of students within the university

- Dean's prize was in 2018 awarded to the following students of the 1st degree study:
  - Marek Bujňák (study program Control engineering)
  - Stanislav Frištyk (study program Biomedical engineering)
- Dean's prize was in 2018 awarded to the following students of the 2nd degree study:
  - Milan Hikel (study program Biomedical engineering)
  - Andrej Kačenka (study program Electric drives)
  - Marek Širanec (study program Electric power systems)
  - Petra Urbancová (study program Photonics)
  - Filip Černý (study program Process control), won the Scheidt & Bachmann Award for the best thesis in the field of transport systems
  - Daniela Ferleťáková (study program Process control),
  - Eva Lieskovská (study program Telecommunications and Radio-communications Engineering)

- Awards to students for work presented at the Student scientific technical competition ŠVOS:
  - 1st place: Tadeáš Bednár (2nd degree study)
    Patrik Žiak (2nd degree study)
    Miroslav Pavelek (3rd degree study)
  - 2nd place: Boris Cucor (1st degree study)
    Daniel Janáček (2nd degree study)
    Marek Novák (3rd degree study)
  - 3rd place: Viktória Rendošová (2nd degree study)
    Marián Tomašov (2nd degree study)
    Jozef Volák (3rd degree study)
    Ján Morgoš (3rd degree study)
- Rector's prize was awarded in 2018 to:
  - Peter Hrabaj (study program Electrical Engineering, 1st degree study)
  - Tadeáš Bednár (study program Biomedical Engineering, 2nd degree study)
- Rector's prize for above average results in scientific and research activities was awarded in 2018 to:
  - Miroslav Pavelek (3rd degree study)
- The National Center of Robotics awarded 3rd place in the competition for the best diploma thesis:
  - Michal Kubica (2nd degree study)

Support for students in 2018

Scholarships (motivation, faculty)

For excellent study results the Faculty provides the scholarships to students. These scholarships were allocated in 2018:

- merit scholarships - the number of students: 79, the amount paid: 50 020 EUR,
- special scholarships - the number of students: 23, the amount paid: 5 593 EUR,
- social scholarships - the average number of recipients/students: 79,9, the amount paid: 124 115 EUR,
- trade scholarships - number 345, the amount paid: 160 225,40 EUR,
- from own resources - the number of students: 61, the amount paid: 10 173 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 the FEE 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, and the IET.

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 18 projects of international cooperation, 46 projects financed from national sources, 3 projects of Structural Funds and 6 other projects have been realized at the FEE in 2018. 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

7th Framework Programme projects

621386: ERAChair - Enhancing Research and innovAtion dimension of the University of Zilina in intelligent transport (ERAdiate)	
Summary:	The ERAdiate project is aimed at unlocking and strengthening the research potential and promoting excellence of the University of Zilina (UNIZA) as well as the Zilina region in the field of Intelligent Transport Systems (ITS). Systematic development of human resources, effective exploitation of unique research infrastructures and advanced transformations of the institution steered towards enhanced competitiveness in the European Research Area (ERA) are the key instruments to reach the ERAdiate goals. The project focuses on sustainable development of human resources and key competences under leadership of an experienced scientist and manager, an ERA Chair Holder, and his team. Major challenges such as creating competitive environment, increasing of critical mass of excellent researchers, significant improvement of the UNIZA performance in competitive research funding, implementation of the ERA culture, contribution to growth and jobs based on the SMART specialization strategies, are addressed.
Realization:	07/2014 – 07/2019
Coordinator:	Milan Dado (DMICT), Jadislav Janoušek (DEBE)
Co-operators:	Juraj Machaj (DMICT)

MSCA-RISE-2016: SENSors and Intelligence in BuiLt Environment SENSIBLE	
Summary:	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. 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 – 12/2020
Coordinator:	Vladimir Stankovic, University of Strathclyde, Glasgow, UK
Sub-Coordinator from FEE:	Juraj Machaj (DMICT)
Co-operators:	Milan Dado, Slavomír Matúška, Róbert Hudec, Peter Brída (DMICT), Jarmila Müllerová (IAS), Peter Holečko, Michal Gregor, Vojtech Šimák (DCIS), Peter Braciník (DPES)

636537 - H2020 High precision positioning for cooperative ITS applications	
Summary:	This project addresses the problems by combining traditional satellite systems with an innovative use of on-board sensing and infrastructure-based wireless communication technologies (e.g., Wi-Fi, ITS-G5, UWB tracking, Zigbee, Bluetooth, LTE...) to produce advanced, highly-accurate positioning technologies for C-ITS. HIGHTS platform will be a key enabler to C-ACC and Platooning. In particular C-ACC and Platooning will provide smoother driving conditions, optimization of traffic flows and high precision lane detection for more efficient guidance in urban and highway environments. The platform will increase the safety level of vulnerable road users (motorcycles, scooters, pedestrians) through bi- directional danger detection and by detecting slight deviations from driving courses, thus detecting danger before it occurs. The results will be integrated into the facilities layer of ETSI C-ITS architecture and will thereby become available for all C-ITS applications, including those targeting the challenging use cases Traffic Safety of Vulnerable Users and Autonomous Driving/platooning. The project will therefore go beyond ego- and infra-structure-based positioning by incorporating them as building blocks to

	develop an enhanced European-wide positioning service platform based on enhanced Local Dynamic Maps and built on open European standards.
Realization:	05/2015 – 04/2018
Coordinator:	Stefano Severi, Jacobs University Bremen gGmbH, Germany
Subcoordinators from FEE	Peter Brída, Juraj Machaj (DMICT)

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 TN 1302: BESTPRAC	
Summary:	BESTPRAC is a COST Targeted Network that gathers administrative, financial and legal staff at universities and research-driven institutions who are carrying out different tasks to support transnational external competition based (in particular EU funded) research projects. The network serves as a platform for exchanging experiences, sharing and developing best practices, encouraging knowledge sharing, knowledge transfer and increasing efficiency in these fields.
Realization:	03/2016 – 03/2020
Coordinator:	Juraj Machaj (DMICT)

Action IC1407: Advanced characterisation and classification of radiated emissions in densely integrated technologies (ACCREDIT)	
Summary:	The electromagnetic interference (EMI) will increase with the anticipated increase of clock speeds, frequency of operation and circuit density. Immunity levels will also decrease due to lower supply voltages and lower signal power levels. Traditionally the potential EMI sources were assessed in the frequency domain assuming static emissions.
Realization:	04/2015 –09/2019
Coordinator:	David Thomas, University of Nottingham
Co-operators:	Darina Jarinová (DMICT)

Action CA 15104: The Inclusive Radiocommunications (IRACON)	
Summary:	This COST Action aims at scientific breakthroughs by introducing novel design and analysis methods for the 5th-generation (5G) and beyond-5G Radiocommunication networks. Challenges include i) modelling the variety of radio channels that can be envisioned for future inclusive radio, ii) capacity, energy, mobility, latency, scalability at the physical layer and iii) network automation, moving nodes, cloud and virtualisation architectures at the network layer, as well as iv) experimental research addressing Over-the-Air testing, Internet of Things, localization and tracking and new radio access technologies.
Realization:	03/2016 – 03/2020
Coordinator:	Juraj Machaj (DMICT)
Co-operators:	Peter Brída (DMICT)

Action MP1401: Advanced fibre laser and coherent source as tools for society, manufacturing and lifescience	
Summary:	Fibre lasers are in the class of rapidly developing lasers with many applications for several reasons. Within the Action we expect an increase of innovations in this field, in particular the coverage of wavelengths from 3 to 6 micrometers, applications in the near-infrared region and increase of output transmission of fibers for a better coverage of visible and ultraviolet regions for biophotonics and improvement of health care.

Realization:	12/2014 - 12/2018
Coordinator:	Daniel Káčik (DPh)
Co-operators:	Ivan Martinček, Dušan Pudiš, Norbert Tarjányi (DPh)

Action BM 1309: European network for innovative uses of EMFs in biomedical applications "EMF-MED"	
Summary:	The Action will provide a cooperative framework to support the research on beneficial biological effects of non-ionizing electromagnetic fields (EMFs) and their use in biomedical applications. Research on biological effects of EMFs has traditionally focused on health risks. Inspired by promising recent studies on useful biomedical EMF interactions and applications, this Action will focus on beneficial effects, aiming for breakthrough results, new discoveries and innovative biomedical technologies. The Action will provide a better understanding of underlying physical and biological interaction mechanisms, related to both cancer and non-cancer applications, filling the gaps in the present state of knowledge. Ultimately, the Action will aim to contribute to development and optimization of innovative EMF-based medical devices and procedures, which will be safer, more efficient and less invasive. Interdisciplinary of the proposed topic and significance of the expected outcomes require a concerted research network at the European level.
Realization:	04/2014 – 04/2018
Coordinator:	Ján Barabáš (DEBE)
Co-operators:	Roman Radil (DEBE)

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 - 16/2020
Coordinator:	Marcus Bleicher, Frankurt
Co-operators:	Ivan Melo (DPh)

TU 1305: Social networks and travel behaviour	
Summary:	COST Action TU1305 aims to initiate a new collaboration framework for the various EU research groups that develops a new transport paradigm based upon ICT social networks and their subsequent travel behaviour in the urban environment. Our goals are to explore ways in which social activities become mobilised in space, identify how social ties affect the integration of local public transport into urban patterns, and develop a rigorous conceptual framework for new ideas and methodologies.

Realization:	03/2014 – 03/2018
Coordinator:	Pnina Plaut, Technion, Israel Institute of Technology, Haifa, Izrael
Co-operators:	Peter Holečko (DCIS), Rein Ahas, Sven Kesselring, Isabelle Thomas, Lucia Cristea, ...

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

International Scientific and Technological Co-operation Projects (MVTS)

RSF 14-49-00079: New methods and algorithms of combined signal and image processing with unknown parameters in promising radars and communication systems	
Summary:	The project solves the issue at the Moscow Energy Institute at the National Research University within the Department of Radio Equipment and Antenna systems.
Realization:	10/2014 – 12/2018
Coordinator:	Yurij Kutojans, Univerzita Le Mans, France
Co-operator:	Branislav Dobrucký (DME)

Other International Research Projects

02–1-1097-2010/2018: Study of polarization phenomena and spin effects at the Nuclotron accelerator (JINR)	
Summary:	The project's aim is to study the spin structure of light nuclei and the mechanism of reactions in which they participate in the inner target of the Nuclotron as well as in the extracted beam in the region of medium energies.
Realization:	01/2018 - 12/2018
Coordinator:	Marián Janek (DPh)
Co-operators:	Marek Veveričík, Gabriela Tarjányiová (DPh)

AO8673: SALSA - Stratospheric Autonomous Landing System Application	
Summary:	The objective of this “SALSA” project is to define, develop and test an autonomous landing system of our stratospheric probe, making use of on-board GPS receivers (and other motion sensors such as gyroscopes and accelerometers), a gliding parachute driven by servomotors and an on-board computer with proper controlling software. Such a system would significantly shorten payload recovery times and most importantly reduce the risk of landing in danger zones (e.g. lakes, mountains, densely populated areas, etc.), allowing stratospheric flights to be conducted with increased safety and applicability to time-sensitive payloads.
Realization:	03/2018 – 12/2020

Coordinator:	GOSPACE Ltd.
Co-operators:	Vojtech Šimák (DCIS), Benedikt Badánik, Branislav Kandera, Filip Škultéty DAT, FPEDAS

Other International Non-research Projects

EPPCN Agreement KE3202/EPPCN	
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:	01/2017-12/2020
Coordinator:	Arnaud Marsolier, CERN
Co-operators:	Ivan Melo (DPh)

PROJECT of the EUROPEAN PHYSICAL SOCIETY INTERNATIONAL PHYSICS MASTERCLASSES 2017 http://www.physicsmasterclasses.org	
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:	01/2018-12/2018
Coordinator:	Ivan Melo (DPh)
Co-operators:	Gabriela Tarjányiová, Mikuláš Gintner, Jozef Kúdelčík, Juraj Remenec (DPh)

Projects of National Programmes

Slovak Research and Development Agency (SRDA)

APVV-15-0152: Research of physical properties and growth kinetics of black silicon layers	
Summary:	The main objectives of the project are basic experimental, applied as well as theoretical research, black Si (c-Si and poly-Si) consisting mainly of crystalline nanometric dimensions. The research is directed to i) the preparation of black Si in chemical liquid media and plasma by means of catalytic layers, ii) the kinetics of its formation - i. electrochemical reactions; (iii) exploration and modelling of basic physical parameters of structures - in particular optical, electrical and morphological properties; and (iv) surface passivation of formed nanocrystalline structures using appropriate technology ensuring long-term stability of their properties. The project solves i) selection of a suitable type of surface catalytic layer and chemical composition of solutions necessary for formation of black Si, ii) formation of modified surface layers by means of catalytic layers and analysis of their physical properties, iii) formation and testing of solar cells with black Si layer, and iv) antibacterial effects of black Si layers. The results of this research are compared with research carried out on the classical porous Si prepared electrochemically.
Realization:	01/2018 – 06/2019
Coordinator:	Emil Pinčík, IP SAS Bratislava
Sub-Coordinator from FEE:	Jarmila Müllerová (IAS)

Co-operators:	Stanislav Jurečka, Gabriel Cibira, Libor Ladányi, Ľubomír Scholtz (IAS)

APVV-17-0631: Coexistence of photonic sensor systems and networks within the Internet of Things	
Summary:	With the development of technology and Internet of Things (IoT), the demands for collecting, processing and transmitting signals are growing in virtually all areas of society. An important role in this field play photonic solutions. This is important both on a signal transmission side - especially in the backbone networks and on the side of data acquisition systems, but especially for machine to machine communications (M2M). The project focuses on the coexistence of photonic sensor systems and photonic communications networks, focusing on the more efficient use of existing communication infrastructure for the purpose of sensing and detecting different physical quantities. The scientific knowledge of this part of the project solution will be used in the design of advanced photonic sensors and sensor systems and networks applicable to IoT solutions based on integrated subwave photonics and fiber optics.
Realization:	08/2018 – 06/2021
Coordinator:	Milan Dado (DMICT)
Co-operators:	Jarmila Müllerová, Michaela Holá, Ľubomír Scholtz, Libor Ladányi (IAS), Jozef Dubovan, Miroslav Markovič, Ján Litvik, Michal Kuba, Michal Frniak (DMICT)

APVV-15-0571: Research of the Optimum Energy Flow Control in the Electric Vehicle System	
Summary:	The project encompasses research into the multi energy storage system for a new generation of electric mobility applications focused on optimal use of energy stored in the primary electrochemical battery. The main criterion is thereby ensuring maximum range of the electric vehicle, at a given stored energy, which will be ensured by utilization of the recovery energy processes in changing the driving dynamics of the vehicles and optimum management of the bidirectional energy flow between the storages (batteries, supercapacitors) and traction drives. The main output of the project will be the simulator traction drive based on two-energy storage system designed to practical testing and optimization algorithms of the flow control and distribution of the power within the on-board network. Another output will be the software packets to manage and monitor on-board power system, including fault conditions and measurements of the relevant traction and energy quantities. The obtained results will be practically utilized in the design of the on-board power systems with optimal use of energy in the newly built university laboratory to teaching specialists in the field of electromobility.
Realization:	10/2016 – 09/2020
Coordinator:	Peter Drgoňa (DME)
Co-operators:	Branislav Dobrucký, Slavomír Kaščák, Michal Praženica, Michal Frivaldský, Roman Koňarik, Marek Paškala (DME)

APVV-17-0345: Research of the optimization procedures for improvement of transfer, safety and reliability characteristics of WET system	
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: • technical and hygienic properties (investigation of negative impact on living

	and non-living objects) and • 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: • radiating EMI into the environment - modification of coil geometry and layout, • optimization of topology of the main circuit and compensating elements, • 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	
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. Despite the fact that the electrosurgical unit belongs to routine surgical instruments, the research of its properties is necessary especially for its higher safety, efficiency, aesthetic and, last but not least, the development of new electrosurgical instruments for precisely specified areas of use, dental, laparoscopic, or aesthetic surgery. The aim of the project will be to investigate the phenomena of a major impact on the effectiveness of electrosurgical instruments. In particular, they will identify and analyse the possibilities of their use in order to optimally manage the power output of the source in relation to the change in tissue impedance. 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. Effective tools of scientific research such as numerical multiphysical modelling of biological structures and their properties during electrosurgical surgery, experimental measurement of tissue properties and proposed technical solutions will be used to solve the project. The expected application area of the system will be optimized

	technical solutions of electrosurgical instruments and procedures in selected areas of surgery.
Realization:	08/2018 – 06/2022
Coordinator:	Dagmar Faktorová (DMAEE)
Co-operators:	Pavol Špánik, Anna Kondelová, Miroslav Pavelek, Marek Paškala, Michal Frivaldský, Rastislav Štefún (DME)

APVV-14-0284: Study of useful properties of molded molybdenum sheets applicable for horizontal crystallisation of sapphire monocrystals	
Summary:	The essence of the scientific project is the complex design of the management system concept and the implementation part for the development of the deformation system for the production of molybdenum plate crystallisation vessels for the production of sapphire monocrystals. This sophisticated molding system, carried out at temperatures up to 1000 ° C in the vacuum chamber, will solve the problem of forming high-strength, at room temperature, difficult-to-form thin molybdenum sheets with a purity of 99.99% by weight produced by powder metallurgy at high temperatures, eliminated by high vacuum. The vacuum high temperature deformation system will be presented and developed integrally with a variable deformation plate (BHF) supported by a hydraulic system, a vacuum system, a cooling water system, and a computer control system. Key parameters such as temperature, retaining force, deformation velocity of the trap will be controlled in real-time by PID controllers using closed loop systems
Realization:	01/2014 – 12/2019
Coordinator:	Branislav Hadzima, Faculty of Mechanical Engineering – Research Centre UNIZA
Co-operators:	Michal Frivaldský, Peter Šindler (DME)

APVV-15-0462: Research on Sophisticated Methods for Analysing the Dynamic Properties of Respiratory Epithelium's Microscopic Elements	
Summary:	The project is focused on research of sophisticated methods based on image analysis, intended to improve the objectivity, efficiency and automation of diagnostic processes in medicine. Its main objective is to identify the dynamic properties of biological objects of interest, which are the cilia of respiratory epithelium. Movement of such objects will be captured using high-speed video microscopy, while recording and data analysis will be carried out by high-power computer system. The recorded data will be then processed by our software system designed for segmentation of the objects of interest. The main criterion for segmentation will be the identification of pathological structures that are, due to disease or structural changes, static and do not contribute to cilia's primary function in vivo. Identification and subsequent analysis of segmented regions will notably contribute to an accurate specification of patient's diagnosis, and thus to determination of early and effective therapy. Although the results of the project are intended to be applied in the medical field, the project is mainly about the research of optimal technical solutions for modern diagnostic methods in medicine also in terms of international research in this area. The dominant project outcome will be the device enabling the analysis of high-speed videos.
Realization:	10/2016 – 09/2020
Coordinator:	Libor Hargaš (DME)
Co-operators:	Dušan Koniar, Miroslav Hrianka, Anna Simonová, Pavel Pavlásek, Peter Čuboň, Zuzana Loncová, Tomáš Uriča, Michal Taraba (DME)

APVV-15-0396: Research of Perspective High Frequency Converter Systems with GaN Technology	
Summary:	The project is focused on the issue of increasing the efficiency and power density of power semiconductor systems, while reducing the electromagnetic interference, which ultimately reduces negative environmental aspects of their application. Its main task is to research the phenomena related to applications of advanced semiconductor structures based on GaN transistors in power electronic systems, including research of commutation techniques applied in the switching frequency range of MHz units. Investigators will be outgoing from the results of the projects addressed at the national (ELTECO Ltd.), respectively international level (Panasonic Gmhb Lueneburg SNR). Another task of the project is to research phenomena affecting the efficiency of the practical application of those facilities. Specifically, the economic burden of production, reduction of CO2 and return on investment. The project also highlighted the issue of the reliability analysis and research methodology for the estimation of mean lifetime of power electronic systems based on GaN technology. At the same time, the project deals with draft measures on the possibility of extending the operation of such systems through multi-level multi-physics simulations. The main outcome of the project will be functional sample of the system meeting the declared goals, intended for direct use in industrial applications of electromobility application or respectively of wireless transmission of electricity. Another output will be a set of knowledge and measures for the optimal design of these systems, reducing the failure rate and lifetime extensions. Based on preliminary discussions with companies ELTECO Ltd. and Delta Electronics, it can be assumed rapid utilization of the results obtained in industrial practice.
Realization:	10/2016 – 09/2020
Coordinator:	Michal Frivaldský (DME)
Co-operators:	Pavol Špánik, Anna Kondelová, Anna Simonová, Ondrej Hock, Jozef Šedo, Peter Čuboň, Boris Kozáček, Michal Prídala (DME)

APVV-15-0441: Measurement system with optical sensor for systems Weight In Motion	
Summary:	Proposed project of applied research will be focused on design, optimalization and creation of a device for weight measurement of a vehicle (or its axle) in movement according to the currently valid traffic regulations on the road or highway. Project will discuss the selection of proper sensor hardware for the system, its mounting into existing solutions Measure-in-Motion® previously designed by project partner and compatibility of the used optical sensor output with the interface of the existing processing unit.
Realization:	07/2016 – 06/2020
Coordinator:	Daniel Káčik (DPh)
Co-operators:	Norbert Tarjányi (DPh), Aleš Janota, Juraj Spalek, Marián Hruboš, Rastislav Pirník, Peter Vestenický, Vojtech Šimák, Dušan Nemec, Jozef Hrbček (DCIS)

APVV-16-0129: Photonic nanostructures prepared by 3D laser lithography for biosensing applications	
Summary:	Project focuses on research and realization of specific 2D and 3D photonic structures and devices for biophotonic applications using new 3D laser lithography system. In the frame of project, the photonic devices as Mach-Zehnder interferometer, ring-resonator and 3D photonic crystal structures will be realized and implemented in LOC (Lab-on-a-chip) device. In the second part of project, nanostructures will be 3D arranged on surface of semiconductor microcone for surfaces with enhanced Raman scattering and their will be

	implemented in LOC device.
Realization:	07/2017 – 12/2020
Coordinator:	Dušan Pudiš (DPh)
Co-operators:	Ivan Martinček, Ľuboš Šušlik, Daniel Jandura, Ivana Lettrichová, Peter Gašo, Mária Figurová, Jana Ďurišová, Matej Goraus (DPh)

APVV SK-FR 2017-0017: New optic sensors based on modal interference in special optic fibers	
Summary:	Project aims at basic and applied research in the area of special optic fibers. There is a demand to use optic fibers in optical telecommunications and in various sensors. The scientific goal is to acquire new knowledge about special optic fibers and then to design a new structure/configuration of optic fiber sensor for the refraction index measurement.
Realization:	01/2018 – 12/2019
Coordinator:	Daniel Káčik (DPh)
Co-operators:	Ivan Martinček, Norbert Tarjányi, Matej Goraus (DPh)

APVV SK-AT 2017-0013: Photonic elements on the basis of polymers prepared by 3D litography: design, preparation and optimalization	
Summary:	The goal of project PHOCOP is the development of the complete process of new polymeric photonic elements using a unique 3D litographic system.
Realization:	01/2018 – 12/2019
Coordinator:	Dušan Pudiš (DPh)
Co-operators:	Peter Gašo, Daniel Jandura, Matej Goraus (DPh)

APVV-16-0006: Automated robotic assembly cell as an instrument of concept Industry 4.0	
Summary:	Global aim of the project is design of new modern concept of automated robotic assembly cell consisted of mobile manipulator, whereby manipulation task is performed by compliant manipulator. This aim is divided into partial tasks - design of mobile platform with capability of autonomous movement in unknown environment, concept of compliant manipulator with enhanced sensorial systems, which allows the manipulator better modelling of environment and interactions with human, and finally mutual cooperation of both modules to ensure the safe and stabile manipulation with objects also during the movement of robot. A suitable design of hardware and development of software will lead to construction of such unique concept, which combines actual trends in R&D in robotics.
Realization:	07/2017 – 06/2020
Coordinator:	František Duchoň (FEI STU)
Co-operators:	Aleš Janota, Juraj Spalek, Vojtech Šimák, Emília Bubeníková, Michal Gregor, Dušan Nemec, Jozef Hrbček (DCIS)

APVV-16-0190: Research of Integration of functional system of TEXtiles for monitoring of BIO data for achievement of synergy of health, comfort and human safety	
Summary:	Main objective of the interdisciplinary project is fundamental innovation and enlargement of assortment of smart textile structures on the European market with using progressive technologies in the form low-temperature plasma and subsequent application of nano-technologies and with integrated smart system for biomedical data monitoring. Result of the solution will be a prototype of smart mattress topper ECG-SmartSheet with increased hygienic properties, designed for human biomedical data monitoring in real time. Implementation of the project will create material suppositions for improvement and assurance

	of suitable a health and social conditions for post-productive generation in the frame of the Slovak Republic and EU. The proposed project is a response to forecast of negative social development in the Slovak Republic and Europe in the course of coming 20-30 years with the aim to build up suppositions for preservation of health and life quality of a considerable portion of population.
Realization:	07/2017-06/2020
Coordinator:	Dana Rástočná Illová (VÚTCH - CHEMITEX,spol. s r.o.)
Sub-coordinator from FEE:	Ladislav Janoušek (DEBE)
Co-operators:	Branko Babušiak, Ján Barabáš, Štefan Borik, Michal Gála, Roman Radil (DEBE), Róbert Hudec, Slavomír Matúška, Martin Paralič (DMICT)

APVV-16-0505: The short-term PREDICtion of photovoltaic energy production for needs of pOwer supply of Intelligent BuildiNgs – PREDICON	
Summary:	The proposed project is aimed at the developing of method for a very short-term prediction of photovoltaic (PV) power plant output with timescale ranging from 5 to 30 minutes. To forecast the intensity of solar irradiance, as the main factor affecting the performance of PV power plant, the algorithm using analysis of recorded image data representing cloudiness motion above the installation site of PV power plant will be proposed. To achieve the best accuracy of output prediction of PV power plant, local factors affecting solar irradiance and PV power plant operation will be identified. The analysis will be done in order to define correction factors for the adaptation of predicted values of solar irradiance determined by the proposed algorithm to current local conditions at the installation site of PV power plant. The functionality and accuracy of proposed method will be verified by the help of created PV power plant mathematical model as well as by measurements performed on real PV power plant.
Realization:	07/2017-06/2020
Coordinator:	Róbert Hudec (DMICT)
Co-operators:	Miroslav Benčo, Patrik Kamencay, Peter Sýkora, Slavomír Matúška, Martin Paralič, Martin Vestenický, Daša Tichá, Ján Hlubík, Miroslav Uhrina, Martin Šinko (DMICT), Peter Braciník, Marek Novák (DPES)

APVV-14-0560: PatRec- Resistive Switching Structures for Pattern Recognition	
Summary:	Verification of the possibility of application of memristors for realisation of logic circuits. Prepared memristors will be connected to simple logic circuits for implementation of fuzzy logic and switching functions. Final goal of the project is to demonstrate ability of memristor circuits to recognize patterns based on experiments and computer models.
Realization:	07/2015-06/2018
Coordinator:	Karol Frohlich (Slovak Academy of Sciences), Martin Klimo (Faculty of Management Science and Informatics)
Co-operators:	Roman Jarina, Michal Kuba, Michal Chmulík (DMICT)

APVV-15-0464: Efficiency Improvement of Electrical Power Transmission in Slovakia	
Summary:	The project deals with research and development of power losses caused by asymmetrical impedance of selected electric components (transformers, catenary, compensation chokes) of electrical power grid in Slovakia. The aim is to develop a series of steps and technology needed to determine impedance and admittance matrixes and to minimize the power losses due to the

	asymmetry of the components. Power losses optimization is still the most effective way of improving the energy resources utilization. Importance of such subject is supported by European Commission statement from 10/23-24/2014 aiming to the climate and energy policies frame, which expresses minimum 27% improvement of energy efficiency by 2030.
Realization:	1/2016 – 12/2020
Coordinator:	Juraj Altus (DPES)
Co-operators:	Marek Roch, Marek Höger, Alena Otčenášová (DPES), Ľuboš Pavlov

APVV-17-0014: Smart tunnel: telematic support for emergencies in the traffic tunnel	
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
Co-operators:	Emília Bubeníková, Stanislava Gašpercová, Peter Holečko, Aleš Janota, Tomáš Loveček, Vladimír Mózer, Peter Nagy, Lenka Siváková, Juraj Spalek, Kamila Kršíková (DCIS)

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

VEGA 1/0676/17: Investigation of electrical and optical properties of nanostructured semiconductor interfaces	
Summary:	Problems of experimental research and theoretical modelling of electrical and optical properties of nanostructured semiconductor-dielectric systems and porous Si layers prepared by etching with electric field assistance were solved in the project. New theoretical methods for analysis of nanostructured and optical properties of investigated systems were developed based on the implementation of Drude-Lorentz formalism, methods of approximation of effective media approximation and modelling of Raman scattering. The project for the construction of an experimental device for the measurement of optical properties and for the measurement of the electrical properties of semiconductor samples was realized for the completion of the experimental base. New methods of experimental investigation and analysis of electrical properties of photovoltaic structures have been developed.
Realization:	01/2018 – 12/2019
Coordinator:	Stanislav Jurečka (IAS)
Co-operators:	Robert Menkyna, Ľubomír Scholtz, Michaela Solanská, Martin Králik (IAS)

VEGA 1/0840/18: Investigation of means to achieve high resilience of optical networks against signal damage	
Summary:	The project focuses on multichannel optical transmission systems with a view to achieving a high degree of resilience to the degradation phenomenon due to the high density of transmitted optical power in the fiber core and the large

	number of optical channels transmitted in one optical fiber. Prevention of signal damage in the WDM optical channel and regeneration of operation by switching to backup channels are addressed by two principal schemes explored to achieve enhanced resilience. In these two schemes, the impact of degradation mechanisms, soliton transmission, signal properties of the input optical radiation, the use of advanced multistage optical modulation formats under coherent reception conditions, and optimization of RWA optical fiber optic switching networks and innovative multi-channel full optical switching structures in nodes of the network are studied.
Realization:	01/2018 – 12/2020
Coordinator:	Jarmila Müllerová (IAS)
Co-operators:	Michaela Holá, Libor Ladányi, Ľubomír Scholtz, Gabriel Cibira, Matúš Vaňko (IAS), Milan Dado, Jozef Dubovan, Ján Litvik, Miroslav Markovič, Michal Kuba (DMICT)

VEGA 1/0510/17: Research and characterization of nanostructures by acoustic spectroscopy	
Summary:	The project is focused to the utilization of acoustic spectroscopy methods to study the structural, transport and relaxational properties of selected materials, forward for the application in the electrical engineering.
Realization:	01/2017 – 12/2019
Coordinator:	Jozef Kúdelčík (DPh)
Co-operators:	Peter Bury, Peter Hockicko, Ivan Bellan, Štefan Hardoň, Marek Veveričík, Emil Jahoda (DPh)

VEGA 2/0016/17 Macroscopic anisotropic composities based on liquid crystals an magnetic nano-particles	
Summary:	Project aims to study composite materials composed of liquid crystals and various magnetic nanoparticles. Combination of anisotropic properties of liquid crystals with magnetic properties of nanoparticles enables to prepare composites with unique magnetic and optic properties. Proposed experiments aim at increased sensitivity of these composite systems to magnetic field and preparation of materials with unique dielectric, magnetic and optic properties.
Realization:	01/2017 – 12/2020
Coordinator:	Institute of Experimental Physics SAV Košice
Co-operators:	Peter Bury, Jozef Kúdelčík, Štefan Hardoň, Marek Veveričík (DPh)

VEGA 1/0348/18: Theory of ultrarelativistic nuclear collisions and matter in extreme conditions	
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)

V-1/0602/17: Analysis of transformer condition by frequency and time methods	
Summary:	The aim of the project is the analysis of constructional and insulation condition of transformers using the selected frequency and time measurement methods. The focus will be to determine the parameters of the winding and insulating elements of transformer through simulations, physical models and direct experimental measurements at different degradation effects. Based on a synthesis will create a new methodology for analyzing the condition of specific

	types of transformers using the specified measuring methods with increased originality and innovation and on this basis will be create a new integrated system of diagnostics with the possibility of analysis and classification of possible faults on power transformers.
Realization:	01/2017 – 12/2019
Coordinator:	Miroslav Gutten (DMAEE)
Co-operators:	Martin Brandt, Milan Chupáč, Daniel Korenčiak, Matej Kučera, Milan Šebök, Milan Šimko (DMAEE), Roman Jarina (DMICT)

VEGA 1/0957/16: Research and Development of Novel Construction of Switched Reluctance Machines for Automotive Traction Applications	
Summary:	This project deals with scientific research of modern electrical drive with switched reluctance motor (SRM) and with investigation of its performances and parameters for traction application in electrical vehicles. In the frame of this project, the detail analysis of a new SRM construction design and optimized construction of SRM will be carried out to obtain the best performances from point of view efficiency, distance range and reliability of electrical car. The modern methods of design as finite element method will be used for these SRM. The research of new control algorithms for this drive will be analysed with cooperation with power converter to obtain best efficiency for all working range. On the base of scientific research of these motors, some recommendations will be given for their manufacturing.
Realization:	01/2016 – 12/2018
Coordinator:	Pavol Rafajdus (DPES)
Co-operators:	Valéria Hrabovcová, Pavol Makyš, Vladimír Vavrúš, Pavel Lehocký, Juraj Makarovič, Adrián Peniak, Milan Diko (DPES)

VEGA 1/0278/15: Research and development of optical waveguides and waveguide structures from polydimetylsiloxane	
Summary:	Design and development of waveguides, fibers and waveguide structures from polydimetylsiloxane with the aim to use them for photonic and sensor applications. Optical properties of waveguides and structures will be investigated in the visible and the near infrared region of the electromagnetic spectrum. Photonic elements on the basis of polydimetylsiloxane will be designed such as tunable waveguide optical attenuators, optical waveguide power limiters, optical fiber switches and optical planar and fiber sensors.
Realization:	01/2015 – 12/ 2018
Coordinator:	Ivan Martinček (DPh)
Co-operators:	Dušan Pudiš, Daniel Káčik, Norbert Tarjányi, Ľuboš Šušlik, Ivana Lettrichová, Peter Gašo, Daniel Jandura (DPh)

VEGA 1/0113/18: Interactions of relativistic nuclei, eta-meson nuclei and spin physics	
Summary:	Research in the area of interactions of relativistic nuclei, eta-meson nuclei and spin physics.
Realization:	01/2018 – 12/ 2020
Coordinator:	Janka Vrláková, UPJŠ Košice
Co-operators:	Marián Janek (DPh)

VEGA 1/0540/18: 3D photonics based on polymers for integrated optics and optoelectronics prepared by laser lithography	
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)
Co-operators:	Ivan Martinček, Daniel Káčik, Norbert Tarjányi, Ľuboš Šušlik, Daniel Jandura, Ivana Lettrichová, Peter Gašo, Mária Figurová, Jana Ďurišová, Matej Goraus (DPh)

VEGA 1/0479/17: Research on optimal approaches to managing energy transfer in systems with accumulation elements	
Summary:	The core of this project is research of relevant phenomena which influence the effectivity of energy management process in systems with accumulation elements. Such systems are represented mainly by dashboard network of electric cars and accumulation nodes of energetic systems. Starting point for the project will be the analysis of characteristic properties of each individual way how to accumulate energy with subsequent selection of optimal accumulation system for transfer process, with acceptance of allowed environmental impact. Another important aspect will be the research of possibilities how to improve the effectiveness of mentioned process using optimal energy flow into accumulation node, and implementation of obtained results through sophisticated converter technologies with ultrahigh switching frequencies. During the project solution, proven scientific methods based on computer simulations will be used, both for analysis in temporal domain as well as in 3D analysis of processes in electrochemical system.
Realization:	01/2017 – 12/2019
Coordinator:	Pavol Špánik (DME)
Co-operators:	Michal Frivaldský, Pavel Pavlásek, Peter Drgoňa, Anna Kondelová, Peter Šindler, Michal Prídala, Michal Taraba, Juraj Adamec, Ján Morgoš, Rastislav Štefúň (DME)

VEGA 1/0160/17: Pharmacological Influence of defense mechanisms of the airways, inflammation and remodeling by flavonol derivatives in conditions of experimental allergic asthma	
Summary:	The project is linked to projects VEGA 1/0073/08 a VEGA 1/0020/11. Their solution has shown the benefit of administering flavonoid mixtures on sensitivity of cough, bronchoconstriction and inflammation in conditions of experimentally induced allergic asthma. Solution of the current project will bring new knowledge about the effect of other derivatives of polyphenols from the flavonol group, in which an antiasthmatic action is expected. Searching for new sources of substances with complex anti-asthmatic action, substances that act as bronchodilatories, anti-inflammatories and anti-remodeling is trend of current experimental research on allergic asthma. The project solution will provide a comprehensive view of the activity of the monitored substances: examination of all basic defense mechanisms of the airways (cough, bronchoconstriction, mucociliary

	clearance), allergic inflammation (using the determination of inflammatory, immune cells, inflammatory cytokines and chemokines, etc.), and the degree of airway remodeling.
Realization:	01/2017 – 12/2020
Coordinator:	Soňa Fraňová, Institute of Pharmacology JLF UK Martin
Co-operators:	Libor Hargaš, Dušan Koniar, Anna Simonová (DME)

VEGA 1/0547/18: Research of possibilities for system optimization of WET technology	
Summary:	The core of the project is research of a method designed to investigate phenomena that affect the efficiency of contactless charging. The proposed method will serve also for optimizing of efficiency of the transmission characteristics of systems depending on the application use. The method is based on an analysis of existing WET systems solutions for different applications, while the output will be a set of knowledge about structural design of individual nodes of the system. The following procedure will lie in the preparation of reference physical sample and its simulation model. The simulation model will be based on a system of multi-level simulation. This model will be after process of calibration used to research of possibilities of efficiency increasing of WET systems. Running of multiple simulation programs will be the basis of the model. Each simulation program is used for individual investigation of a partial problem. The global result is then represented as the intersection of partial results.
Realization:	01/2018 – 12/2020
Coordinator:	Michal Frivaldský (KME)
Co-operators:	Peter Drgoňa, Anna Kondelová, Anna Simonová, Marek Paškala, Michal Praženica, Miroslav Pavelek, Matúš Danko, Michal Taraba (DME)

VEGA 1/0119/18: Methods research for optimization of electromagnetic compatibility of systems for wireless energy transfer (WET)	
Summary:	The project focuses on the optimization of the EMC properties of wireless energy transfer (WET) systems. The project is related with the research of the significant phenomena of EMC features of WET systems. First of all, it is identification of the phenomena that affect negatively EMC properties during wireless energy transfer (EMI emissions to the environment)-the appropriate coil geometry suitable - circuit topology, method of energy transfer. The second area of research will deal about optimization of the EMC through multi-physics analyzes and multi-level simulations, in the way to not significantly affect the efficiency of the transmitting process and control process of energy at the load side. A very important step is to just suppress undesirable phenomena through optimizing individual circuit elements of WET system, while the primary method will be implemented through computer simulation of circuit simulators. For verification purposes the partially physical models will be used, and final verification of the WET.
Realization:	01/2018 – 12/2020
Coordinator:	Michal Praženica (DME)
Co-operators:	Branislav Dobrucký, Dušan Koniar, Libor Hargaš, Marek Paškala, Slavomír Kaščák, Roman Koňarik, Michal Prídala, Juraj Adamec, Tomáš Uriča (DME)

VEGA 1/0774/18: Research of high speed and high efficiency electric drive	
Summary:	The main aim of the present project is a research and design of compact high-speed electric drive. The electric drive represents a set of equipment (electric motor, power converter and control system with an appropriate control structure) that provide energy conversion with some efficiency. Therefore, the project addresses the individual parts of the electric drive focusing on the overall efficiency of the high-speed drive. The project is divided into three key parts. The first part deals with the high-speed electric motor. It is about designing the electro-mechanical motor structure, minimizing the losses in the machine, size proposition, design and verification of mechanical strength and stiffness of the rotor. The second part of the project is focused on the power converter design which is intended to supply the electric motor. The third part of the project discusses the design and implementation of appropriate control algorithms for high speed drive.
Realization:	01/2018 – 12/2020
Coordinator:	Pavol Makyš (DPES)
Co-operators:	Pavol Rafajdus, Vladimír Vavrúš, Marek Štulrajter, Ján Vittek, Valéria Hrabovcová, Pavol Lehocký, Juraj Makarovič, Ľuboš Struharňanský, Milan Diko, Pavel Sovička (DPES), Slavomír Kaščák, Jozef Šedo (DME)

VEGA 1/0263/16: Research of integrated localization system based on wireless systems and sensors implemented in smart mobile devices	
Summary:	With the increasing amount of localization based services (LBS) also demands on the quality of positioning systems increase. Providers try to provide such LBS without restrictions about environment in which the user is located. High demands on the quality can be fulfilled only by the systems that utilize combination of all available technologies. The project is focused on proposal of positioning system, which will integrate systems commonly used for positioning of mobile device (MD) - smartphones. Systems that are assumed to be utilized are based on wireless networks, GNSS and sensors which are integrated in MD. The project will be focused on research of localization algorithms based on fingerprinting method, which will utilize data from available sensors in order to improve the method performance. Crucial part of the research is algorithms development that will integrate all available data in order to estimate position of MD. Proposed algorithms will represent core of the developed integrated positioning system.
Realization:	01/2016 – 12/2018
Coordinator:	Peter Brída (DMICT)
Co-operators:	Vladimír Wieser, Juraj Machaj, Darina Jarinová, Peter Počta, Martin Vestenický, Bohumil Adamec, Tomáš Bielik (DMICT)

VEGA 2/0015/18: Mezo- and micro-meteorology detection of hydrometeors in lower part of troposphere based on passive detection of changes in electromagnetic radiation from anthropogenic sources.	
Summary:	Mezo- and micro-meteorology detection of hydrometeors in lower part of troposphere based on passive detection of changes in electromagnetic radiation from anthropogenic sources.
Realization:	01/2018 – 12/2020
Coordinator:	Pavol Nejedlík, (Ústav vied o Zemi SAV)
Co-operators:	Michal Kuba (DMICT)

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

KEGA 012TU Z-4/2017: Interactive methods in Physics Education at Technical Universities	
Summary:	The goal is to create a comprehensive study material for core physics subjects of new study programmes for the bachelor degree at four faculties of the Technical University in Zvolen and at six faculties of University of Žilina. This material will use modern interactive teaching methods
Realization:	01/2017 – 31.12.2019
Coordinator:	Ľuboš Krišťák (TU Zvolen)
Sub-Coordinator from FEE:	Peter Hockicko (DPh)
Co-operators:	Jozef Kúdelčík, Gabriela Tarjányiová, Marián Janek (DPh)

KEGA 029ŽU-4/2018: Creation of innovative teaching materials from the field of applied physics and experimental measurements for technical subjects of newly accredited study programs	
Summary:	The goal is to create a comprehensive study material for physical and technical subjects of the newly accredited study programmes for the bachelor and master degree at the Technical University in Zvolen and University of Žilina.
Realization:	01/2018 – 12/2020
Coordinator:	Peter Hockicko (DPh)
Co-operators:	Gabriela Tarjányiová, Štefan Hardoň (DPh)

KEGA 011UCM-4/2018: The education games impact on the cognitive process	
Summary:	Nowadays, the problem of the implementation of advanced and virtual reality technologies into the teaching process, which should extend the classical teaching of new experiential forms, is becoming increasingly important. However, the effectiveness of this deployment for the learning process is still questionable. The goal of the project is to map the principles needed to create an educational game so that the game with the support of virtual reality develops the cognitive abilities of the involved game participants as well as to set the minimum requirements that are needed to implement the educational platform. For this purpose, with the support of virtual reality, a prototype test-based serious game for pupils/ students in the field of mathematics oriented to spatial imagination will be developed. The key criterion of the game performance in terms of developing of cognitive abilities will be a detection of brain waves activation at the beta wave level. This data will be measured by means of an electroencephalograph (EEG). Beta waves are brain waves that are activated when the subject is concentrated to solve a task or a problem. Activating beta waves through the game has a significant impact on the cognitive process of the learner.
Realization:	01/2018 – 12/2020
Coordinator:	Ladislav Huraj, UCM Trnava
Sub-Coordinator from FEE:	Branko Babušiak (DEBE)
Co-operators:	Milan Smetana, Michal Gála, Štefan Borik, Maroš Šmondrk (DEBE)

KEGA 031ŽU-4/2016: Implementation of Geometric product specifications (GPS) into the teaching process of engineering study programs and putting them into the technical practice	
Summary:	The goal of the project is modernisation, improving and supplementing of teaching contents and form within the education of study programs at universities of technical orientation and support for students to achieve such level of knowledge's and skills, which increase their competitiveness at the labour market. The project deals with the implementation of the latest findings introduced in the latest international technical standards in the field of Geometrical product specifications (GPS) into the contents of teaching materials of subjects as Engineering Drawing, Design, Methodology of Design, Engineering metrology and Metrology. The project is multidisciplinary. It is aimed at problems of designing and tolerances prescription for dimension, for geometry and form prescription within the product designing. It is also aimed at the field of geometrical quantities measuring and evaluation as well as at using of latest measuring equipment. The goal of the project is creating of educating program and publishing of textbook for university students. The book will be supplemented with digital annexes available at the information system with exercises assignments and results. Within the annexes there will be teaching tools and tests for students. One part of exercises will be in English. Another result of the solution of the project will be completion of laboratory for 3D measurement. That will be a benefit for students preparing themselves for future occupation in international firms – mainly in the field of automobile and bearings industry.
Realization:	01/2016 – 12/2018
Coordinator:	Jozef Bronček, Faculty of Mechanical Engineering UNIZA
Co-operators:	Ivan Litvaj (DPES)

KEGA 034ŽU-4/2016: Implementation of modern technologies into education with focus on safety PLC control	
Summary:	The project is focused on bridging the shortcomings resulting from the growing demands of industry for the theoretical knowledge and practical experiences in deployment of control systems with safety PLC. The project aim is to build a laboratory in which control systems with safety PLC will be together with the physical models allowing simulation of real situations in industry. The laboratory will allow the emergence of a new subject "Control systems with safety PLC" and subsequent solution of bachelor's thesis, master's thesis and dissertations. Under the project will be developed the teaching materials supported by examples. This allows to make studying more attractive and to train students for the practical needs and finally to develop cooperation with practice primarily in the area of consultation about achieving the required safety integrity level (SIL - Safety Integrity Level) of realized applications.
Realization:	01/2016 – 12/2018
Coordinator:	Juraj Ždánsky (DCIS)
Co-operators:	Karol Rástočný (Vice Coordinator), Jozef Hrbček, Peter Holečko, Peter Nagy, Vojtech Šimák (DCIS)

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 – 12/2020
Coordinator:	Emília Bubeníková (DCIS)
Co-operators:	Mária Franeková, Karol Rástočný, Aleš Janota, Juraj Spalek, Peter Holečko, Alžbeta Kanáliková, Rastislav Pirník, Dušan Nemec (DCIS)

KEGA 038ŽU-4/2017: Laboratory education methods of automatic identification and localization using radiofrequency identification technology	
Summary:	Automatic identification systems currently represent an irreplaceable role in the automation of industrial production, transport, logistics and trade. Among the technical means allowing automatic identification of persons, objects or animals a radio frequency identification (RFID) dominates. Taking the importance of this technology into account it is necessary that graduates of the study field "Automation" and "Telecommunication and Radio Communication Engineering" that are accredited on the Faculty of Electrical Engineering, University of Žilina, have gained deep knowledge of the principles and applications of this modern technology. The presented project sets a number of scientific and pedagogical objectives. In the scientific objectives the mathematical modelling of RFID systems and their data channels, and also the development of digital signal processing algorithms in the field of RFID are dominant. The dominant educational objectives are the building of several laboratory workplaces enabling to demonstrate the basic physical principles of identification and localization of the RFID tags and to demonstrate the data structures of most commonly used identification cards such as Mifare and Desfire.
Realization:	01/2017 – 12/2019
Coordinator:	Peter Vestenický (DCIS)
Co-operators:	Jozef Balák, Michal Gregor, Peter Kello, Peter Nagy, Dušan Nemec, Juraj Ždánsky, Matej Guráň, Jozef Valigurský (DCIS), Michal Kuba, Martin Vestenický (DMICT)

KEGA 071ŽU-4/2017: Key Competences Formation and Effective Support of Students Mobility at Technology Faculties: Modelling, Design and Assessment of Flexible Education Concept	
Summary:	The project is aimed at effective flexible digital educational environment for technical and technological education at technical faculties concentrated on the support of development of key competencies of graduates of technical faculties by means of massive technological support directed at synergy of components of knowledge base and its integration with competences of graduates of technical study fields in an actual working environment. To the main aims of the project is related the setting up of educational environment, the integration of the content of education and the support of effective transfer of knowledge into the actual environment of „the European working market". The solution of the project is directed at the main component of the educational process – the content of education and its compatibility with the technological trends in the actual working environment where digitization of the content of education and flexibility of design of educational modules with multimedia components is dominant and is compatible with the trends of flexible educational environment (eContent, eLearning, eMobile, Blended Learning, Connected

	Learning). The project responds to the outputs of the National Project "Universities as engines of development of the knowledge society" in the context of massive amount of active researchers who work and use knowledge and technology base for this project. The main contribution is the conceptual solution of flexible education, i.e. the proposal, the design and the verification of the open „online“ educational modules to support the development of key competences of students in the specific field of technical science. The project will contribute to diversification of university education, mobility of graduates of technical universities that will contribute to increase of educational efficiency and will encourage arrival of foreign investment to Slovakia and, mainly, will help Slovak firms to succeed at world market by strengthening of the dominant subject which produces values – the technical field graduate with the key competences for the 21st century needs.
Realization:	01/2017 – 12/2019
Coordinator:	Pavel Pavlásek (DME)
Co-operators:	Anna Simonová, Pavol Špánik, Dušan Koniar, Libor Hargaš, Tomáš Uriča, Andera Prandová (DME)

KEGA 073ŽU-4/2017: Implementation of modern education tools for automotive electronics and electromobility education	
Summary:	This project is focused on utilization of modern research and educational methods for improvement of new study programme Automotive electronics at the University of Zilina. Since the study programme Autotronics emerged from discussion between experts from the academic and scientific sector and from industry sector, this project is focused on combination of modern technologies in practise and teaching process. In our department (mechatronics and electronics) we see the trend of increasing requirements for number of graduates of first and second degree with knowledge involving not only the area of mechatronics and electronics but also automotive electronics. In addition, the cooperating companies in automotive industry require students with knowledge of the car (either with internal combustion engine ICE and electric cars) in a broader context and deeper understanding. It is clear, that the new study programme Autotronics must include the most modern technical means not only at the hardware level (real vehicle systems of ICE and EV), but also at the software level (freely programmable ECUs, embedded processor systems). The educational process will be used by means of e-learning, online lab and multimedia access. Students will be using modern tools of learning, will acquire the knowledge needed for success in practice or in the higher levels of study. The project builds on previously successfully investigated projects at the Department of mechatronics and electronics. Main focus is to complete laboratory of Autotronics and electromobility with comprehensive applications and samples of automotive electronic and control systems for cars with internal combustion engine and electric cars. Another objective includes the release of two university textbooks focused on automotive electronic systems and control systems for automotive and industrial applications. Finally, a new educational website with course materials, practical guides and tutorials will be created. The educational portal will be designed not only for students of study programme Autotronics, but also for all students of the Electrical engineering.
Realization:	01/2017 – 12/2019
Coordinator:	Pavol Špánik (DME)

Co-operators:	Peter Drgoňa, Pavel Pavlásek, Michal Frivaldský, Anna Kondelová, Ondrej Hock, Slavomír Kaščák, Jozef Lakatoš, Marek Paškala, Roman Koňarik (DME)

KEGA 027ŽU-4/2018: Modelling, Design and Implementation of the Modern Method in the Educational Process of the Technical Faculties Focusing on Discrete Control of Power Systems	
Summary:	The project is focused on digital learning environment for technical and technological education at technical schools with a focus on electrotechnics to support the development of knowledge and skills of graduates of technical schools. The main objectives of the project include the development of modern research and educational aids in the creation of study materials, university textbooks and didactic means, for the needs of teaching discrete control of power electronic systems and the integration of the content of education into the real environment of the labour market. Based on the results of the project is also expected further innovative research in the scientific field. The aim of the project are research activities associated with the advanced method of creating and tuning algorithms for various application in the field of power electronics and the use of research results in the educational process within the field of electrical engineering and related study programs focusing on control and power electronic systems such as Mechatronics, Automation and Electric Drives. In addition, companies carrying out development in power electronics require students which possess the knowledge not only from a hardware point of view (knowledge of the converter topologies, electronic component, making printed circuit boards, i.e.), but also to have a deeper knowledge of programming of the power systems. It follows that the teaching process of the study program must be focused on the control of the advanced converters structure using the latest technical equipment not only in hardware but also in the software level. Students using the proposed teaching resources that are compatible with flexible learning environment (eContent, eLearning, Blended Learning, Connected Learning) acquire knowledge necessary for success in the labour market. The individual outputs of the project will be modified and offered to high school teachers to increase their qualifications and to high school students to improve their knowledge in the field of Electrical Engineering. The project responds to the outputs of the National project "Universities as Drivers of the Knowledge Society" and the projects "Centre of Excellence of Power Electronic Systems and Materials for Their Components", which contributed to a significant improvement of the knowledge and technological base of the research workplace. The main benefit of the project is to design flexible learning; the solution is to design and create open "online" learning modules to support the competence development of students in a specific area of engineering. The project also envisages the creation of modules in the English language, which will contribute to the improvement of the teaching of the mobility programs and will contribute to the better use of graduates in the Slovak and world market. The other goal includes edition of the university textbook on topic of the control method of the power electronics systems and about methods in process of the tuning the algorithms. Finally, it will be created 6/12 workplaces in the existed Laboratory of… Accordingly, it is the assumption of utilization teaching aids in related study program or among general professional public.
Realization:	01/2018 – 12/2020
Coordinator:	Slavomír Kaščák (DME)
Co-operators:	Michal Frivaldský, Michal Praženica, Jozef Šedo, Peter Šindler, Miroslav Pavelek, Matúš Danko, Juraj Adamec (DME)

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.
Realization:	01/2018 – 12/2020
Coordinator:	Aleš Janota (DCIS)
Co-operators:	Michal Gregor (vice-coordinator), Juraj Spalek, Alžbeta Kanáliková, Emília Bubeníková, Vojtech Šimák, Jozef Hrbček, Peter Kello, Marián Hruboš, Rastislav Pirník, Kamila Kršíková (DCIS)

Structural Funds

ITMS 313011B765: Universal virtual intelligent space for transport systems	
Summary:	The research objective is in creating a system environment of information sources based on IoE, its advanced processing, connection to other life areas, searching for correlations between things, processes (information), seemingly unrelated, using these discovered dependencies in technological innovations, decision making and process control in transport and in standard living of citizens.
Realization:	09/2017 – 08/2022 , Project is currently under hold
Coordinator / Project manager (UNIZA):	Rastislav Pirník (DCIS)
Co-operators:	Aleš Janota, Juraj Spalek, Mária Franeková, Pavel Přibyl, Peter Vestenický, Marian Hruboš, Peter Holečko, Emília Bubeníková, Vojtech Šimák, Jozef Hrbček, Michal Gregor, Alžbeta Kanáliková, Dušan Nemec (DCIS)

ITMS2014+313011B738: Research and development of wireless system for prediction of potential savings of heating energy in large buildings	
Summary:	The project is focussed on research and development of wireless monitoring system WHEMS (Wireless Heating Efficiency Monitoring System), which will consist of wireless agents for monitoring of physical parameters (provided heat, interior and exterior temperatures, humidity, etc.) at the room level and master ICT architecture for archiving and processing of data for prediction of potential reduction of heating energy costs in large buildings possible by use of optimal regulatory system. Successful development of the system will enable new services in area of energetics, which will enable development of optimal regulation system for a given building and estimation of investment return. Side effect of this service will be reduction of heating costs and protection of the environment. Activities of the project involve research and development of wireless agents and infrastructure from both hardware and software point of view, development of software for ICT infrastructure, as well as basic research of algorithms for estimation of energy savings. The system is assumed

	to be deployed in buildings of government, schools, hospitals and administrative buildings. Implementation of the project will be based on close cooperation of teams from University of Zilina and from Amicus SK company, this will enable improvement of regional cooperation of both institution with focus on new experiences in area if construction, development and operation of wireless agents and ICT infrastructure in areas of heating and cooling regulations.
Realization:	09/2017 – 02/2023, Project is currently under hold
Coordinator:	Martin Vestenický (DMICT)
Co-operators:	Peter Vestenický (DMICT)

312010F057: IT academy – education for 21st century	
Summary:	Project will support development of IT sector by changes in education systems at primary schools, secondary schools and universities, mainly by increased quality of education in informatics, mathematics, science and technology with focus on ICT, motivation of students to study ICT and development of scientific competences of students.
Realization:	03/2017 – 10/2020
Coordinator:	Segeč Pavel (Faculty of Management Science and Informatics UNIZA)
Co-operators:	Ivan Dolnák, Peter Kortiš (DMICT)

Other National Research Projects

IBM-10/2016: Exploration of Smart City Services with IBM within UNIZA Campus	
Summary:	The aim of the project is to follow up the IOT activities within UNIZA Campus, bring new solutions & innovations and help more students to get familiar with IBM technology in this area (IOT, BigData, Analysis). It will also deepen the relation between IBM and UNIZA.
Realization:	10/2016 – 10/2018
Coordinator:	Peter Holečko (DCIS)
Co-operators:	Aleš Janota, Juraj Spalek (DCIS)

I-18-024-00: Storage of solar energy in renewable fuels and batteries	
Summary:	Fossil fuels represent 85% and electricity only 15% of today's global energy consumption. In order to replace the decreasing fossil fuel reserves and also to reduce the corresponding CO2 emissions, the representation of renewable energy sources is rapidly increasing. This transition is considered to be one of the greatest social challenges of the 21st century and will have a major impact on the climate, the environment and the economy. A major barrier to wider use of renewable energy is the lack of extensive and long-term energy conservation technology. Since fuels have an order higher energy density than lithium-ion batteries, in the long run an alternative way to produce fuels from renewable sources is sought. The aim of this project is to substantially shift research into the production of hydrogen from solar energy by the synthesis, characterization and optimization of metal oxide semiconductors.
Realization:	03/2018 – 08/2019
Coordinator:	Peter Čendula (IAS)
Co-operators:	Stanislav Jurečka (IAS), Prangya P. Sahoo (India)

314/17_RT: Universal balancing system for traction batteries of electric vehicles	
Summary:	Creation of a universal balancer of traction lithium batteries of all types is a project goal. The balancer system includes an active-passive balancer with intelligent control system that ensures increased cyclability and safety of different battery types.
Realization:	09/2017 – 04/2018
Coordinator:	Peter Drgoňa (DME)
Co-operators:	Matúš Danko, Juraj Adamec, Michal Taraba (DME)

Other National Non-research Projects

312011F057 – National project IT academy	
Summary:	Creating a model for education and preparation of young people for the current and perspective needs of knowledge oriented society and labour market with focus on informatics and ICT.
Realization:	09/2016 – 10/2020
Coordinator:	Michal Varga (FMI)
Co-operators:	Alžbeta Kanáliková (DCIS), Emil Kršák, Michal Varga, Norbert Adamko (FMI)

Phenomenology and Outreach (FEPO), Agreement between Ministry of Education SR and University of Žilina	
Summary:	Department of Physics will collaborate with CERN in the area of research and outreach in particle physics. In the research part we will collaborate with the Theory Department in the area of Heavy Ion Physics and mechanism of Electroweak Symmetry Breaking. Our department will coordinate Particle Physics Masterclasses at the national level (Masterclasses, http://fyzika.uniza.sk/mc/) at 6 Slovak universities, will co-organize international competition Beamline for Schools and develop portal svetcastic.sk for outreach and communication of particle physics.
Realization:	01/2017 – 12/2020
Coordinator:	Ivan Melo (DPh)
Co-perators:	Mikuláš Gintner, Gabriela Tarjányiová, Jozef Kúdelčík (DPh)

K4 Žilina Childrens University 2018	
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:	02/2018 – 11/2018
Coordinator:	Peter Hockicko (DPh)
Co-operators:	Teachers from UNIZA

Contract-based research activities for 2018

Valid from	Number of contract	Customer	Coordinator	Title
1/18	S-103-0001/18	MONDEZ s.r.o. Žilina	Ladislav Janoušek	Analysis of EM field values
11/17	S-103-0002/18	ŠKODA	Matěj Pácha	Simulation of consumption tram

		TRANSPORTATION, a.s. Plzeň		Sofia
05/18	S-103-0003/18	BSH Drives and Pumps,s.r.o. Michalovce	Michal Frivaldský	Power supply solution and its topology
11/18	S-103-0004/18	SuiTec, s.r.o. Žilina	Ladislav Janoušek	Prototype of heated suit
07/18	S-103-0005/18	Stredoslovenská distribučná, a.s. Žilina	Juraj Altus	Optimizing losses in the distribution system
07/18	S-103-0006/18	VÚS Banská Bystrica	Peter Brída	Possibilities of using modular localization systems
05/18	S-103-0007/18	KOVAL Systems, a.s. Beluša	Pavol Makýš	Design and manufacture of LED control strip
11/18	S-103-0008/18	ELKOND HHK, a.s. Trstená	Michal Frivaldský	Cable length meter optimization from EMC compatibility point of view
03/18	S-103-0009/18	Scheidt Bachmannn, s.r.o. Žilina	Karol Rástočný	Safety assessment of the security of the BUES2000 system

Contract-based non-research activities for 2018

Valid from	Number of contract	Customer	Coordinator	Title
4/18	P-103-0001/18	Danfoss Power Solutions,.a.s. Pov.Bystrica	Libor Hargaš	Vocational training
10/18	P-103-0002/18	HMH,s.r.o. Bratislava	Peter Nagy	Safety assessment of the integrated airborne system

Submitted Proposals of International Research Projects in 2018

Type / call	**Name of the project**	**Outcome of evaluation**
Research projects	Internationale Zusammenarbeit in Bildung und Forschung, Region Mittelost- und Südosteuropa (MOEL-SOEL-Bekanntmachung)	supported
Interreg PL-SK	GAME JAM as new didactic method for improved quality of education in area of n novel technologies at the border of Slovakia and Poland	under evaluation
H2020 Twinning	LEMA4.0- Low Energy Machine Learning for Industry 4.0	under evaluation
EEA and Norway Grants Fund for Regional Cooperation	Humid air and carbon dioxide - the future solar fuels' feedstock.	not supported

Research for Practice; the Most Important Realized Outputs

IAS LM:
Project number: VEGA 1/0676/17
Name of the project: Research of electrical and optical properties of nanostructured semiconductor interfaces
Coordinator: Stanislav Jurečka
Summary / Achievement:
[1] Developed new method of analysis of microstructure semiconductor systems based on TEM experiment analysis by multifractal algorithms.
[2] Developed new method of analysis of porosity thin oxide porosity analysis based on the theoretical modelling of the optical experiment.
[3] Developed new method of analysis of nanoparticle size based on the theoretical modelling of Raman scattering.

DEBE:
Project number: S-103-0010/17
Name of the project: Realization of intelligent textiles and evaluation of their properties
Coordinator: Ladislav Janoušek
Summary / Achievement: Evaluation of electrical parameters of conductive yarn; implementation of conductive yarns into textiles; evaluation of electric properties of textiles with implemented conductive yarns; proposal and evaluation of connectivity of active textile elements with external electronic circuits.

Conferences and seminars

The Faculty of Electrical Engineering organized, or participated in preparation of the following scientific events in 2018:

- International Conference Solid State Surfaces and Interfaces, SSSI 2018, 19.-22.11.2018, Smolenice. The main organizer: Emil Pinčík, Stanislav Jurečka;
- ADEPT 2018 – International conference Advances in Electronic and Photonic Technologies, Organizer: Physics Department, 18.-21.6.2018, Tatranská Lomnica, SK. Members of the Organizing committee: Dušan Pudiš, Ivana Lettrichová, Jana Ďurišová, Ľuboš Šušlik;
- 12th International conference ELEKTRO 2018, 21.-23. 5.2018, Mikulov, CZ. The main organizer: Peter Hockicko;
- 19th International conference IEEE „Computational Problems in Electrical Engineering “, CPEE2018 9.-12.9.2018, Banská Štiavnica. Chairman: Ladislav Janoušek; organizing committee: Ladislav Janoušek, Branko Babušiak, Ján Barabáš, Mariana Beňová, Štefan Borik, Michal Gála, Daniela Gombárska, Zuzana Pšenáková, Roman Radil;
- Co-organization: 24th International Congress of Applied Physics of Condensed Matter APCOM, 20.-22.6. 2018, Štrbské Pleso. The main organizer: Institute of Nuclear and Physical Engineering FEI STU Bratislava, Jan Vajda, CSc.;
- Conference Alternative Energy Resources ALER, 3.-5.10.2018, Liptovský Ján. The main organizer: Pavel Šimon;
- Competition for secondary school students: The Technical Idea of the Year, 17.4.2018, DME, FEE, Ondrej Hock;
- Futurikon, 31. 5. 2018, Žilina. Organizer: FEE UNIZA, Jozef Šedo;
- Students' Research Competition ŠVOS of FEE UNIZA, May 2018, organizers: AIS and FEE;

- Workshops: Presentation of safety PLC laboratory and study options of safety control systems within the automation study branch, organised for secondary schools students: 14.2.2018 – SOŠE Liptovský Hrádok, 19.4.2018 – SOŠ Trenčín, 20.9.2018 – SPŠ Martin and Gymnasium Púchov, organisers: Juraj Ždánsky, Peter Nagy;
- Workshop „Ready for Conti 1“: discussion meeting of the representation of German/Slovak division of Continental AG/Continental Matador Truck Tires, s.r.o., DCIS representation and 1st grade master degree students on IoT, cloud, big data, industry 4.0 and others: 26.4.2018 – DCIS FEE UNIZA, within the KEGA 014ŽU-4/2018 project;
- Workshop „Ready for Conti 2“: discussion meeting of the representation of German/Slovak division of Continental AG/Continental Matador Truck Tires, s.r.o., DCIS representation and 1st and 2nd grade master degree students on IoT, cloud, big data, industry 4.0 and others: 23.10.2018 – DCIS FEE UNIZA, within the KEGA 014ŽU-4/2018 project.

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 the FEE (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.)
2008	8	126 (8*)	196	0	69
2009	4	89 (11*)	231	1	29
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

* 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 2017 (based on registration at the University Library up to February, 2019)

Category	Category name	Number
AAB	Scientific monographs published in domestic publishers	2
ABC	Chapters in scientific monographs published by foreign publishers	4
ACB	University textbooks published in domestic publishers	1
ADC	Scientific papers in foreign journals	34
ADE	Scientific papers in other foreign journals	17
ADF	Scientific papers in other domestic journals	8

ADD	Scientific papers in domestic carrented journals	2
ADM	Scientific papers in foreign journals registered in the Web of Science or SCOPUS databases	9
ADN	Scientific papers in domestic journals registered in the Web of Science or SCOPUS databases	13
AEC	Scientific papers in foreign reviewed scientific proceedings, monographs	1
AED	Scientific work in domestic reviewed scientific proceedings, monographs	4
AGJ	Applications of patents, utility models, …	5
AGI	Reports on solved scientific research tasks	1
AFA	Published invited papers at foreign scientific conferences	3
AFC	Published papers at foreign scientific conferences	145
AFD	Published papers at domestic scientific conferences	53
AFG	Abstracts of contributions from foreign conferences	4
AFH	Abstracts of papers from domestic conferences	8
BCI	Scripts and textbooks	1
BDE	Professional papers in non-currented foreign journals	6
BDF	Professional papers in non-currented domestic journals	2
BEF	Professional work in unrecognized domestic proceedings (both conference and non-conference)	3
FAI	Editorial and compilation work	2
DAI	Dissertation and habilitation works	7
GAI	Research studies and ongoing reports	1
GHG	Papers published on the Internet	8
GII	Various publications and documents that cannot be classified in any of the previous categories	1

Monographs (Chapters in monographs)

[1] LITVAJ, Ivan: Manažérstvo kvality, EDIS – vydavateľstvo Žilinskej univerzity, 2018, ISBN 978-80-554-1496-6., pp.133

[2] NĚMEC, Miroslav – KRIŠŤÁK, Ľuboš – HOCKICKO, Peter – GEJDOŠ, Miloš – HANČ, Jozef – TARJÁNYIOVÁ, Gabriela: Konceptuálne vzdelávanie na technických univerzitách. 1. vyd. - Zvolen: Technická univerzita vo Zvolene, 2018, ISBN 978-80-228-3028-7, pp. 88

Books, Textbooks and Lecture Notes

[1] LETTRICHOVÁ, Ivana – ŠUŠLIK Ľuboš – UHEREK František – TURÁN Ján: Fotonika I, 1. vyd., Žilina: Žilinská univerzita, 2017, ISBN 978-80-554-1417-1, pp. 114

Current Content Journals

[1] MŰLLEROVÁ, Jarmila – SCHOLTZ, Ľubomír – ĎURIŠOVÁ, Jana – PINČÍK, Emil – SOLANSKÁ, Michaela – PUDIŠ, Dušan: Angle-and polarization resolved antireflection properties of blask siliscon prepared by electrochemical etching supported by external electric field. In: Applied Surface Science: A Journal Devoted to Alpplied Physics and Chemistry of Surfaces and Interfaces, Vol. 461, 2018, ISSN 0169-4332, p. 182-189

[2] KÚDELČÍK, Jozef – HARDOŇ, Štefan – BURY, Peter – TIMKO, Milan – KOPČANSKÝ, Peter: Influence of temperature on the magneto-dielectrics effect of all-based ferrofluid, In: Acta

Physica Polonica A, Vol. 133, č. 3, 2018, ISSN 0587-4246, p. 483-485
[3] HARDOŇ, Štefan – KÚDELČÍK, Jozef – BURY, Peter – GUTTEN, Miroslav: Influence of electric and magnetic fields on dielectric response of oil-based ferrofluid, In: Acta Physica Polonica A, Vol. 133, č. 3, 2018, ISSN 1587-4246, p. 477-479
[4] BURY, Peter – VEVERIČÍK, Marek – KÚDELČÍK, Jozef - KOPČANSKÝ, Peter – TIMKO, Milan – ZÁVIŠOVÁ, Vlasta: SAW Investigation of Structural Changes in Liquid Crystals Doped with Magnetic Particles, In: Acta Acustica United with Acustica, Vol. 104, 2018, ISSN 1610-1928, 1861-9959 on line, p. 48-53
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[6] MATINČEK, Ivan – KÁČIK, Daniel: A PDMS Microfiber Mach-Zehnderov interferometer and determination of nanometer displacements, In: Optical fiber technology, Vol. 40, 2018, ISSN 1068-5200, p. 13-17
[7] HOCKICKO, Peter – MIZERÁKOVÁ, Jana – MUÑOZ, Francisco: The internal friction of lithium and sodium borophosphate glasses, In: Journal of Non-Crystalline Solids 498, 2018, ISSN 0022-3093, p. 194-198
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[10] ĎURIŠOVÁ, Jana – PUDIŠ, Dušan – GORAUS, Matej – GAŠO, Peter: ID-Dip photoresist surfaces for photonic applications prepared by laser lithography and studied by AFM, In: Applied Surface Science, Vol. 461, 2018, ISSN 0169-4332, p. 108-112
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[13] Tomášková, Tetjana – Trnka, Pavel – GUTTEN, Miroslav – KORENČIAK, Daniel: The analysis of the thermal and dielectric properties of high voltage insulating materials with the addition of aluminium oxide, In: Archives of Metallurgy and Materials, Vol. 63, No. 12, 2018, ISSN 1733-3490, p. 641-646
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development, engineering, and the studies in policy and management., Vol. 11, No. 11, 2018, ISSN 1996-1073 (online), p. 1-10
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[31] Frivaldský, Michal – Čuntala, Jozef - špánik, Pavol - KAŇOVSKÝ, Andrej: Investigation of thermal effects and lifetime estimation of electrolytic double layer capacitors during repeated charge and discharge cycles in dedicated application. In: Electrical Engineering - Archiv für Elektrotechnik, SPRINGER, Vol. 100, Issue, 2018, DOI 10.1007/s00202-016-0482-2, ISSN 0948-7921, ISSN(e) 1432-0487, p. 11- 25
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2018, ISSN 0169-4332, p. 227-232
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Patents, Utility Models, Designs, Trade Marks

Submitted in 2018:

[1] Category: patent
Application number: 126-2018
Authors: Martinček Ivan, Bánovčin Peter
Title: Swallowable capsule endoscope

[2] Category: Industrial Designs
Application number: 165-2018
Authors: KUČERA, Matej – ĎURATNÝ, Maroš – ŠEBÖK, Milan – DRGOŇA, Peter
Title: A device for measuring longitudinal unevenness of road surfaces

[3] Category: Industrial design
Application number: 7-2018
Authors: Praženica Michal, Dobrucký Branislav, Kaščák Slavomír
Title: Circuit for AC power transmission of hybrid electric vehicle

[4] Category: Industrial design
Application number: 212-2018
Authors: Jaroš Viliam, Frivaldský Michal, Praženica Michal, Drgoňa Peter
Title: Circuit of wireless electric power transmission using efficiency correction

[5] Category: Industrial design
Application number: 211-2018
Authors: FrivaldskýMichal, Dobrucký Branislav, Praženica Michal, Špánik Pavol
Title: Modular scheme of resonant converters in constant frequency configuration

[6] Category: Industrial design
Application number: 213-2018
Authors: Frivaldský Michal, Dobrucký Branislav, Praženica Michal, Špánik Pavol
Title: Modular circuit of resonant converters in configuration MASTER-voltage, SLAVE-current

[7] Category: Industrial design
Application number: 4-2018
Authors: Praženica Michal, Dobrucký Branislav, Kaščák Slavomír
Title: Circuit for AC power transmission of hybrid electric vehicle

[8] Category: Industrial design
Application number: 58-2018
Authors: Praženica Michal, Frivaldský Michal, Pavelek Miroslav, Hanko Branislav
Title: Interleaved boost converter with high gain, coupled inductances and magnetic flux reset

[9] Category: Industrial design
Application number: 82-2018
Authors: Praženica Michal, Kaščák Slavomír
Title: Circuit for measurement of common current of interleaved converter

[10] Category: Industrial design
Application number: 83-2018
Authors: Praženica Michal, Kaščák Slavomír

Title: Circuit for measurement of phase currents of interleaved converter

[11] Category: Industrial design
Application number: 84-2018
Authors: Praženica, Michal, Kaščák, Slavomír
Title: Circuit for measurement of switched current by differential amplifier with virtual ground

[12] Category: Industrial design
Application number: 85-2018
Authors: Praženica Michal, Kaščák Slavomír
Title: Circuit for measurement of switched current by differential amplifier with common ground

[13] Category: Industrial design
Application number: 86-2018
Authors: Praženica Michal, Kaščák Slavomír
Title: Circuit for measurement of current by current measuring amplifier with virtual ground

[14] Category: Industrial design
Application number: 87-2018
Authors: Praženica Michal, Kaščák Slavomír
Title: Circuit for measurement of current by current measuring amplifier with common ground

[15] Category: Industrial design
Application number: 92-2018
Authors: Praženica Michal, Kaščák Slavomír, Koňarik Roman
Title: Circuit of two-phase electric motor controlled for a common current

[16] Category: Industrial design
Application number: 93-2018
Authors: Koňarik Roman, Dobrucký Branislav
Title: Circuit of two-phase electric motor using a switched capacitor

[17] Category: Industrial design
Application number: 91-2018
Authors: Koňarik Roman, Dobrucký Branislav, Šedo Jozef
Title: Circuit for control current phase shift by switched capacitor

[18] Category: Industrial design
Application number: 89-2018
Authors: Koňarik Roman, Šedo Jozef
Title: Circuit for modified control of current phase shift by switched capacitor

[19] Category: Industrial design
Application number: 94-2018
Authors: Praženica Michal, Kaščák Slavomír
Title: Control of one-leg matrix converter

[20] Category: Industrial design
Application number: 137-2018
Authors: Praženica Michal, Dobrucký Branislav, Kaščák Slavomír
Title: Modified circuit for AC power transmission of hybrid electric vehicle

Granted in 2018:

[1] Category: patent
Application number: 73-2014
Authors: Martinček Ivan, Pudiš Dušan, Gašo Peter
Title: A way to prepare optic waveguide coupling elements from siloxane polymeric fibres

[2] Category: patent
Application number: 134-2018
Authors: Martinček, Ivan, Káčik, Daniel
Title: Device for measurement of the dynamical force using optic fibre

[3] Category: Industrial design UV 8160
Application number: 65-2017
Authors: Praženica Michal, Dobrucký Branislav, Kaščák Slavomír, Drgoňa Peter
Title: Two-stage power semiconductor system with multi-resonant and matrix converter

[4] Category: Industrial design UV 8185
Application number: 66-2017
Authors: Praženica Michal, Dobrucký Branislav, Kaščák Slavomír, Drgoňa Peter
Title: Two-stage converter with a half bridge matrix converter and low-frequency output

[5] Category: Industrial design UV 8180
Application number: 72-2017
Authors: Praženica Michal, Dobrucký Branislav, Kaščák Slavomír, Drgoňa Peter
Title: Single-phase bridge pulse cycloconverter with a reduced number of semiconductor elements

[6] Category: Industrial design UV 8234
Application number: 155-2017
Authors: Praženica Michal, Prídala Michal, Frivaldský, Michal
Title: Double LCCT converter with VF TR and DC output

[7] Category: Industrial design UV 8257
Application number: 156-2017
Authors: Praženica Michal, Kaščák Slavomír, Dobrucký Branislav
Title: Dual multi-resonant converter with symmetrical output

[8] Category: Industrial design UV 8263
Application number: 157-2017
Authors: Praženica Michal, Kaščák Slavomír, Frivaldský Michal, Šedo Jozef
Title: Dual serial-parallel resonant (LLC) converter utilising full voltage of a source

[9] Category: Industrial design UV 8264
Application number: 158-2017
Authors: Praženica Michal, Kaščák Slavomír, Frivaldský Michal, Šedo Jozef
Title: Series-parallel resonant (LLC) converter with dual resonance capacitor

[10] Category: Industrial design UV 8271
Application number: 186-2017
Authors: Praženica Michal, Frivaldský Michal, Pavelek Miroslav, Hanko Branislav
Title: Interlaced step-up converter with a high gain, bound inductance and magnetic flux reset

[11] Category: Industrial design UV 8226
Application number: 180-2017
Authors: Praženica Michal, Dobrucký Branislav, Kaščák Slavomír, Koňarik Roman
Title: Connection of a two-phase electric motor supplied by constant frequency from single-stranded matrix converter from industrial networks

[12] Category: Industrial design UV 8317
Application number: 188-2017
Authors: Praženica Michal, Dobrucký Branislav, Kaščák Slavomír, Koňarik Roman
Title: Connection of a two-phase electric motor supplied by variable frequency from single-stranded matrix converter from industrial networks

[13] Category: Industrial design UV 8304
Application number: 187-2017
Authors: Praženica Michal, Dobrucký Branislav, Kaščák Slavomír, Koňarik Roman
Title: Connection of a two-phase electric motor supplied from single-stranded matrix converter with switched capacitor from industrial networks

[14] Category: Industrial design UV 8283
Application number: 159-2017
Authors: Píri Marek, Frivaldský Michal, Drgoňa Peter
Title: Device for testing the topologies of power semiconductor converters

[15] Category: utility model
Application number: 8218 (20180726)
Authors: Gála Michal; Babušiak Branko; Janoušek Ladislav; Borik Štefan; Hudec Róbert; Paralič Martin; Matúška Slavomír; Balogová Ľudmila; Šesták Jozef; Huljaková Kamila
Title: Intelligent clothing for biosignals monitoring, in particular an electrocardiogram signal

Specific Realization Outputs

Output type: Prototype
Output description: Within the project 314/17_RT Universal balancing system for traction batteries of electric vehicles, the two balancing systems (passive one and active one) for lithium batteries were developed.

Awards

Milan Dado	Scientist of 2017, International cooperation
Milan Dado	Award of Zilina self-governing region
Valéria Hrabovcová	Rector of the University of Zilina Award: Citations 2018
Peter Počta	Jozefa Murgaš award for publication of theoretical contribution to development of electronic communications in 2017
Juraj Machaj	Scientist of UNIZA under 35 years
Gabriel Cibira	Medal on behalf of personal contribution for international scientific conference Fuzzy Set Theory and Applications FSTA
Ivan Martinček	Innovator Award for Technology Transfer 2018
Ivan Melo	Award of the Unity of Slovak Mathematicians and Physicists for lifelong contribution to the education of young generation
Pavel Pavlásek	Award - International recognition by the scientific and pedagogical community in the context of the KEGA project solution by nominating the reviewer of contribution: „A study on the Causes and Countermeasures of the imbalance in the Flow of Compulsory Education Teachers in Urban and Rural areas in China“ at the international conference FEBM2018: The Third International Conference on Economic and Business Management, October 20-22, 2018, Hohot, China, certificate
Pavel Pavlásek	Award and an international recognition by the scientific and pedagogical community in the context of the KEGA project solution by nominating the reviewer of contribution: „Perceived Value of Interactive Digital Textbook and Adaptive Learning: Implications on Student Learning Activities“, for the international renowned magazine: Journal of Education for Business, certificate
Michal Frivaldský, Miroslav Pavelek	Contribution to FEIT in publishing and business development - Category publishing
Dušan Koniar, Libor Hargaš, Miroslav Hrianka (in memoriam), Pavol Špánik	TOP innovations in health care in 2018, Zdravotnícke noviny - Medical newspaper, award for the unique use of the device for measuring of cilia kinematic

Habilitations and Inaugurations

Tab. 13: Number of habitations and inaugurations within last eight 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	

FOREIGN ACTIVITIES

Foreign activities at the FEE in 2018 include realization of international projects summarized in the previous section, active participation in foreign scientific and technical forums, and mutual mobility of teachers, researchers and students at foreign institutions.

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 59 foreign universities were approved for students / teachers / other staff exchanges for the academic year 2017/2018, as follows:

1. TU Wien (AT)
2. Todor Kableshkov Higher School of Transport (BG)
3. College 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. RWTH Aachen (DE)
14. TU Dresden (DE)
15. Hochschule für Technik und Wirtschaft Dresden (DE)
16. Hochschule fuer Telekommunikation Leipzig (DE)
17. RUHR Bochum (DE)
18. University of Applied Sciences Aschaffenburg (DE)
19. Technische Universität Ilmenau (DE)
20. Universitat Autonoma de Barcelona (ES)
21. Tampere University of Technology (FIN)
22. University of Jyväskylä (FIN)
23. Aalto University (FIN)
24. University of Vaasa (FIN)
25. Lappeenranta University of Technology (FIN)
26. Télécom SudParis (FR)
27. Télécom Ecole de Management (FR)
28. Université de Picardie "JulesVerne" (FR)
29. Université de Technologie de Compiègne (FR)
30. Polytech Orléans (FR)
31. Lille 1 University Science and Technology, Polytech Lille (FR)

32. Ecole d'ingénieurs ECE Paris (FR)
33. University of Patras (GR)
34. University of Zagreb (HR)
35. Budapest University of Technology and Economics (HU)
36. University of Catania (IT)
37. Dublin Institute of Technology (IRL)
38. Transport and Telecommunication Institute (LV)
39. Riga Technical University (LV)
40. Kaunas University of Technology (LT)
41. Universidade da Beira Interior (PT)
42. Universidade de Lisboa (PT)
43. Universidade do Porto (PT)
44. Kazimierz Pulaski University of Technology and Humanities in Radom (PL)
45. Lublin University of Technology (PL)
46. Silesian University of Technology (PL)
47. West Pomeranian University of Technology (PL)
48. Gdansk University of Technology (PL)
49. Uniwersitet Technologiczno Przyrodniczy w Bydgoszczy (PL)
50. Warsaw University of Technology (PL)
51. Transilvania University of Brasov (RO)
52. Universitatea Technica din Cluj-Napoca (RO)
53. Universitatea "POLITEHNICA" din Bucuresti (RO)
54. University of Maribor (SI)
55. University of Strathclyde (UK)
56. Uludağ University (TR)
57. Istanbul Arel University (TR)
58. Biruni University (TR)
59. Karabuk University (TR)

Erasmus+ stays

In the academic year 2017/2018 22 students (thence 10 students for Erasmus+ practical placement), 20 teachers and 4 administrative staff participated in the Erasmus+ programme. The Faculty accepted 22 students and 17 teachers from partner universities.

Other scholarship programmes

In the academic year 2017/2018 three PhD. students participated in the CEEPUS programme, the mobility was realized at the Silesian University of Technology, Poland.

The Faculty accepted in the academic year 2017/2018:

- one PhD. student from the Sumy State University, Department of Nanoelectronics, Ukraine, for 5 months mobility within the framework of the National Scholarship Programme of the Slovak Republic;
- one PhD. student from the University of Strathclyde, Glasgow, UK, for a 1-month mobility within the framework of Horizon 2020 RISE project – SENSBLE;
- two students, from the Manipal Institute of Technology, India and from the East Kazakhstan State University, Kazakhstan, for 2 months' mobility within the framework of IAESTE programme.

Other activities

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

- Ryazan State Radio Engineering University (RU),
- University of Catania (IT),
- Czech Technical University in Prague (CZ),
- University of Pardubice (CZ),
- ELTODO dopravní systémy s.r.o. Prague (CZ),
- ELTODO EG, a.s., Prague (CZ),
- Railway Research Institute, j.s.c., Prague (CZ),
- VÚKV, a.s., Prague (CZ),
- Technický a zkušební ústav stavební Prague, s.p. (CZ).

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, the FEE 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),
- 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),
- Lublin University of Technology, 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 2018 several short or long stays in foreign countries at partner universities or institutions, and on the contrary, the FEE and its departments accepted students and teachers from abroad.

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

The table contains also long stays of employees and doctoral students abroad, and long stay visits of foreign participants at the departments of the FEE.

Employees of the FEE published and/or took part in many 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 the FEE for 2018.

Tab. 14: Foreign stays, conferences and visits in 2018

IN/OUT	DPh	DMAEE	DEBE	DME	DPES	DCIS	DMICT	IAS
Belgium						0 / 2	0 / 1	
Czech Republic	0 / 3	1 / 0	4 / 6	3 / 1		10 / 6	0 / 4	1 / 1
China				0 / 1		0 / 1		
France	0 / 3						0 / 1	
Greece	0 / 1						1 / 0	
Denmark	0 / 1							
India				1 / 0				
Canada								1 / 0
Lithuania							1 / 0	
Latvia							0 / 3	
Germany			1 / 0	4 / 5		4 / 0		
Poland	0 / 2	3 / 4	1 / 1	0 / 3		0 / 2		
Portugal	0 / 1		0 / 2					
Austria	0 / 4					0 / 1		
Romania							0 / 3	0 / 1
Russian Federation	0 / 5			0 / 1		3 / 0		
Serbia						0 / 1	0 / 1	
Scotland							0 / 4	
Spain				0 / 3			5 / 1	
Switzerland	0 / 1							
Italy	0 / 2			1 / 1				
USA				2 / 0		0 / 3		
Great Britain					0 / 1	0 / 2	3 / 0	0 / 1
Vietnam							0 / 1	
Total	**0 / 23**	**4 / 4**	**6 / 9**	**11 / 15**	**0 / 1**	**17 / 18**	**10 / 19**	**2 / 3**
Total all	**50 / 92**							

Membership in International Institutions/Committees

Employees of the Faculty of Electrical Engineering, 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 the FEE for 2018.

MAIN TASKS OF THE FACULTY FOR THE YEAR 2019

The development of the FEE will be realized in accordance with the framework program of the Faculty for the period 2014-2020, which was approved by the Scientific Board of the FEE on the 12th of May 2014, while in the process will be incorporated knowledge obtained from the practical implementation of the activities proposed in the framework program. The basic strategic aim 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.

Quantifiable main tasks for the year 2019

Field of education

- continue the mentoring program for first year students of Bachelor study;
- get better feedback from students about their satisfaction with the education provided at the Faculty;
- organization of a meeting of the faculty management with doctoral students and their supervisors and a meeting with academic community of the Faculty at least once a year;
- continue in set up marketing activities towards primary and secondary schools to raise students' awareness of faculty studies;
- 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 the FEE;
- organization of 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;
- performing optimization of the number and focus of study programs offered by the Faculty and preparing for new accreditation.

Field of science and research

- active participation at annual meetings of the management of faculties of electrical engineering and related orientations of FELAPO 2019;
- participation in the organization of at least 5 other 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;
- create a system for recording scientific and research activities of projects and related outputs.

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 EUREKA, 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 the conditions for more effective conclusion of bilateral agreements;
- attractiveness of the faculty's educational system for international students;
- more prominent presentation of study opportunities in Eastern European countries.

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