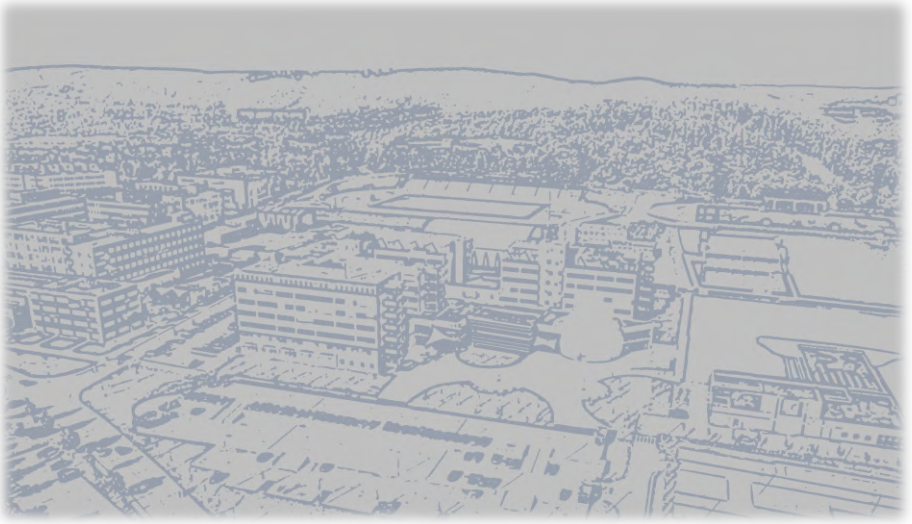
ANNUAL REPORT 2015

FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION BRNO UNIVERSITY OF TECHNOLOGY



Contents

Introduction

History

Brno University of Technology (BUT) is the second largest and the second oldest technical university in the Czech Republic. It was founded in 1849 for technical, agricultural and commercial specializations. The languages of instruction were Czech and German. However, in consequence of political and national disputes, Czech gradually ceased to be used as a language of instruction until in 1899 the Czech Technical High School was established in Brno. After World War I and the founding of Czechoslovakia this school merged with the German Technical School (originally bilingual) to form the High Technical School in Brno (later bearing the name of Dr. Edvard Beneš, the second President of Czechoslovakia). In the period between World War I and World War II the school was among the best technical high schools in Europe. During World War II the school was, as all other Czech high schools were, closed and the premises were used by German military institutions, and most equipment was destroyed. Immediately after the end of World War II the activities of the school were resumed. In 1951 at the beginning of Cold War, the Technical High School was closed and some departments were incorporated in the newly established Military Academy. Tuition for civilians continued at the former Faculty of Civil Engineering only.

Electrotechnical disciplines were first taught at the university in 1905. Since the Faculty of Power Engineering was founded in 1959, and subsequently transformed into Electrotechnical Faculty, 25,000 students have graduated from the faculty. In 1993 the structure of the faculty was changed. It received a new name Faculty of Electrical Engineering and Computer Science (FEECS) and was the third largest among the then existing seven faculties of Brno University of Technology after, at the beginning of 2000, the Faculty of Technology and the Faculty of Management joined to establish Tomáš Baťa University in Zlín.

A number of historical decisions were taken in 2001 in connection with the founding of a new faculty in 2002 - Faculty of Information Technology (FIT) and transformation of the Faculty of Electrical Engineering and Computer Science (FEECS) into the Faculty of Electrical Engineering and Communication (FEEC). A significant milestone in the faculty history was the year 2013 when construction of new faculty premises was completed. After more than fifty years of its existence, the whole faculty, all departments and workplaces, moved to one location in the BUT campus Pod Palackého vrchem.

The Faculty in 2015

The Rector was Professor Petr Štěpánek who took office on 1 February 2014 and his Vice-Rector for Creative Activities was Professor Lubomír Grmela from the Department of Physics, Faculty of Electrical Engineering and Communciation.

The Dean of FEEC in 2015 was Professor Jarmila Dědková, and the four vice-deans were Professor Vladimír Aubrecht (research and doctoral study programme, acting dean), Associate Professor Jiří Háze (external relations and international affairs), Associate Professor Petr Fiedler (Bachelor study programme), Professor Stanislav Hanus (Master study programme), and Miloslav Morda was faculty bursar.

At the end of 2015 there were 213.4 academic loads at the faculty (professors, associate professors, senior lecturers, lecturers and other pedagogical and research staff) and 3,678 students in all forms of government supported programmes. Moreover, inter-faculty instruction was provided to 266 students of the Faculty of Information Technology,16 students of the Faculty of Mechanical Engineering, 34 students of the Faculty of Management and 4 students of the Institute of Forensic Engineering. On the other hand, the faculty purchased instruction for 16 students from the Faculty of Management and for 2 students from the Faculty of Information Technology. Then the number of students educated at the faculty totalled 4,135. In 2015 education was provided in study programmes Electrical Engineering, Electronics, Communication and Control Technology (EECR, accredited in 2001) and Biomedical Technology and Bioinformatics (BTBIO-A, reaccredited in 2013), Biomedical Engineering and Bioinformatics (BTBIO-F, accredited in 2010), English in Electrical Engineering and Information Technology (AJEI-H, accredited in 2012) and Audio Engineering (AUDIO, accredited in 2012) in the Bologna system. The study programmes at FEEC are now fully compatible with the European education system, and student mobility has been facilitated. Among the FEEC graduates in 2015 there were 409 students who completed the Bachelor degree programme, 382 follow-up Master programme graduates and 45 doctoral students completed the Ph.D. programme. There were 1,399 admissions to Bachelor programmes, 597 admissions to follow-up Master programmes, and 83 students started their Ph.D. studies. Instruction in English was provided to 2 international students paying their fees. One academic received the title of professor and eight academics were appointed associate professors.

Events and Activities

- reconstruction of premises Technická 8
- opening of the interactive playroom 'Elektrikárium'
- meeting of the deans of the Faculty of Electrical Engineering and Faculty of Information Technology with members of the club 'Elektron'
- meeting to commemorate avalanche victims on Kubínská hola
- accreditation of the follow-up Master degree programme 'Audio Engineering'
- courses for secondary school students interested in study at FEEC organized by Department of Mathematics to help them prepare for entrance examination and 'Summer School of Electrical Engineering'organized by Department of Theoretical and Experimental Electrical Engineering
- Open Door Days (November, December 2015), visits by students to secondary schools, secondary school advisors visiting FEEC, 'Night of Scientists' (25 September 2015)
- presentation of new study programmes at European trade fair of higher and lifelong education 'GAUDEAMUS 2015, 3-6 November 2015', to promote FEEC and arise interest of secondary school students in study at FEEC, participation in trade fairs in Bratislava, Nitra and Prague
- development of programmes leading to habilitation and appointment procedures
- meeting of the leaderships of Czech and Slovak faculties of electrical engineering and associated faculties in Žilina, 20-22 May 2015
- '21th STUDENT EEICT Conference and Competition 2015' with 46 Bachelor, 52 Master, 61 Ph.D. and 10 papers by secondary school students, sponsored by Honeywell, ABB, ON Semiconductor etc.
- creative competition for secondary school students 'Merkur perFEKT Challenge' with more than 200 participants from all parts of the Czech Republic
- continuation of the Lifelong Learning Programme-Erasmus and other European programmes
- full use of the central BUT information system
- continuation of the project 'Energy in Conditions of Sustainable Development (EN-PUR)' of the regional centre CVVOZE (Centre for Renewable Electric Energy Sources) funded from NPU I, investigator Vladimír Aubrecht
- commencement of the project 'Interdisciplinary Research of Wireless Technologies' (INWITE) of the regional centre SIX (Centre for Sensor, Information and Communication Systems) funded from NPU I, director Martin Slanina
- operation of the mini nursery 'Edisonka' supported by BUT faculties
- activities of Academic Senate member Ivana Jakubová in her capacity as a member of the Higher Education Council
- organizational and economic interests of FEEC
- activities of Advisor for Equal Opportunities Naděžda Uhdeová focused on consultancy for female students and study opportunities for handicapped students
- recruitment and care of international students paying their fees. Education of these students is a valuable experience for participation of individuals and departments in mobility projects, and also a source of additional income for qualified teachers with language skills.
- forty-ninth faculty ball at the Voroněž hotel.

Achievement

Economic situation of the faculty in 2015 was satisfactory. Analyzing the budget, it can be said that income for education slightly increased, however, higher write-offs had to be covered, partly from the Fund from operations. The trend in salaries and material supply was favourable due to outstanding pedagogical and research achievements of academic staff and minimization of faculty expenditure.

When the validity of individual items in Investment development fund was clear, the FRIM item was reduced and transferred to Operation fund to be used to cover labour costs.

Economic stability of departments was mainly due to involvement in research projects of the Czech Science Foundation, Czech Technology Agency, Ministry of Trade and Industry, European Commission (FP7), and efforts of those who under the leadership of chief investigators participated in OP VK, EN-PUR, INWITE and NPU projects.

All staff members and Ph.D. students deserve high appreciation and my gratitude.

Jarmila Dědková
Dean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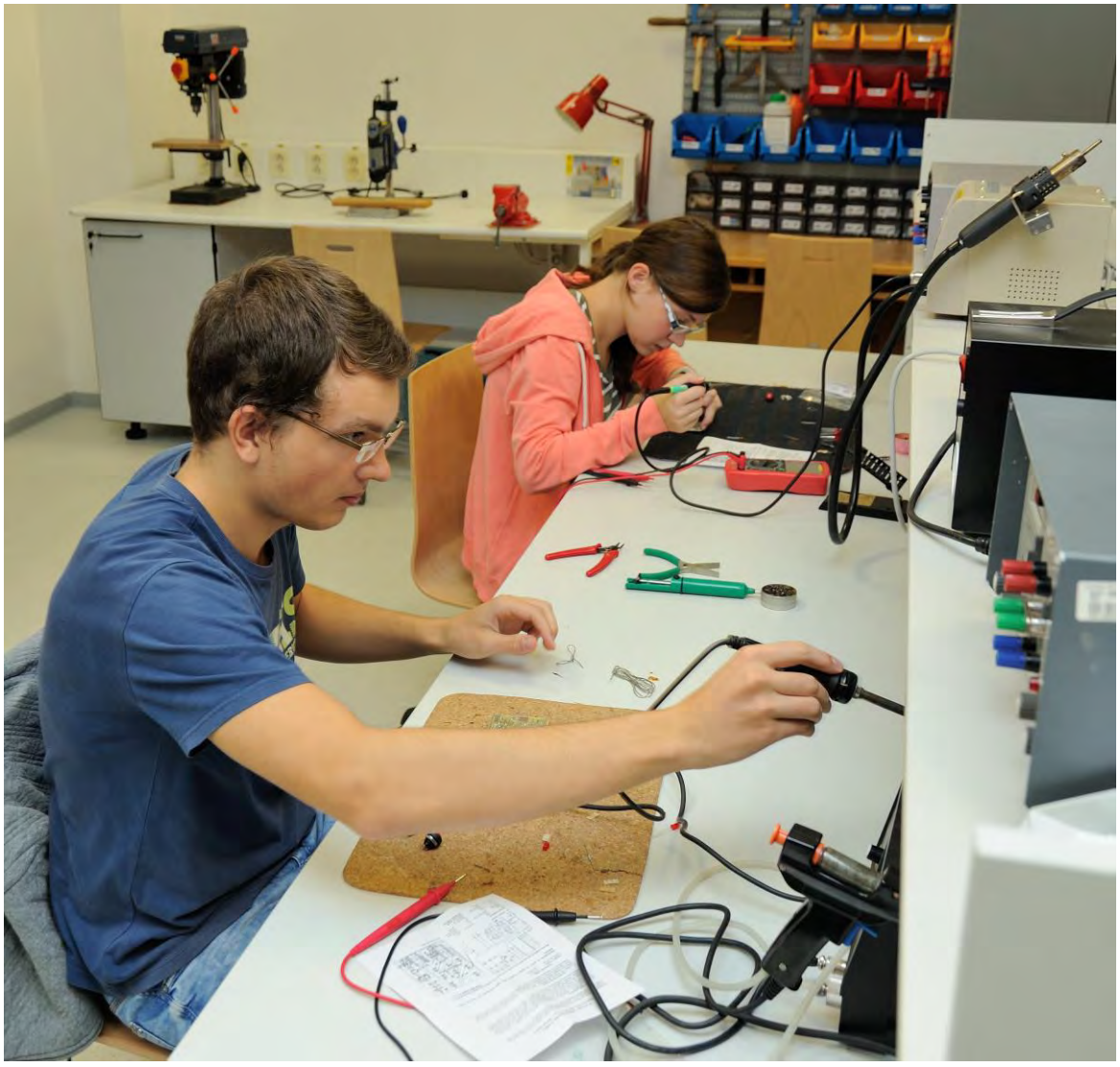

Faculty of Electrical Engineering and Communication

Dean

Prof. Ing. Jarmila Dědková, CSc.

Vice-Deans

Prof. RNDr. Vladimír Aubrecht, CSc.
Acting Dean, Vice-Dean for Creative Activities and Doctoral Degree Programme

Doc. Ing. Petr Fiedler, PhD.
Vice-Dean for Bachelor Degree Programme

Prof. Ing. Stanislav Hanus, CSc.
Vice-Dean for Master Degree Programme

Doc. Ing. Jiří Háze, Ph.D.
Vice-Dean for External Relations and International Affairs

Chairman of Academic Senate

Doc. Ing. Miloslav Steinbauer, Ph.D.

Faculty Secretary

Ing. Miloslav Morda

Student Advisor to the Dean

Bc. Daniel Janík

Advisor for Equal Opportunities

RNDr. Naděžda Uhdeová, Ph.D.

Trade Unions Representative

Prof. Ing. Vítězslav Hájek, CSc.

Departments

Department of Control and Instrumentation
Department of Biomedical Engineering
Department of Electrical Power Engineering
Department of Electrical and Electronic Technology
Department of Physics
Department of Languages
Department of Mathematics
Department of Microelectronics
Department of Radioelectronics
Department of Telecommunications
Department of Theoretical and Experimental Electrical Engineering
Department of Power Electrical and Electronic Engineering

Scientific Board

Internal members

Prof. RNDr. Vladimír Aubrecht, CSc.
Prof. Ing. Lubomír Brančík, CSc.
Prof. Ing. Jarmila Dědková, CSc.
Doc. Ing. Petr Fiedler, Ph.D.
Prof. Ing. Eva Gescheidtová, CSc.
Prof. Ing. Lubomír Grmela, CSc.
Prof. Ing. Stanislav Hanus, CSc.
Doc. Ing. Jiří Háze, Ph.D.
Prof. RNDr. Jan Chvalina, DrSc.
Prof. Ing. Jiří Kazelle, CSc.
Prof. Ing. Vladislav Musil, CSc.
Doc. Ing. Vít Novotný, Ph.D.
Doc. Dr. Ing. Miroslav Patočka
Prof. Ing. Ivo Provazník, Ph.D.
Prof. Dr. Ing. Zbyněk Raida
Prof. Ing. Zdeněk Smékal, CSc.
Doc. Ing. Petr Toman, Ph.D.
Prof. Ing. Pavel Václavek, Ph.D.
Prof. Ing. Radimír Vrba, CSc.
Doc. Ing. Jaroslav Zendulka, CSc.

External members

Doc. Ing. Otto Dostál, CSc.
Doc. Ing. Ladislav Dušek, CSc.
Ing. Leoš Dvořák
Ing. Jiří Holoubek
Doc. Dr. Ing. Pavel Horský
Prof. Ing. Miroslav Husák, CSc.
Prof. Dr. Ing. Josef Lazar
Doc. Ing. Jiří Masopust, CSc.
Ing. Petra Peterková, Ph.D.
Ing. Jiří Potěšil
Prof. Ing. Aleš Richter, CSc.
Ing. Roman Schiffer

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Youtube: http://www.youtube.com/user/perFEKTniFakulta

Accredited study programmes and specializations

Accredited Study Programmes

Bachelor Degree Programme Electrical, Electronic, Communication and Control Technology
Study areas: Control and Measurement Technology
Electronics and Communications
Microelectronics and Technology
Power Electrical and Electronic Engineering
Teleinformatics

Bachelor Degree Programme Biomedical Technology and Bioinformatics
Study area: Biomedical Technology and Bioinformatics

Bachelor Degree Programme English in Electrical Engineering and Information Technology
Study area: English in Electrical Engineering and Information Technology

Bachelor Degree Programme Audio Engineering
Study area: Audio Engineering

Bachelor Degree Programme Information Safety
Study area: Information Safety

Follow-up Master Degree Programme Electrical, Electronic, Communication and Control Technology
Study areas: Biomedical and Ecological Engineering
Electronics and Communications
Electrotechnical Manufacturing and Management
Cybernetics, Control and Measurement
Microelectronics
Power Electrical Engineering and Power Electronics
Telecommunications and Information Technology

Follow-up Master Degree Programme Biomedical Engineering and Bioinformatics
Study area: Biomedical Engineering and Bioinformatics

Doctoral Degree Programme Electrical Engineering and Communication Technology
Study areas: Biomedical Electronics and Biocybernetics
Electronics and Communications
Physical Electronics and Nanotechnology
Cybernetics, Control and Measurement
Mathematics in Electrical Engineering
Microelectronics and Technology
Power Electrical and Electronic Engineering
Teleinformatics
Theoretical Electrical Engineering

Doctoral Degree Programme Biomedical Technology and Bioinformatics
Study area: Biomedical Technology and Bioinformatics

Accredited Study Areas for Habilitation and Professorship

Biomedical Engineering
Electronics and Communications
Electrical and Electronic Technology
Power Electrical Engineering
Technical Cybernetics
Teleinformatics
Theoretical Electrical Engineering

Study Programmes

Bachelor Degree Programme Electrical, Electronic, Communication and Control Technology

The faculty has been providing education in the Bachelor programme Electrical, Electronic, Communication and Control Technology (EECR) in full-time form of study since academic year 2002/03 and in part-time form of study since academic year 2004/05.

There were 1,387 full-time students enrolled in the Bachelor programme EECR-B in 2015. The programme was completed by 316 full-time students, 62 of them in the study area Automation and Measurement Technology (B-AMT), 45 in Electronics and Communications (B-EST), 45 in Microelectronics and Technology (B-MET), 82 in Power Electrical and Electronic Engineering (B-SEE) and 82 in Teleinformatics (B-TLI).

In the part-time Bachelor programme EECR-BK there were 224 students in 2015. The programme was completed by 20 students, 2 of them in study area Automation and Meassurement Technology (BK-AMT), 3 in Electronics and Communications (BK-EST), 3 in Power Electrical and Electronic Engineering (BK-SEE) and 12 in Teleinformatics (BK-TLI).

Applications for full-time and part-time Bachelor study were accepted. There was a written entrance test in either mathematics and physics, or mathematics and the basics of informatics. Students who met one of the following requirements were exempt from the examination:

- passed their school-leaving examination in mathematics or physics with grade 1 or 2 in at least one of these subjects
- completed a preparatory course in mathematics or physics with grade 1 or 2
- achieved a secondary-school average better than 2.0 (arithmetical average of grades in final reports for 1st, 2nd and 3rd year and the first half of 4th year)
- passed National Comparative Examinations and Test of General Study Prerequisites with a minimum of 60% in all assessed parts

The maximum number of points to be achieved in entrance examination for each subject was 50 and the pass was 12 for each subject. All applicants who passed entrance examination or who were exempt from it were admitted.

In 2015 there were 1,198 applicants, 1,021 for full-time study and 177 for part-time study. Finally, 826 students were admitted, 713 in full-time study and 113 in part-time study. As the number of admitted students did not reach full capacity, a second term was announced. There were 117 applications for full-time study and 34 applications for part-time study. The total number of students enrolled was 746, 621 full-time students and 125 part-time students. It can be said that part-time study remains in the focus of interest. However, an analysis shows that a substantial percentage of those interested in part-time study are former full-time students.

Preparatory courses are offered by the Department of Mathematics and Department of Physics to assist applicants preparing for entrance examinations and help them adapt to university studies. Information on study programmes and qualifications such as Certificate of Electrotechnical Qualification, Certificate of Pedagogical Practice, Microsoft Certificate, Cisco Certificate are regularly presented in the media, on Open Door Days, visits by teachers and students to secondary schools, and at the GAUDEAMUS fair. All activities are focused on promotion of FEEC and increasing the interest in studies at FEEC.

Bachelor Degree Programme Biomedical Technology and Bioinformatics

In academic year 2007/08 the Bachelor programme Biomedical Technology and Bioinformatics (BTBIO-A) was launched. The full-time form of study covers one study area Biomedical Technology and Bioinformatics (A-BTB). Also taking part in instruction in this interdisciplinary programme is the Faculty of Medicine, Masaryk University in Brno.

The study area Biomedical Technology and Bioinformatics is mainly focused on practical training, but it also prepares graduates for further studies in follow-up Master programmes at universities providing education in biomedical engineering, medical informatics and mathematical biology (Brno University of Technology, Czech Technical University in Prague, Charles University, Masaryk University). Students gain theoretical knowledge in mathematics, physics and chemistry, basic knowledge in biology, human anatomy and physiology, needed to understand the basic biological processes taking place in human organism anad to communicate with doctors and medical staff. They get acquainted with operation principles and use of medical technology and informatics, and gain ability to work with them. Moreover, they are offered information on medical legislative and learn how to apply it in practice. Emphasis is laid on general and professional language skills. The Bachelor programme includes a four-week professional training in hospitals, health centres, institutions and companies focused on running clinics, treatment, research and trade in biomedical technology and bioinformatics in the Czech Republic

and abroad The training is arranged by the students themselves and takes place outside scheduled instruction (mainly during the summer holidays) by the time of completion of the Bachelor programme.

The top limit approved by Academic Senate for admission to full-time study in the programme BTBIO-A was 150. Applicants with secondary-school grade average of 1.25 were exempt from entrance examination. The maximum number of points to be achieved in each subject was 50 and the pass was 12 points for each subject. All applicants exempt from entrance examination and those who passed the examination with excellent results were admitted. In 2015 there were 183 paid applicantions, 120 admissions and 92 enrolled. And there were 218 full-time students in the BTBIO-A programme.

Bachelor Degree Programme English in Electrical Engineering and Information Technology

In academic year 2012/13 the Bachelor programme English in Electrical Enginering and Information Technology (AJEI-H) with the study area English in Electrical Engineering and Information Technology (H-AEI) was launched. English in Electrical Engineering and Information Technology as a specific professional variety had not been taught before at universities in the Czech Republic though English is the lingua franca of engineering specializations. The programme also includes cultural studies, and fundamentals of electrical engineering and economics. The graduates will be equipped for work in industrial companies, government administration, research institutions, management, and translating technical texts. They will acquire basic knowledge of electrical engineering and professional language competences on level C1 of the 'Common European Reference Framework'.

The subjects selected for entrance examination are mathematics and English. The entrance examination contained an English language test (multiple choice) at the intermediate level B1 of the 'Common European Reference Framework'. Exempt from the examination in English were students who submitted a certificate or report confirming the required level of knowledge (Upper-Intermediate).

Students who met one of the following requirements were exempt from examination in mathematics:

- passed their school-leaving examination in mathematics with grade 1 or 2
- completed a preparatory course in mathematics with grade 1 or 2
- achieved a secondary-school average better than 1.70 (arithmetical average of grades in final reports for 1st, 2nd and 3rd year and the first half of 4th year)
- passed National Comparative Examinations and reached 60.0% in each part of the test in mathematics

The maximum number of points to be achieved in entrance examination for each subject was 50 and the pass was 12 for each subject. All applicants who passed the entrance examination or who were exempt from it were admitted. There were 136 appliccants for academic year 2015/2016, 108 of them were admitted and 97 enrolled.

Bachelor Degree Programme Audio Engineering

Since academic year 2013/14 a new full-time Bachelor programme Audio Engineering (AUDIO-J) with one study area Audio Engineering (J-AUD) has been offered. The programme provides interdisciplinary Bachelor education in audio engineering and is focused on training of audio engineers with technical and artistic approach to the latest audio technology, audio signal processing, musical production and studio practice. The programme was prepared and implemented in cooperation with Janáček Academy of Music and Performing Arts, Faculty of Music.

Applicants for admission to the study programme AUDIO-J are required to take an aptitude test and entrance examination in mathematics and physics or mathematics and basics of informatics. The aptitude test is taken prior to entrance examination. Decisive for admission are results of aptitude test. The requirement for entrance examination is to achieve the given minimum number of points. The aptitude test is obligatory. Exempt from entrance examination are applicants who achieved a secondary-school average 1.25 (an arithmetical average of grades in final reports for 1st, 2nd and 3rd year and the first half of the fourth year). There were 157 applicants, 81 admissions and 67 enrolled.

Bachelor Degree Programme Information Safety

In 2015/16 a new full-time Bachelor programme Information Safety (IBEP-T) was launched, with one study area Information Safety (T-IBP). The programme provides training for a Bachelor degree in information and communication safety. It is focused on education of experts in safety of information and communication technologies, and legal and economic aspects connected with safety issues. The graduates will be educated in theory of mathematics, informatics, cryptography, economy and law associated with the design, operation and management of information and communication systems. Emphasis is laid on language competences, namely professional English. The programme was designed and is implemented in cooperation with Faculty of Law, Masaryk University.

Entrance examination contains an optional combination of mathematics and physics or mathematics and fundamentals of informatics. One of these alternatives is chosen by the applicant at entrance examination. Exempt from entrance examination are applicants who achieved a secondary-school average 1.50 (an arithmetical average of grades in final reports for 1st, 2nd and 3rd year and the first half of the fourth year).

In 2015 there were 142 applicants, 70 admissions and 54 enrolled.

Follow-up Master Degree Programme Electrical, Electronic, Communication and Control Technology

The faculty has been providing education in the follow-up Master programme Electrical, Electronic, Communication and Control Technology in full-time form of study since academic year 2005/06 and in part-time form of study since academic year 2007/08.

In academic year 2015 there were 790 students in the EECR-M programme, 358 in the first year of study and 432 in the second year, there were 212 students in the part-time programme EECR-ML, 125 of them in the first year of study and 87 in the second year.

In 2015 the full-time programme was completed by 289 students, 20 of them in Biomedical and Ecological Engineering (M-BEI), 31 in Power Electrical Engineering (M-EEN), 42 in Electronics and Communications (M-EST), 25 in Electrotechnical Manufacturing and Management (M-EVM), 48 in Cybernetics, Control and Measurement (M-KAM), 26 in Microelectronics (M-MEL), 25 in Power Electrical and Electronic Engineering (M-SVE) and 72 in Telecommunications and Informatics (M-TIT). Part-time study was completed by 40 students, 1 in Biomedical and Ecological Engineering (ML-BEI), 3 in Power Electrical Engineering (ML-EEN), 3 in Electronics and Communications (ML-EST), 9 in Electrotechn ical Manufacturing and Management (ML EVM), 3 in Cybernetics, Control and Measurement (ML-KAM), 1 in Microelectronics (ML-MEL), 6 in Power Electrical and Electronic Engineering (ML-SVE) and 14 in Telecommunications and Informatics (ML-TIT).

The total number of applicants for study in the EECR programme (with paid application) was 660, 502 for full-time programme (EECR-M) and 158 for part-time programme (EECR-ML). For academic year 2015/16 the maximum numbers of admissions approved by Academic Senate were 750 (full-time form of study) and 250 (part-time study). The written entrance examination contained 10 tasks, two for each of the five subjects approved by the Council of Study Programmes - Electrotechnical Engineering 1, Electrotechnical Engineering 2, Electronic Components, Signals, Structures, Systems and Measurement in Electrical Engineering. The number of points to be achieved for each problem was 10, total of 100 points. The time limit was 75 minutes. As the number of applicants was lower than the number approved for admission, the Dean decided, in accordance with Admission Procedure Rules, about exemption from entrance examination and admission of all applicants. The second examination term 7 July 2015 and Committee meeting scheduled for 20 August 2015 were cancelled. There were 541 applicants, 418 for full-time study and 123 for part-time of study. All admitted were registered for the study areas they had selected. Numbers of applicants and admitted by study areas are in Table 2. The total number of enrolled is 513, 396 in full-time study and 117 in part-time study.

Follow-up Master Degree Programme Biomedical Engineering and Bioinformatics

Since academic year 2010/11 education has been provided in full-time follow-up Master programme Biomedical Engineering and Bioinformatics BTBIO-F. In 2015 there were 108 students in this programme, 36 of them in the first year of study and 72 in the second year. The programme BTBIO-F was completed by 53 students.

The total number of applicants (with paid application) for BTBIO-F was 59. The total number of admissions approved by Academic Senate for full-time study in 2015/16 was 250. The written examination contained 10 problems selected from two topic areas published on faculty websites. The topic areas were approved by the Council of Study Programmes. Every correct result yielded 10 points, max. 100 for the whole examination. The time was 75 minutes. As the number of applicants was lower than the number approved for admission, the Dean decided, in accordance with Admission Procedure Rules, about exemption from entrance examination. On announced entrance examination date 25 June 2015 nearly all applicants enrolled. The second entrance examination term 7 july 2015 and Committee meeting scheduled for 20 August 2015 were cancelled. There were 42 admissions and 40 enrolled.

Lifelong Education and Self-Paid Study

The faculty participates in the system of lifelong education (Amendment to Act 111/98 Coll. on tertiary education). Apart from a range of specialized courses for professionals, the faculty offers paid study of subjects in the Bachelor and follow-up Master programme EECR. Having completed the courses, the graduates will be admitted in a study programme without being required to pass entrance examination, and earned credits will be recognized. In 2015 there were 8 students in lifelong education programme.

Table 1: Numbers of applicants and admissions in study areas of follow-up Master programmes EECR-M and EECR-ML in 2015: Biomedical and Ecological Engineering (M-BEI, ML-BEI), Power Electrical Engineering (M-EEN, ML-EEN), Electronics and Communications (M-EST, ML-EST), Electrotechnical Manufacturing and Management (M-EVM, ML-EVM), Cybernetics, Control and Measurement (M-KAM, ML-KAM), Microelectronics (M-MEL, ML-MEL), Power Electrical and Electronic Engineering (M-SVE, ML-VE), Telecommunications and Informatics (M-TIT, ML-TIT)

Study area	*Applicants*	*Admissions*	*Study area*	*Applicants*	*Admissions*
M-BEI	55	43	ML-BEI	28	24
M-EEN	67	56	ML-EEN	21	11
M-EST	54	42	ML-EST	6	4
M-EVM	59	50	ML-EVM	17	12
M-KAM	77	60	ML-KAM	19	14
M-MEL	49	45	ML-MEL	7	4
M-SVE	38	35	ML-SVE	13	12
M-TIT	103	87	ML-TIT	47	42

Table 2: Numbers of students in Bachelor and Master programmes in the period 2011 - 2015

Programme	**2011**	**2012**	**2013**	**2014**	**2015**
EEKR-B	1915	1868	1812	1716	1611
BTBIO-A	290	285	263	230	218
AJEI-H	0	76	88	162	179
AUDIO-J	0	0	52	100	139
IBEP-T	0	0	0	0	52
Bc. total	**2205**	**2229**	**2215**	**2208**	**2199**
EEKR-M	1018	989	974	964	1002
BTBIO-F	109	115	118	137	108
Mgr. total	1127	1104	1092	1101	1110
Total	3332	3333	3307	3309	3309

Instruction Support

There has been a consistent effort at the FEEC to improve and use more extensively the information system for management of study affairs and to make relevant information accessible to students. In 2015 regular assessment of the quality of teaching by students took place at the end of the winter and the summer semester using the BUT information system. In support of instruction in full-time and part-time Bachelor and follow-up Master programmes innovated electronic texts (ET) and multimedia aids (MP) were created and published on faculty websites.

Science, Research and Doctoral Study

Creative Activities, Science and Research

Academics and students are involved in basic and applied research in most specilizations of electrical engineering.

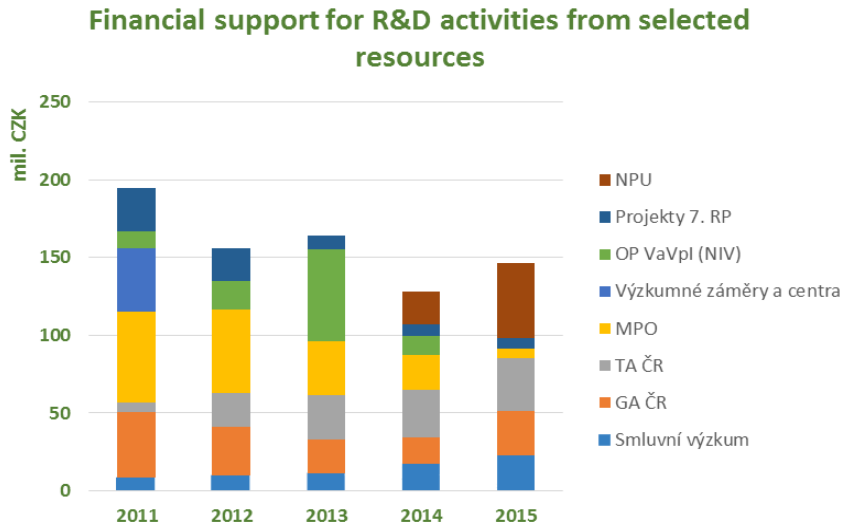
Research and development at FEEC is supported by the Ministry of Education of Czech Republic and the major sources of funds are projects of the Czech Science Foundation etc. In the period 2011 - 2013 a major source of mainly investment funds was the Operational Programme 'Research and Development for Innovations' (OP VaVpI) for completion of two regional research centres CVVOZE and SIX.

Another major sources of funds were projects of the Czech Science Foundation, Technology Agency of the Czech Republic, Ministry of Industry and Trade, and the National Sustainability Programme I. On international level, our researchers were involved in a number of projects, mainly for the programme Horizon 2020. The faculty prepares its own projects, and offers partnership in other institutions projects.

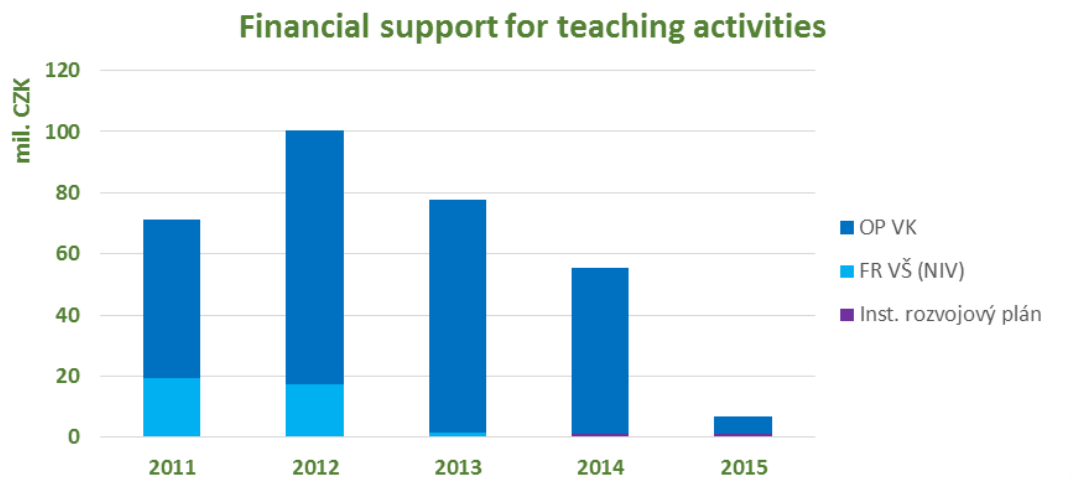
FEEC is also involved in applied research for industrial partners. Apart from cooperation projects, research on contract basis is increasing. Income from contracts in 2015 amounted to roughlyy 25 million CZK, with significant contribution of the regional research centres CVVOZE and SIX. Research is carried out on the basis of commercial contracts, and also as part of diploma theses and dissertations (specific research). All companies interested in cooperation with FEEC can contact us.

In 2015 education at FEEC was supported from the finishing OP VK projects and Institutional Development Project.

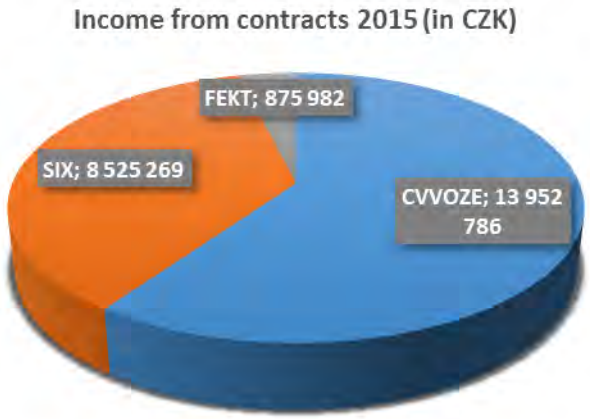
Original scientific and research results were published in 3 internal monographs and 144 papers in impact journals. FEEC was granted 8 national and one international patent or utility sample.



Graph 2: FEEC funds for research and development from 2011 to 2015.



Graph 3: FEEC funds for education from 2011 to 2015



Graph 4: Income from contracts in 2015

Regional Research Centres

Two regional research centres continued their research and development activities.

Centre for Research and Exploitation of Renewable Energy Sources (CVVOZE)
(investigator Vladimír Aubrecht)

This research centre concentrates and coordinates research, development and innovation capacities for research on renewable energy sources. The research team focuses on chemical and photovoltaic energy sources, electro-chemistry, electromechanics, electrotechnology, electrical drives, power electrical engineering, mobile robots and industrial electronics. In 2015 CVVOZE focused on research in five research areas:

- optimization of electromechanical enery conversion
- generation, transmission, distribution and utilization of electrical energy
- automation and sensor technologies
- the switch-off process in switching devices

An important source of funding for research in 2015 was the project of National Sustainability Programme 'Energy in Conditions of Sustainable Development (EN-PUR)'. Another significant project conducted in 2015 was an OP VaVpI project 'Expansion of Research Capacities of the Centre CVVOZE' (CVVOZE+) funded with over 15 mil. CZK used for purchase of top laboratory technology.

The centre's activities are focused on basic research, and on applications and acceleration of transfer of novel technologies into industrial use. All CVVOZE laboratories form a unique infrastructure that will undoubtedly attract important industrial partners whose production is closely connected with research carried out in the centre.

The leading workplaces of the centre are Laboratory of Switching Devices and Ultra High Voltage Laboratory located in Professor List Technology Park. These strategic laboratories are used for research and development of various power and high voltage electrical devices and systems. The equipment can be used to simulate extreme short-circuit conditions in the network, lightning strike on lines etc. The unique laboratory equipment draws attention of many industrial companies. We have been offered contracts from SIEMENS, ABB, EATON, and from smaller Czech firms (DRIBO) and foreign firms (SEZ Krompachy - Slovakia, Techna Ltd. – Great Britain, Schaltbau - Austria). Research contracts for these laboratories in 2015 amounted to more than 8 mil. CZK.

For more information on CVVOZE visit www.cvvoze.cz.

Centre of Sensor, Information and Communication Systems (SIX)

(Director Ing. Martin Slanina, PhD.)

Research centre SIX was established in 2010 as a joint initiative of FEEC departments involved in research and development of sensor systems, information and communication technologies. The aim was to interconnect research interests and utilize achieved synergy in work on extensive and complex research projects.

The involved departments offered their laboratories that were upgraded and extended in the period 2011 - 2013 owing to support from the operational programme 'Research and Development for Innovations'.

In 2014 the centre started full operation without direct financial support from public sources. The centre grew, not only in terms of numbers of involved researchers and their loads, but also results, grants and commercial contracts. And the growth continued in 2015.

Since 2015 Centre SIX is supported by the National Sustainability Programme 'Interdisciplinary Research of Wireless Technologies' (INWITE), designed to develop the volume and quality of basic research of the centre and thus increase its chances to make a good use of acquired knowledge in projects of applied and commercial research. The project is conducted by a team of five groups jointly led by professors from Vienna Technical University and Centre SIX.

The same team of five working groups of Centre SIX closely associated with Vienna Technical University succeeded in the first stage of programme Horizon 2020 'Widespread Teaming' and is among the 31 candidates entitled to a seven-year grant for the second stage. Decisive for a success of project 'Advanced Wireless Technologies for Clever Engineering' (ADWICE – www.adwice.org) in the second stage of programme Teaming will be the 2016 strategy of the development of the centre in cooperation with Vienna Technical University. The programme may bring 15 million euro from European sources and additional (investment) funds from the special call of the Operational Programme 'Research, Development and Education (VVV)'.

The main goal in 2016 will be finalization of the first stage of project ADWICE and preparation of an associated project for OP VVV. We would like to develop cooperation with international institutions by way of bilateral projects or mobility support. And the Centre will focus on programme Horizon 2020.

For more information visit www.six-centre.cz.

Professor List Technology Park (VTP PL)

Professor List Technology Park was designed to support technology companies and research institutions involved in renewable energy sources, power engineering and power electrical engineering, microelectronics, control and measurement. One part of the Park contains laboratories for research on ultrahigh voltages and switching devices and the second part of the Park there are administration buildings rented to industrial companies. The Park covers an area of 1,900 sq.m. The chief target is the development of novel technologies, products and services connected with research conducted at FEEC. In 2015 Professor List Technology Park ranked 3rd in competition 'Entrepreneurial Project 2014', category 'Infrastructure for Support of Enterprise and Innovations' (PROSPERITA)". More at www.vtppl.cz.

Habilitations and Appointments to Professorship

In 2015 the Scientific Council made three appointments to professorship::
Prof. Ing. Tomáš Kratochvíl, Ph.D.
Prof. Ing. Roman Maršálek, Ph.D.
Electronics and Communications

Prof. Ing. Luděk Žalud, Ph.D.
Technical Cybernetics

In 2015 there were eight habilitations:
Doc. Ing. Jana Drbohlavová, Ph.D.
Doc. RNDr. Edita Kolářová, Ph.D.
Doc. Ing. Petr Křivík, Ph.D.
Doc. Ing. Radovan Novotný, Ph.D.
Electrical and Electronic Technology

Doc. Ing. Norbert Herencsár, Ph.D.
Doc. Mgr. Pavel Rajmic, Ph.D.
Teleinformatics

Doc. Ing. Jan Mikulka, Ph.D.
Theoretical Electrical Engineering

Doc. Ing. Daniel Schwarz, Ph.D.
Biomedical Engineering

Doctoral Programme

In academic year 2015/16 there are 401 students in the Ph.D. programme, 2 of them enrolled in the study programme in English. Numbers of Ph.D. students over the last five years are shown in Table 3.

Table 4 shows numbers of Ph.D. graduates over the last five years. The list of graduates in 2015 can be found on FEEC websites, links *Study, Doctoral study programmes, Doctoral programme graduates.*

Table 3: Numbers of Ph.D. graduates from 2011 to 2015

year	*2011*	*2012*	*2013*	*2014*	2015
1.	**85**	**77**	**79**	**70**	**84**
2.	96	82	62	62	62
3.	69	85	70	50	62
4.	71	64	77	57	47
5.	48	58	49	55	45
6.	43	37	46	38	45
7.	7	41	51	43	56
Total	**419**	**444**	**434**	**375**	**401**

Table 4: Numbers of Ph.D. graduates by departments from 2011 to 2015

	2011	*2012*	*2013*	*2014*	*2015*	*Total*
UAMT	0	3	2	1	7	**13**
UBMI	2	1	4	2	2	**11**
UEEN	4	0	1	5	0	**10**
UETE	2	0	1	4	8	**15**
UMAT	2	2	1	4	1	**10**
UFYZ	0	4	2	3	6	**15**
UMEL	3	3	4	8	8	**26**
UREL	8	7	8	10	3	**36**
UTEE	1	1	1	4	1	**8**
UTKO	4	7	4	11	7	**33**
UVEE	1	3	5	1	2	**12**
Total	**27**	**31**	**33**	**53**	**45**	**189**

Student Creative Activities

The 21st STUDENT EEICT 2015 conference was organized on 23 April 2015, for the first time by FEEC only. The abbreviation stands for the English words Electrical Engineering, Information and Communication Technology indicating the priority areas of research and education. There were 179 papers, 49 Bachelor, 56 Master and 62 Ph.D. papers. Twelve posters were presented by secondary school students. The event was sponsored by Honeywell, ABB a ON Semiconductor.

The papers were defended before 20 expert committees including representatives of sponsoring companies, academics and representatives of the club Students for Students. Sixty top or outstanding papers were awarded at the closing ceremony. For more information visit FEEC websites, links *Research, Conference, Student EEICT.*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IXPERTA
freescale
SCHAFER

External Relations and International Cooperation

International Cooperation

International activities have been focused on promoting FEEC by presenting results of research projects at international conferences and participating in international research and education projects, placements of FEEC students at partner universities abroad, and offering instruction in English to international students.

Among our priorities is student and teacher mobility involving universities cooperating within the framework of European Commission programmes. FEEC is one of the most active. There has been good cooperation with the BUT Department of International Relations responsible for organizational and economic support of programme Erasmus +. As a result, there were 81 placements of students of 324 months in 2015, 22 lecture stays of 22 weeks and three-week trainings of academic staff (see Table 5). There were 99 students coming for placements of 380 months. Mobility figures for incoming and outgoing students in individual programmes in 2015 are in Table 6. The list of partners cooperating with FEEC within the programme Erasmus is in Table 8.

In 2015 funding was obtained for long-term international placements of students of all study programmes from the mobility Development Programme of Ministry of Education in the amount of 570 thous. CZK and 148.2 thous.CZK from BUT mobility fund. Owing to this financial support 20 students could go for placements of 36.5 months.

Mobility figures for outgoing and incoming students in all programmes are in Table 8. It is apparent that there has been an increasing trend in the numbers of incoming students. Also the number of outgoing students has substantially increased. In 2015 there were outgoing student placements of 361.5 months and incoming student placements of 380 months.

The faculty supports cooperation of academics and departments with international institutions based on interfaculty and Erasmus+ agreements, as well as seeking of new contacts. Last year 62 thous. CZK was provided in support of such activities. Targeted international relations were financed by departments through operational programmes. The funds were used to cover travel expenses of internationally recognized academics coming to short lecture stays at FEEC.

The faculty invites recognized international experts to lectures, short-term stays or visits connected with work on research projects. Such visits help to increase the professional level of instruction and contribute to the general education of students and to atmosphere of international environment in work on research projects.

An amount of 300 thous. CZK was obtained from the Development Programme of Ministry of Education 3.5 ‘Support of International Mobility of Academics’. Financial support was provided to 8 FEEC experts and to cover expenses on lecture stays of Professor Irada Dzalladova and Professor Denys Khusainov of Kiev University, Professor Luis Manuel de Jesus Sousa Correia of IST University of Lisbon and Professor Sridhar Krishnan of Ryerson University, Toronto.

Discussed with some of the visiting experts was the potential joint preparation of consortium research projects funded by European Commission or joint technology initiatives, e.g. ENIAC and ARTEMIS.

The faculty obtained 420 thous. CZK from the Ministry of Education Development Programme 3.4. ‘International cooperation of BUT Brno’ for cooperation of academics and Ph.D. students with international institutions and framework agreements.

Table 5: Student and teacher placements at international universities in the Erasmus programme from 2011 to 2015

Activity Socrates (LLP)-Erasmus	*2011*	*2012*	*2013*	*2014*	*2015*
Students	54	46	49	46	81
Months	224	215	201	191	324
Lecture stays	27	27	19	23	22
Lecture weeks	32	33	22	25	22
Trainings		1	2	4	3
Training weeks		2	2	4	3

Table 6: Student placements at FEEC and abroad by programmes in 2015

Activity	*Arrivals*		*Departures*	
	Students	*Months*	*Students*	*Months*
Erasmus plus	95	366,5	81	324
Inter-university contracts	3	10,5	-	-
Development programme of Ministry of Education	-	-	20	36,5
Other mobility	1	3	1	1

Table 7: Student placements at FEEC and abroad in all mobility programmes from 2011 to 2015

		2011	*2012*	*2013*	*2014*	*2015*
Arrivals	Students	86	100	109	83	99
	Months	298	432,5	462,5	378,5	380
Departures	Students	71	65	60	62	102
	Months	276	261	223	227,5	361,5

External Relations

External relations are focused on promoting faculty activities and providing updated and specific information on study opportunities offered by the Faculty, study programmes and study areas. The newly structured websites, presentations and videopresentations as well as the faculty profile on the social network Facebook are targeted at our future students, secondary school and technical secondary school students. In this respect, an important role was played by the so called Roadshow – FEEC students popularizing technical science at secondary schools.

Very popular is the recently launched competition of four-person secondary-school teams Merkur perFEKT Challenge. The competition offered 9 topics, selected by the teams at registration. For capacity reasons only the first 54 applications could be accepted. This number was reached only one month after the call. Secondary schools from all over Moravia and part of Bohemia registered 200 students, including several girls. The competition was conducted in an atmosphere of fair-play and generally the performance and knowledge of students in areas such as electrical engineering, robotics, programming, etc. must be appreciated. In February 2016 the winners of individual areas competed in the superfinals, where the winner was the team *Štuplíci II.* representing the technical secondary school of Edvard Beneš, Praha. This year they are owners of the challenge cup for the overall winner.

The opening of the interactive playroom 'Elektrikárium' was not the only occasion of this kind at FEEC. Children from the kindergarten in Babice u Rosic, where several staff members work with a small electrotechnical playgroup, presented their work at the faculty.

Increased attention was paid to the media, presentation of FEEC achievements in basic and applied research, development and cooperation with the industrial sector.

On FEEC websites, BUT portals and other subjects, information is given on research and education at FEEC departments and workplaces, habilitations and appointments to professorship, research and development projects of the Czech Science Foundation, Ministry of Trade and Industry, Ministry of Education and other projects including EU framework programmes. The websites are available in Czech and English.

As every year, the management attended the annual meeting of the Czech and Slovak faculties of electrical engineering and associated faculties held in Rajecké Teplice 20-22 May 2015. Exchange of experience and discussions on the current situation in education and research, solution of research projects, participation in European programmes and coordination of activities, research plans and centres and cooperation with universities in other countries were on the agenda.

The Faculty commemorated the tragic event on Kubínská Hola in 1968 when an avalanche killed 6 students of the then Electrotechnical Faculty, who were on a ski course. Representatives of faculty management and of the town of Dolný Kubín honoured their memory at the memorial on Kubínská hola.

Contacts have been maintained with industrial companies in the Brno region and other parts of the Czech Republic. These contacts are mainly based on cooperation with FEEC departments in specific research, expert's reports and consultancy. The major cooperating companies are ABB s.r.o., Siemens A. G., Honeywell s.r.o., T-Mobile Czech Republic, a.s., ON Semiconductor Czech Republic, AT&T Czech, EATON Czech Republic, Rockwell/Allen Bradley, Škoda Volkswagen Mladá Boleslav, Motorola Solutions, National Semiconductor, ČEZ, a.s., Linet, s.r.o., BD Sensors, s.r.o., Buchlovice etc.

Cooperation continued within the two regional centres CVVOZE and SIX, and was intensified during the preparation and launching of the project of research centre of excellence 'CEITEC - Central European Institute of Technology', a joint project of six partners – four universities and two research institutes.

Another recent and significant contribution to cooperation with industrial partners is the Partner Programme constituting a platform for presentation of industrial companies, increased cooperation with research teams and theses projects.

Close cooperation of many years has been maintained with the Institute of Instrument Technology of Czech Academy of Sciences in Brno in research projects of joint interest. Members of the Institute's staff are part-time teachers at FEEC, in Master and Ph.D. programmes. Academy of Sciences can offer Ph.D. study based on a contract with the faculty. Academic staff, mainly departments of mathematics and physics have cultivated long-term cooperation with secondary schools in the Brno region in preparing their students for studies at FEEC.

Table 8: Universities having Erasmus agreements with FEEC for academic year 2015/16

University	**Country**
University of Applied Sciences Upper Austria School of Engineering and Environmental Sciences	Austria
Technische Universität Wien- Vienna University of Technology Faculty of Electrical Engineering and Information Technology	Austria
Kunstuniversität Graz (KUG) - University of Music and Performing Arts Graz	Austria
UMIT - Universität für Gesundheitswissenschaften, Medizinische Informatik und Technik	Austria
Technische Universität Graz	Austria
University of Applied Sciences Technikum Wien	Austria
University for Continuing Education Krems	Austria
KHLIM/Limburg Catholic University College	Belgium
KU Leuven Faculty of Engineering Technology	Belgium
Technical University of Gabrovo	Bulgaria
Technical University of Sofia	Bulgaria
Technical University of Sofia, branch Plovdiv	Bulgaria
Hochschule RheinMain - RheinMain University of Applied Sciences	Germany
Technische Universität Dresden	Germany
Hochschule Augsburg - University of Applied Sciences	Germany
Universität Ulm	Germany
Hochschule für Technik, Wirtschaft und Kultur Leipzig (Leipzig University of Applied Sciences)	Germany
Hochschule Furtwangen University	Germany
Aalborg Universitet	Denmark
TTK University of Applied Sciences, Talin	Estonia
Universitat Rovira i Virgili School of Engineering	Spain
Universitat de Vic Escola Politecnica Superior	Spain

Universidad de Cantabria	Spain
UNIVERSITAT POLITÉCNICA DE VALENCIA Escuela Politécnica Superior de Alcoy (EPSA)	Spain
Universitat Politécnica de Valencia Escuela Técnica Superior de Ingenieros de Telecomunicación	Spain
Universidad de Granada - Escuela Técnica Superior de Ingenierías Informática y de Telecomunicación (ETSIIT - UGR)	Spain
Universidad de Zaragoza	Spain
Universitat Politecnica de Catalunya Mataró School of Technology	Spain
Universidad del País Vasco/Euskal Herriko Unibertsitatea	Spain
Universidad de Malaga School of Industrial Engineering	Spain
Universitat de Valencia	Spain
UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA	Spain
Institut Supérieur d´Electronique de Paris (ISEP)	France
INSA Rennes Dpt Communication Systems and Network Dpt Electronics and Computer Engineering	France
ESIEE PARIS	France
Institut Polytechnique de Grenoble	France
ESIGELEC Rouen School of Engineering	France
ESIEE Amiens	France
Université Joseph Fourier Polytech School of Engineering	France
UNIVERSITE DU MAINE	France
Eastern Macedonia and Thrace Institute of Technology	Greece
TEI of Crete Branch Chania	Greece
Technological Educational Institute (TEI) of Thessaly	Greece
UNIVERSITY OF PATRAS	Greece
Seconda Universitá degli Studi di Napoli	Italy
University of Palermo	Italy
Vilnius Gediminas Technical University	Lithuania
University of Malta	Malta
University of Stavanger Department of Music and Dance	Norway
POLITECHNIKA WROCLAWSKA - WROCLAV UNIVERSITY OF TECHNOLOGY	Poland
AGH University of Science and Technology Faculty of Computer Science, Electronics and Telecommunications	Poland
University of Porto Faculty of Engineering	Portugal

Instituto Politécnico de Lisboa (IPL) Instituto Superior de Engenharia de Lisboa (ISEL)	Portugal
Universidade Católica Portuguesa - Escola Superior de Biotecnologia	Portugal
Polytechnic Institute of Coimbra	Portugal
TÉCNICO LISBOA Department of Electrical Engineering and Computer Science	Portugal
MALMÖ UNIVERSITY Faculty of Technology and Society	Sweden
Aalto University School of Electrical Engineering	Finland
Tampere University of Technology	Finland
University of Eastern Finland	Finland
Technical University of Cluj-Napoca	Romania
Univerza v Novi Gorici/University of Nova Gorica	Slovenia
UNIVERSITY OF MARIBOR	Slovenia
Žilinská univerzita v Žilině - Elektrotechnická fakulta - Fakulta humanitních vied	Slovakia
Yildirim Beyazit University	Turkey
Yildiz Technical University - Dept. of Electronics and Communication Engineering - Dept. of Mathematics (Faculty of Sciences and Arts)	Turkey
T.C. Dogus University	Turkey
Bogazici University Department of Electrical & Electronics Engineering	Turkey
Istanbul Teknik Universitesi	Turkey
Suleyman Demirel University	Turkey
Işik University Faculty of Engineering	Turkey


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perFEKT Challenge

Academic Senate

In 2015 the members of Academic Senate were (LK – legislative committee, PK – pedagogical committee, EK – economic committee, and represented department):

Chair

Doc. Ing. Miloslav Steinbauer, Ph.D., EK, LK, UTEE

Academic Staff Chamber

Ing. Ivana Jakubová, EK, LK, UREL, chair
Doc. Ing. Bohuslav Bušov, CSc., EK, PK, UVEE
Ing. Petr Číka, Ph.D., EK, PK, UTKO
RNDr. Petr Fuchs, Ph.D., EK, UMAT
Ing. Petr Honzík, Ph.D., EK, LK, UAMT
Ing. Martin Jílek, EK, UJAZ
Doc. Ing. Petr Mastný, Ph.D., EK, PK, UEEN
Prof. Ing. Vladislav Musil, CSc., EK, LK, UMEL
Ing. Helena Polsterová, CSc., EK, UETE
Doc. Ing. Vlasta Sedláková, Ph.D., EK, PK, UFYZ
Doc. Ing. Miloslav Steinbauer, Ph.D., EK, LK, PK, UTEE
Ing. Martin Vítek, Ph.D. EK, LK, UBMI

Student Chamber

Bc. Daniel Janík, EK, PK, chair
Bc. Martin Holčík, EK, LK
Bc. Juraj Jakubík, PK (until June 2015)
Bc. Petr Jarchovský (until June 2015)
Bc. Lukáš Lučenič, PK (since October 2015)
Miroslav Molinek, EK (since June 2015)
Ing. Karel Sedlář, EK
Alexandra Šujanská, EK, PK (until June 2015)
Martin Šelinga, PK (since November 2015)
Bc. Michal Talába, EK, PK

Academic Senate held 8 regular and 1 unscheduled session, and discussed legislative, economic and pedagogical issues. Average attendance was 81%. Discussions were always constructive, proposals were sent to members prior to the meeting for study and comments.

Academic Senate discussed novels of internal directives and standards, amendment to ‘Scholarship Regulations of BUT’ and ‘Admission Rules’. Updating of the Longterm Intent of FEEC 2011-2015 for 2015 was dealt with and approved as well as the Annual Report for 2014.

The economic issues discussed and approved included proposal for the distribution of financial means in 2015 and proposal on the distribution of the Balanced Fund. Budget rules were drafted at several joint meeetings of economic committee and faculty management. Amendments in budget regulations of BUT were reflected in the proposal on amendments to faculty rules for the distribution of financial means at FEEC for 2016.

During 2015 three members of Student Chamber finished their studies at FEEC and resigned on membership – A. Šujanská, P. Jarchovský aj. Jakubík. Two substitutes elected in regular elections in 2014 – M. Molinek, a L. Lučenič took their places. The third member - M. Šelinga - was elected in supplementary elections on 26 and 27 October 2015.

The Student Chamber organized an opinion poll on the quality of accommodation and catering services. Results were offered to the supervisory board of responsible facility and to BUT management.

Campus Development

Reconstruction of the premises Technická 8 was completed at the beginning of 2015, funded from the Operational Programme 'Research and Development for Innovations'. After the reconstruction the technology at all faculty premises is at the same level and it is possible to use a uniform control system. Similarly, technical support for instruction has been upgraded and unified.

Computer Networks and Information Systems

Priority was given to:

- upgrading of servers and adaptation of facilities as a constant responsibility of OSIS
- completion of centralization of network administration services in connection with consolidation of operation of Technická 12 and Professor List Technology Park
- network backup
- transition of files and directory services so far provided on the basis of Novell NetWare products to Microsoft Active Directory. Hardware was purchased and installed: independent AD domain files and two (staff and student) servers with disk fields
- restructuring, innovation and administration of faculty websites in two languages
- full use of modern communication channels favoured by young generation, namely faculty profile on social network Facebook and Youtube channel

Information Systems and Services

Besides the economic system SAP, the faculty uses the BUT information system. Negotiations and analyses of individual modules of the BUT system and adaptation of the information system in operation are in progress. The process will continue in 2016.

Other

Equal Opportunities

The consultancy centre for support of equal education opportunities continued its activities in 2015. The centre provided professional and personal consultancy for FEEC students, and organized promotion and information events for the public aimed at removing the barriers female students face when choosing careers in technical fields.

In 2015 the centre focused its attention on improving conditions for students with specific needs in terms of financial and operational support. The centre concentrates on integration of handicapped students in full-time and part-time study programmes, promotion of study opportunities, and individual approach to students with specific needs.

The Centre cooperated with Department of Physics, club 'Students for Students' and members of faculty departments.

Contact: uhdeova@feec.vutbr.cz

Institute of Experimental Technology

Institute of Experimental Technology centres its activities on innovation of education methods and quality of training of specialists, experts and professionals with contract research experience for the industrial sector.

The Institute was involved in two projects in 2015 - 'Institute of Experimental Technology 1' within the framework of a global project of South Moravian Region OP VK and 'Institute of Experimental Technology 2' – an individual project in category Other, OP VK.

Project IET1 has been focused on a system designed to arise interest of secondary school students in electrical engineering and improving conditions for teaching electrical engineering and physics, including exploitation of ICT in instruction. The institute organized informal popularization and motivation lectures at elementary and secondary schools. The staff also conducted projects for gifted secondary-school students and organized lectures for teachers. In laboratories, the students can carry out experiments and tasks to support their basic knowledge.

Project IET2 provides training for researchers and specialists in their particular fields with the view of the latest requirements of IET's industrial partners.

Close contacts with authorities in science and technology contribute to education of young researchers and create an innovative potential of the coming generation. Most IET team students enter a Ph.D. programme. In cooperation with industrial partners, 8 projects were commenced and completed. Project 'Elektro-výzkumník (CZ.1.07/2.3.00/20.0175) ' supports research potential development.

As every year, IET organized competition '*Microcontrollers are in*' for individuals and teams from secondary schools and universities.

Representatives:
Director –Prof. Ing. Pavel Fiala, Ph.D.
IET1 coordinator – Doc. Ing. Jan Mikulka, Ph.D.
IET2 coordinator –P. Ing. Pavel Fiala, Ph.D.
Members - UTEE staff, representatives of industrial partners IET1 (Siemens, s.r.o.) and IET2 (SVS FEM, s.r.o., Prototypa, a.s., ABB, s.r.o., Eaton Elektrotechnika, s.r.o.).

Address:
Institute of Experimental Technology (UTEE)
Technická 3082/12
616 00 Brno
Phone.: 541 146 281
E-mail: iet@feec.vutbr.cz

Interactive Playroom Elektrikárium

A new interactive playroom 'Elektrikárium' was opened in December. As in large scientific centres worldwide, its goal is to polularize science and technology and draw a wide spectrum of visitors. The playroom can be found at the premises of FEEC. The exhibits illustrate electricity and electronics issues.

There are 15 exhibits for the visitors' hands-on experience and entertainment that will explain the principles of electricity, electrical engineering, physics etc.

The visitors can compete in production of electricity, examine robots or laser harp. The composition of exhibits will be changed to motivate the visitors to come back.

The playroom in building T12 was opened on 10 December with the presence of companies and media. ‘Elektrikárium’ or ‘PerFEKT’ electro games is accessible to visitors from 5 years on and is free of charge.

It is open to the public on Tuesday to Thursday afternoon and the whole of Sunday. For more information go to www.feec.vutbr.cz/elektrikarium.

Student Activities

Active at FEEC are two student organizations – the voluntary club ‘Students for Students’ (SPS) and the Student Chamber of Academic Senate FEEC (SK AS FEKT), the student part of officially elected faculty body. Both organizations closely cooperate. The Student Chamber acts as an intermediary between faculty management and students, is involved in solutions of student problems, and instruction quality assessment to increase the quality of instruction. Activities of the club ‘Students for Students’ are focused on leisure time. Its role is to enrich student life. The membership is voluntary, all those interested in student activities at FEEC and BUT can apply. Activities are centred on:

1. Magazine e-FEKT

The student magazine is issued every second month. It offers information on current events at FEEC. Moreover, technical, entertaining and many other articles can be found there.

2. Assistance

The club helps first-year students to adapt to life in an unfamiliar environment of the faculty, halls ofresidence and the town of Brno. It offers information and help with getting to know people before the start of the winter semester in the so called ‘Zaškolovák’. To be able to find their way in the labyrinth of school corridors and get around the town, students are invited to the event ‘PerFEKT start’ organized at a weekend before the start of the semester to meet each other, explore the premises and get some tips for places to go to in their free time. For students who wish to meet during the whole winter semester, there are sports, cultural and entertainment events every week within the programme ‘PerFEKT assistance’.

3. Cultural events

Social, cultural and education events are organized for students. The biggest event last year was the 7th open-air festival - ‘Music from FEEC’ (Hudba z FEKTu) staged at the faculty car park on 23 September 2015. The festival offered a rich programme, student amateur groups performed and competed, over 6,000 spectators came to see ‘Smola a hrušky’ and ‘Rybičky 48’.

Sport-loving students were invited to take part in the fun race ‘Run to 53’. The task was to run the distance from school to the 53 bus stop in the shortest possible time. There were several student categories and, as every year, VIP management relays.

At the beginning of 2015 a board games room was opened for students to spend free time playing Sedm divů světa, Šalingrad, Ticket to ride, Power grid, STARLING etiquette by play. Regular afternoon games and tournaments are organized.

Department of Control and Instrumentation

Doc. Ing. Václav Jirsík, CSc.

Head

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Professors

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Prof. Ing. František Šolc, CSc.
Prof. Ing. Pavel Václavek, Ph.D.
Prof. Ing. Petr Vavřín, DrSc.
Prof. Ing. František Zezulka, CSc.

Associate Professors

Doc. Ing. Ludvík Bejček, CSc.
Doc. Ing. Petr Beneš, Ph.D.
Doc. Ing. Petr Blaha, Ph.D.
Doc. Ing. Zdeněk Bradáč, Ph.D.
Doc. Ing. Petr Fiedler, Ph.D.,
Doc. Ing. Václav Jirsík, CSc.
Doc. Ing. Luděk Žalud, Ph.

Lecturers

Mgr. Terezie Filipenská, Ph.D., Ing. Marie Havlíková, Ph.D., Ing. Zdeněk Havránek, Ph.D., Ing. Radovan Holek, CSc., Ing. Peter Honec, Ph.D., Ing. Petr Honzík, Ph.D., Ing. Karel Horák, Ph.D., Ing. Stanislav Klusáček, Ph.D., Ing. Tomáš Macho, Ph.D., Ing. Petr Málek, CSc., Ing. Jan Pásek, CSc., Ing. Miloslav Richter, Ph.D., Ing. Soňa Šedivá, Ph.D., Ing. Radek Štohl, Ph.D, Ing. Libor Veselý, Ph.D.

Ph.D. Students

Internal: Ing. Jakub Arm, Ing. Radek Baránek, Ing. Luděk Buchta, Ing. Vladimír Burlak, Ing. Martin Čala, Ing. Davídek Daniel, Ing. Lešek Franek, Ing. Petr Gábrlík, Ing. Jan Glos, Ing. Ondřej Hynčica, Ing. Adam Chromý, Ing. Aleš Jelínek, Ing. Tomáš Jílek, Ing. Miroslav Jirgl, Ing. Jan Klečka, Ing. Jan Klusáček, Ing. Matúš Kozovský, Ing. Vlastimil Kříž, Ing. Aleš Lebeda, Ing. Štefan Mišík, Ing. Lucie Obšilová, Ing. Petr Nováček, Ing. Lukáš Otava, Ing. Milan Papež, Ing. Stanislav Pikula, Ing. Ladislav Šťastný

External: Ing. Tomáš Babinec, Ing. Vladimír Burlak, Ing. Luděk Červinka, Ing. Pavel Číp, Ing, Michal Dobias, Ing. Jiří Fialka, Ing. Tomáš Florián, Ing. František Gogol, Ing. Miroslav Graf, Ing. Tomáš Hynčica, Ing. Václav Kaczmarczyk, Ing. Jaroslav Lepka, Ing. Stanislav Mašláň, Ing. Zbyněk Mynář, Ing. Petr Petyovský. Ing. Jan Pohl, Ing. Peter Rášo, Ing. Karel Stibor, Ing. Michal Šír, Mgr. Martin Tůma, Ing. Miroslav Uher, Ing. Martin Vágner, Ing. Michal Vašina, Ing. Ivo Veselý, Ing. Dušan Zámečník

Administrative and Technical Staff

Ing. Luděk Anděra, Ing. František Burian, Ph.D., Ing. Martin Čala, Ing. Pavel Číp, Ing. Tomáš Florián, Ing. Ondřej Hynčica, Ing. Jan Klečka, Lenka Petrová, Ing. Petr Petyovský, Ing. Stanislav Pikula, Ing. Lukáš Pohl, Ph.D., Ing. Michal Šír, Ing. Miroslav Uher, Ing. Martin Vágner, Ing. Soběslav Valach, Ing. Ivo Veselý, Jan Vodička

Main Interests

The department provides instruction in the Bachelor degree programme Control and Measurement and the follow-up Master degree programme Cybernetics, Control and Measurement. Instruction and research are conducted by five specialized groups.

The main interest of the group involved in automatic control was robust and predictive electrical drives control. Research of nonlinear estimators for sensor-free drives control continued. Research outcomes have been applied within the competence centre projects, namely TA ČR CAK3 – 'Centre of Applied Cybernetics' and CIDAM – 'Centre of Intelligent Drives and Advanced Machine Control'. In cooperation with the 'Centre of Excellence CEITEC', the group was involved in international projects H2020 '3Ccar Integrated Components for Complexity Control in Affordable Electrified Cars' and OSEM-EV 'Optimised and Systematic Energy Management in Electric Vehicles'. Intensive research was carried out in the field of theoretical probability filtration of dynamical systems, automatic setting algorithms of filter parameters with possible suppression of system model vagueness. The group continued its cooperation with Freescale Semiconductor (now NXP) and Infineon Technologies) in the development of robust and predictive algortihms for alternating electrical drives.

The group of measurement technology focuses on electrical and electronic measurements, virtual instruments in the LabView environment, sensors of non-electrical characteristics, measurements and evaluation of non-

electrical characteristics with focus on vibrodiagnostics, thermodiagnostics, acoustic emission, flux and noise measurement.

The group involved in industrial automation deals with real-time embedded systems, wireless communication systems and industrial Ethernet with focus on operational safety and protection against external and internal errors, faults and attacks. Furthermore, the group deals with fault-tolerant systems and research of decentralized and distributed control and communication systems. Research is particularly centred on construction management, safety and authorization systems. The group closely cooperates with BD Sensors, Beta Control, Siemens, Rockwell Automation, Škoda Auto etc.

The group of artificial intelligence and robotics is involved in research of service mobile robotics. Research is mainly concerned with telepresence control of mobile robots in difficult terrain, self-localization in outer environment, in urban areas and interiors of buildings, design of highly reliable robotic systems for work under extreme conditions, and automatic map-making. Now we entered the third year of research on employment of elements of advanced optical scanning and virtual/extended reality in biomedical engineering, especially for cardio- and neuro-rehabilitation. Instruction encompasses introduction into stationary and mobile robotics and sections dealing with above mentioned research issues.

The long-term prime interest in computer vision is applied research and development of industrial and transport visual systems. The group cooperates with a number of commercial companies and university departments. Academics are involved in research project solution and research contracts, and provide instruction in signal and image processing and analysis, localization, recognition and reconstruction of 3D bodies. Part of the group deals with specialized hardware design on the basis of FPGA/DSP platforms for processing of extensive data files in real time.

Research teams are involved in the project of European 'Centre of Excellence' OP VaVpI CEITEC – Central European Technology Institute, group Cybernetics for Materials Science involved in cutting-edge research on control, sensors, robotics and embedded systems.

The department's two laboratories are part of the 'Centre for Research and Utilization of Renewable Energy' (CVVOZE). They focus on developing a smart grid model with different renewable sources to test grid stabilization algorithms, operation of certified rooms for vibration and climate testing, and training and testing laboratories for safety control systems.

Major achievements

The automatic control group joined international projects H2020 3Ccar and OSEM-EV and cooperates with the 'Centre of Excellence CEITEC' and major international partners. In 2015 the group extended its role in projects of centres of competence CAK3 a CIDAM.

The group of measurement technology involved in projects VaVPI made major investment in the development of laboratories for measurement of noise, vibrations and temperature. The Climate and Vibration Test Laboratory was accredited, and a new course on analog processing of sensor signals was launched.

The group of industrial automation dealt with several significant projects, mainly 'Research and Development of a Filter Ventillation Unit for Protection from Chemical Substances, Dust and Biological Infection in Personal Protection Means' and REVYT.

The group of artificial intelligence and robotics focused on the system for visual telepresence with high resolution and option to combine data from TOF proximity scanners, CCD sensors and thermovision cameras. The reconnaissance robotic system Orpheus-XTA was presented. And a system for precise self-localization and navigation in outer environment was designed.

The group of computer vision continued research in TAČR CK TE01020197 project 'Centre of Applied Cybernetics', as investigator of the package 'Camera systems and methods of image analysis for monitoring in transportation and industry'. Research is centred on sophisticated computer vision problems in traffic applications, driving assistance systems and industrial camera inspection systems. Another important research objective is the development of our own systems for processing of large volumes of data on the basis of FPGA/DSP platforms e.g. the high rate 4K camera with 10G Ethernet optical interface. The TAČR Alfa TA03030333 project 'Research, Design and Pilot Verification of the Operation of an Integrated Smart Parking System'. Pilot installation was tested in Brno in the presence of municipal police and Brno communications, a.s.

Major Research Projects

Centre of Intelligent Drives and Advanced Machine Control– TA ČR – CK TE02000103,

Investigator: Zdeněk Peroutka, investigator at UAMT: Pavel Václavek

Research, Design and Verification of the Operation of an Integrated Smart Parking System (ISIP) –TA ČR – ALFA TA03030333

Investigator: Peter Honec

Centre of Competence TA ČR – Advanced Sensors and Methods of Sensor Data Processing –TA ČR TE02000202

Investigator: Antonín Platil, ČVUT, investigator at ÚAMT: Petr Beneš

MotorBrain - Nanoelectronics for Electric Vehicle Intelligent Failsafe Power Train - ENIAC 2010-1 270693

Investigator: Pavel Václavek

REVYT – Recuperation of the Lift Loss Energy for the Lift Idle Consumption– TAČR - TA03020907

Investigator: Zdeněk Bradáč

Selected Publications

HAVLÍKOVÁ, M.; ŠEDIVÁ, S.; BRADÁČ, Z.; JIRGL, M. A Man as the Regulator in Man- Machine Systems. *Advances in Electrical and Electronic Engineering - intenetový časopis, (http://advances.utc.sk),* 2015, vol. 12, no. 5, p. 469-475. ISSN: 1804- 3119.

KACZMARCZYK, V.; BRADÁČ, Z.; ARM, J. An Indoor Positioning System Based on NanoPAN Modules. *Programmable devices and systems,* 2015, vol. 2015, no. 13, p. 1-6. ISSN: 1474- 6670.

JIRGL, M.; JALOVECKÝ, R. Analysis of the Dynamic Properties of Longitudinal Flight Based on the Measurement on the Flight Simulator. *Transport Means,* 2015, no. 1, p. 290-293. ISSN: 1822- 296X.

ARM, J.; MIŠÍK, Š.; BRADÁČ, Z.; KACZMARCZYK, V. Android OS parameters measurement on S3C6410. *Programmable devices and systems,* 2015, vol. 2015, no. 13, p. 153-158. ISSN: 1474- 6670.

FRANEK, L. Data Concentrators: Unfairly ignored parts of modern smart grids. *Metering & Smart Energy International,* 2015, vol. 2015, no. 4, p. 38-39. ISSN: 1025- 8248.

MIŠÍK, Š.; BRADÁČ, Z.; ARM, J.; ŠŤASTNÝ, L. Embedded Telemetry System with data presentation using HTTP and data logging. *Programmable devices and systems,* 2015, vol. 2015, no. 13, p. 113-118. ISSN: 1474- 6670.

ŠOLC, F.; ZEZULKA, F.; VESELÝ, I. Mathematical model of Mobile Circulatory Module for ex- vivo lungs perfusion. *IFAC-PapersOnLine (ELSEVIER),* 2015, vol. 48, no. 4, p. 392-397. ISSN: 2405- 8963.

JIRGL, M.; JALOVECKÝ, R. Parameters Identification of the Dynamic Models of Pilot Behavior. *Transport Means,* 2015, no. 1, p. 368-371. ISSN: 1822- 296X.

ROUBAL, Z.; MARCOŇ, P.; SZABÓ, Z.; SAJDL, O.; VESELÝ, I.; ZEZULKA, F. Remote measurement and performance modeling for smart grid. *Journal of the Technical University at Plovdiv. Fundamental Sciences and Applications,* 2015, vol. 1, no. 21, p. 111-114. ISSN: 1310- 8271.

KACZMARCZYK, V.; FIEDLER, P.; BRADÁČ, Z.; FRANEK, L.; PÁSEK, J. Simulator for optimal scheduling of domestic appliances. *Programmable devices and systems,* 2015, vol. 2015, no. 13, p. 1-6. ISSN: 1474- 6670.

ZEZULKA, F.; SZABÓ, Z.; VESELÝ, I.; MARCOŇ, P.; BRADÁČ, Z.; SAJDL, O. Smart Energo Model. *IFAC-PapersOnLine (ELSEVIER),* 2015, vol. 48, no. 4, p. 404-408. ISSN: 2405- 8963.

ŠŤASTNÝ, L.; BENEŠ, B. Smart Grids: say YES to time synchronization, avoid today's 'standards'. *Metering & Smart Energy International,* 2015, no. 2, p. 42-43. ISSN: 1025- 8248.

ZEZULKA, F.; MARCOŇ, P.; SAJDL, O.; VESELÝ, I.; BRADÁČ, Z. Stabilization of grids with significant contribution of renewable energy sources. *Journal of the Technical University at Plovdiv. Fundamental Sciences and Applications,* 2015, vol. 1, no. 21, p. 105-110. ISSN: 1310- 8271.

MARCOŇ, P.; VESELÝ, I.; ZEZULKA, F.; ROUBAL, Z.; SZABÓ, Z. The Energy Efficiency of a Hydrogen Circuit in a Smart Grid. *IFAC-PapersOnLine (ELSEVIER),* 2015, vol. 48, no. 4, p. 386-391. ISSN: 2405- 8963. KOŤOVÁ, M.; KOLÁŘOVÁ, J.; ŽALUD, L.; DOBŠÁK, P. Training Isolated Respiratory in Rehabilitation. *World Academy of Science, Engineering and Technology,* 2015, vol. 1, no. 9, p. 1650-1654. ISSN: 1307- 6892.

Bachelor Degree Programme

Číslicová řídicí technika
(prof. Ing. Petr Pivoňka, CSc.)

Databázové systémy
(Ing. Radovan Holek, CSc.)

Elektronické měřicí systémy
(Ing. Marie Havlíková, Ph.D.)

Měření fyzikálních veličin
(doc. Ing. Petr Beneš, Ph.D.)

Měření v elektrotechnice
(doc. Ing. Petr Beneš, Ph.D.)

Mikroprocesory
(Ing. Tomáš Macho, Ph.D.)

Modelování a simulace
(prof. Ing. Pavel Václavek, Ph.D.)

Moderní prostředky v automatizaci
(doc. Ing. Václav Jirsík, CSc.)

Počítače a programování 1
(doc. Ing. Václav Jirsík, CSc.)

Počítače a programování 2
(doc. Ing. Václav Jirsík, CSc.)

Použití PC v měřicí technice
(Ing. Zdeněk Havránek, Ph.D.)

Praktické programování v C++
(Ing. Miloslav Richter, Ph.D.)

Programovatelné automaty
(Ing. Radek Štohl, Ph.D.)

Prostředky průmyslové automatizace
(Ing. Radek Štohl, Ph.D.)

Řízení a regulace 1
(doc. Ing. Petr Blaha, Ph.D.)

Řízení a regulace 2
(prof. Ing. Pavel Václavek, Ph.D.)

Signály a systémy
(prof. Ing. Pavel Jura, CSc.)

Subsystémy PC
(Ing. Karel Horák, Ph.D.)

Výpočetní technika v automatizaci
(prof. Ing. Petr Pivoňka, CSc.)

Základy robotiky
(doc. Ing. Luděk Žalud, Ph.D.)

Zpracování a digitalizace analogových signálů
(Ing. Zdeněk Havránek, Ph.D.)

Zpracování vícerozměrných signálů
(Ing. Karel Horák, Ph.D.)

Master Degree Programme

Aplikace počítačového vidění
(Ing. Karel Horák, Ph.D.)

Automatizace procesů
(prof. Ing. František Zezulka, CSc.)

Distribuované systémy a sítě
(doc. Ing. Petr Fiedler, Ph.D.)

Elektronická měřicí technika
(Ing. Soňa Šedivá, Ph.D.)

Embedded systems for industrial control
(doc. Ing. Petr Fiedler, Ph.D.)

Fuzzy systémy
(prof. Ing. Pavel Jura, CSc.)

Inteligentní a polovodičové snímače
(doc. Ing. Petr Beneš, Ph.D.)

Inteligentní regulátory
(prof. Ing. Petr Pivoňka, CSc.)

Logické systémy
(Ing. Radovan Holek, CSc.)

Měření neelektrických veličin
(doc. Ing. Ludvík Bejček, CSc.)

Modelování a identifikace
(doc. Ing. Petr Blaha, Ph.D.)

Operační systémy a sítě
(Ing. Tomáš Macho, Ph.D.)

Optimalizace regulátorů
(prof. Ing. Petr Pivoňka, CSc.)

Optoelektronické snímače
(doc. Ing. Ludvík Bejček, CSc.)

Počítače pro řízení
(doc. Ing. Zdeněk Bradáč, Ph.D.)

Počítačové vidění
(Ing. Karel Horák, Ph.D.)

Robotika
(doc. Ing. Luděk Žalud, Ph.D.)

Robustní a algebraické řízení
(doc. Ing. Petr Blaha, Ph.D.)

Sběr, analýza a zpracování dat
(Ing. Marie Havlíková, Ph.D.)

Senzory neelektrických veličin
(doc. Ing. Ludvík Bejček, CSc.)

Strojové učení
(Ing. Petr Honzík, Ph.D.)

Systémy diskrétních událostí
(prof. Ing. Pavel Václavek, Ph.D.)

Teorie dynamických systémů
(doc. Ing. Petr Blaha, Ph.D.)

Umělá inteligence
(doc. Ing. Václav Jirsík, CSc.)

Doctoral Degree Programme

Vybrané kapitoly měřicí techniky
(doc. Ing. Ludvík Bejček, CSc.)

Vybrané kapitoly řídicí techniky
(prof. Ing. Petr Pivoňka, CSc.)

Laboratories

Laboratory of Automatic Control (instruction in automatic control, physical models of controlled processes, Pavel Václavek)

Laboratory of Electrical Measurement (second-year study areas B-AMT, B-MET, B-SEE and part-time second-year study areas BK-AMT, BK-SEE, Marie Havlíková)

Laboratory of Electronic Measurement (instruction in Measurement in Electrical Engineering for first-year study areas M-AMT, M-EST, Soňa Šedivá)

Laboratory of Intelligent Controllers (instruction in control algorithms, physical models, design and verification of control algorithms on principles of artificial intelligence, Petr Pivoňka)

Laboratory for Measurement of Non-Electrical Characteristics (instruction in Measurement of Non-Electrical Characteristics and Sensors of Non-Electrical Characteristics, Petr Beneš)

Laboratory of Airflow and Pressure Measurement (airflow and pressure measurement – testing air track, Ludvík Bejček)

Laboratory of Temperature Measurement (infrared technology and contactless temperature measurement, Ludvík Bejček)

Laboratory of Modern Methods (control systems Siemens – Schneider – Modicon, research and instruction in computer control of physical models, instruction and development of software for control by programmable automatics – PLC, instruction and development of communication via Profibus and Profinet, Petr Fiedler)

Optoelectronics Laboratory (optical fiber sensors and optical methods for measurement of non-electrical characteristics, Ludvík Bejček)

Laboratory of Computer Vision (instruction, research and development of devices for image recording and methods of image processing and analysis for recognition and modelling of objects, Karel Horák)

Laboratory of Process Automation (CAK laboratory, research and development of communication technology for industrial applications including wireless communication technology, research of Real-Time Control systems and Fault-Tolerant systems, František Zezulka)

Laboratory of Programmable Automatics (control systems Rockwell, instruction and development of software for PLC of Rockwell, instruction and development of communication via DeviceNet and Ethernet IP, Radek Štohl)

Laboratory of Robotics (research and development of non-conventional drives and robotic soccer, Lukáš Kopečný, František Burian)

Laboratory of Drives Control (research of intelligent algorithms for control of electric drives, Pavel Václavek)

Laboratory of PC Subsystems (instruction, research and development of advanced peripheral devices and elements based on FPGA/DSP for real-time processing of large volumes of data, Soběslav Valach)

Laboratory of Telepresence (research and development of autonomous and remote control robots, Luděk Žalud)

Laboratory of Embedded Systems (instruction in embedded control systems and real-time operation systems, Zdeněk Bradáč)

Laboratory of Vibrodiagnostics (acoustic emission sensors and measurement, calibration, laser vibrodiagnostics, Petr Beneš)

CVVOZE Laboratory of Automation (safe control systems, experimental power grid, František Zezulka)

CVVOZE Testing Laboratory (accredited testing of machine, electrotechnical and electronic components, products and parts, ČSN EN 60068-2-xx tests (vibrations, shocks, cold, heat, moisture, combined, Petr Beneš)

Department of Biomedical Engineering

Prof. Ing. Ivo Provazník, Ph.D.
Head

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Professors

Prof. Ing. Jiří Jan, CSc.
Prof. Ing. Ivo Provazník, Ph.D.
Prof. Ewaryst Tkacz, Ph.D., D. Sc.

Associate Professors

Doc. Ing. Aleš Drastich, CSc.
Doc. Ing. Milan Chmelař, CSc.
Doc. Ing. Radim Kolář, Ph.D.
Doc. Ing. Jana Kolářová, Ph.D.
Doc. Ing. Jiří Kozumplík, CSc.
Doc. Ing. Jiří Rozman, CSc.

Lecturers

RNDr. Mgr. Michal Bittner, Ph.D., Ing. Vratislav Čmiel, Ing. Oto Janoušek, Ph.D., Ing. Radovan Jiřík, Ph.D., Ing. Vratislav Harabiš, Ph.D., Ing. Denisa Maděránková, Ph.D., Ing. Jan Odstrčilík, Ph.D., Sudeep Roy, Ph.D., Ing. Jiří Sekora, Ing. Lukáš Smital, Ph.D., Ing. Martin Vítek, Ph.D.

PhD. Students

Ing. Layal Abo Khayal, Ing. Larisa Baiazitova, Ing. Jaroslav Balogh, Ing. Karel Bubník, Ing. Mgr. Jan Cimbálník, Ing. Vratislav Čmiel, Ing. Jiří Dvořák, Ing. Lenka Dvořáková, Ing. Lucie Grossová, Ing. Jakub Hejč, Ing. Pavla Horáková (roz. Ronková), Ing. Jiří Chmelík, Ing. Martin Chrobák, Ing. Roman Jakubíček, Ing. Joshua Janů, Ing. Martin Klimek, Ing. Petr Klimeš, Ing. Pavlína Koščová, Ing. Markéta Koťová, Ing. Jiří Kratochvíla, Ing. Vladimíra Kubicová, Ing. Alena Kubičková (roz. Drkošová), Ing. René Labounek, Ing. Martin Lamoš, Mgr. Peter Langer, Ing. Pavel Leinveber, Ing. Ondřej Macíček, Ing. Magdaléna Matejková, Ing. Martin Mézl, Ing. Jiří Nedvěd, Ing. Andrea Němcová, Ing. Tomáš Potočňák, Ing. Tereza Reichlová, Ing. Marina Ronzhina, Ing. Karel Sedlář, Ing. Jiří Sekora, Ing. Tomáš Slavíček, Ing. Vladimír Slávik, Ing. Ladislav Soukup, Ing. Ondřej Svoboda, Ing. Tomáš Šikner, Ing. Helena Škutková, Ing. Petra Štohanzlová (roz. Podlipná), Ing. Šimon Vadják, Ing. Petr Veselý, Ing. Petr Walek, RNDr. Bohuslav Zmek

Administrative and Technical Staff

Ing. Gabriela Petrovičová, Miroslava Prášilová, Hana Rýznarová, MUDr. Šárka Sekorová

Main Interests

The department provides instruction in processing of signals and images, ecology, biomedical and ecological engineering, environmental studies, biomedical technology and bioinformatics in Bachelor, Master and Ph.D. programmes.

The department is involved in basic and applied research on engineering principles in neuroscience, cardiology, physiology, electrochemistry, botany, genetics, molecular biology and ecology. The main areas of interest are digital processing and analysis of especially cardiological signals, digital processing and analysis of medical images for different imaging modalities, mainly ultrasonography, MRI, CT, microscopy, phylogenetic, evolutionary and similarity analysis of genomic and proteomic data, metallothionein protein and mitochondrial DNA.

The department closely cooperates with the Opthalmological Clinic of Friedrich-Alexander-University Erlangen, Germany, University of Bergen, Norway, Philips Česká republika, Philips Nederland, MIKRO s.r.o., VUP Medical, a.s., MDT-Medical Data Transfer, s.r.o., Touchless Biometric Systems s.r.o., Smart Brain Sale, s.r.o., Institute of Scientific Instruments AVČR, Medical Faculty, Masaryk University in Brno, Mendel University in Brno, Veterinary Research Institute in Brno, High School of Chemical Technology in Prague, University Hospital Bohunice and University Hospital U sv. Anny, Brno.

UBMI cooperates with the 'International Clinical Research Centre (FNUSA-ICRC) dealing with non-invasive imaging methods in clinical and basic research, experimental electrophysiology and development of advanced rehabilitation technology. The department participates in national grant projects GAČR (research of electrophysiology of the heart under load, research of nanotechnological and electrochemical tools for biochemical and molecular-biological studies, TAČR ALFA projects (development of artificial arteries with antibacterial effect). Cooperation is

underway with the company Philips in the development of automated CT subtraction angiography of lower limbs. Along with the Faculty of Information Technology and Department of Technology Transfer, the department completed the OP VaVpI project BUT 'Safety and Protection' centred on biometric technology for the retina and iris.

Major Achievements

In 2015 members of the department published numerous articles in scientific journals and presented papers at international conferences, with favourable response within the scientific community. Twenty papers were published in non-zero impact factor journals. Among the most significant achievements are papers in the journal 'Plos One', 'Magnetic Resonance in Medicine' and 'Computers in Biology and Medicine'. We published a chapter in the book 'Developments in Medical Image Processing and Computational Vision'. Members of the department staff were awarded a national patent in signal processing for heart disease diagnosis, certification of a method of preparation of nanotechnological materials for artificial arteries, and an application for a national patent was submitted.

The department continued extensive cooperation with University Hospital U sv. Anny Brno in the project of ICRC 'International Clinical Research Center in Biomedical Engineering' supported by the Operational Programme 'Research and Development for Innovations'. The participating teams are Experimental electrophysiology (Ivo Provazník), Rehabilitation techniques (Jana Kolářová) and Ultrasonic imaging (Radim Kolář).

In the framework of the international project European Regional Cooperation AT – ČR, UBMI and Technikum Wien prepared a double-degree programme, which was approved by both universities, and launched in academic year 2014/15.

Major Research Projects

An Analysis of the Relationship between Electrical Processes and Blood Flow in Heart Chambers – GAČR P102/12/2034

Investigator: Jana Kolářová

Nano-Electro-Bio-Tools for Biochemical and Molecular-Biological Study of Eucaryotic Cells (NanoBioTE-Cell) – GAČR P102/11/1068

Investigator: Ivo Provazník

Selected Publications

KOŤOVÁ, M.; KOLÁŘOVÁ, J.; ŽALUD, L.; DOBŠÁK, P. Training Isolated Respiratory in Rehabilitation. *World Academy of Science, Engineering and Technology*. 2015. 1(9). p. 1650 - 1654. ISSN 1307-6892.

ŽALUD, L.; KOŤOVÁ, M.; KOCMANOVÁ, P.; DOBŠÁK, P.; KOLÁŘOVÁ, J. Breath Analysis Using a Time-of-Flight Camera and Pressure Belts. *Artificial Organs*. 2015. 39(11). p. 1 - 7. ISSN 0160-564X. (IF(2014)=2,05).

OLEJNÍČKOVÁ, V.; NOVÁKOVÁ, M.; PROVAZNÍK, I. Isolated heart models: cardiovascular system studies and technological advances. *Medical and Biological Engineering and Computing*. 2015. 2015(3). p. 1 - 9. ISSN 0140-0118. (IF(2014)=1,726).

LABOUNEK, R.; LAMOŠ, M.; MAREČEK, R.; BRÁZDIL, M.; JAN, J. Exploring task-related variability in fMRI data using fluctuations in power spectrum of simultaneously acquired EEG. *Journal Of Neuroscience Methods*. 2015. 245(1). p. 125 - 136. ISSN 0165-0270. (IF(2014)=2,025).

HEJČ, J.; VÍTEK, M.; RONZHINA, M.; NOVÁKOVÁ, M.; KOLÁŘOVÁ, J. A Wavelet-Based ECG Delineation Method: Adaptation to an Experimental Electrograms with Manifested Global Ischemia. *Cardiovascular Engineering and Technology*. 2015. 2015(6). p. 364 - 375. ISSN 1869-408X.

MÉZL, M.; JIŘÍK, R.; HARABIŠ, V.; KOLÁŘ, R.; STANDARA, M.; NYLUND, K.; GILJA, O.; TAXT, T. Absolute ultrasound perfusion parameter quantification of a tissue-mimicking phantom using bolus tracking. *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*. 2015. 62(5). p. 983 - 987. ISSN 0885-3010. (IF(2014)=1,512).

POBOŘILOVÁ, Z.; OHLSSON, A.; BERGLUND, T.; VILDOVA, A.; PROVAZNÍK, I.; BABULA, P. DNA hypomethylation concomitant with the overproduction of ROS induced by naphthoquinone juglone on tobacco BY-2 suspension cells. *Environmental And Experimental Botany*. 2015. 113(1). p. 28 - 39. ISSN 0098-8472. (IF(2014)=3,359).

BABULA, P.; VAVERKOVÁ, V.; POBOŘILOVÁ, Z.; BALLOVÁ, L.; MASAŘÍK, M.; PROVAZNÍK, I. Phytotoxic action of naphthoquinone juglone demonstrated on lettuce seedling roots. *Plant Physiology And Biochemistry*. 2015. 84(11). p. 78 - 86. ISSN 0981-9428. (IF(2014)=2,756).

VONDRA V, JURAK P, VISCOR I, HALAMEK J, LEINVEBER P, MATEJKOVA M, SOUKUP L. A multichannel bioimpedance monitor for full-body blood flow monitoring. *Biomedical Engineering / Biomedizinische Technik*. 2015. ISSN 1862-278X.

ŠOLC, F.; ZEZULKA, F.; VESELÝ, I.; SEKORA, J.; MÉZL, M.; ESCHLI, A.; PROVAZNÍK, I. The mathematical model of a LUNG simulator. *MEFANET Journal*. 2015. 2(2). p. 71 - 78. ISSN 1805-9171.

KUMAR, A.; ROY, S.; TRIPATHI, S.; SHARMA, A. Molecular docking based virtual screening of natural compounds as potential BACE1 inhibitors: 3D – QSAR pharmacophore mapping and molecular dynamics analysis. *Journal Of Biomolecular Structure & Dynamics*. 2015. 9(4). p. 1 - 11. ISSN 0739-1102. (IF(2014)=2,919).

SINGH, B.; UPRETI, D.; SINGH, B.; PANDEY, G.; VERMA, S.; ROY, S.; NAQVI, A.; RAWAT, A. Quercetin Sensitizes Fluconazole-Resistant Candida albicans To Induce Apoptotic Cell Death by Modulating Quorum Sensing. *Antimicrobial Agents And Chemotherapy*. 2015. 59(4). p. 599 - 613. ISSN 0066-4804. (IF(2014)=4,476).

SHUKLA, R.; SHARMA, D.; BAIG, M.; BANO, S.; ROY, S.; PROVAZNÍK, I.; KAMAL, M. Antioxidant, antimicrobial activity and Medicinal properties of Grewiaasiatica *L. Med Chem*. 2015. (09). p. 1 - 6. ISSN 1573-4064. (IF(2014)=1,363).

ROY, S.; KUMAR, A.; BAIG, M.; MASAŘÍK, M.; PROVAZNÍK, I. Virtual screening, ADMET profiling, molecular docking and dynamics approaches to search for potent selective natural molecules based inhibitors against metallothionein-III to study Alzheimer disease. *Methods*. 2015. 25(4). p. 1 - 26. ISSN 1046-2023. (IF(2014)=3,645).

KOMOROWSKI, D.; PIETRASZEK, S.; TKACZ, E.; PROVAZNÍK, I. The extraction of the new components from electrogastrogram (EGG), using both adaptive filtering and electrocardiographic (ECG) derived respiration signal. *Biomedical Engineering Online*. 2015. 14(60). p. 1 - 16. ISSN 1475-925X. (IF(2014)=1,427).

KUBICOVÁ, V.; PROVAZNÍK, I. Use of whole genome DNA spectrograms in bacterial classification. *Computers In Biology And Medicine*. 2015. (2015). p. 1 - 10. ISSN 0010-4825. (IF(2014)=1,24).

SEDLÁŘ, K.; ŠKUTKOVÁ, H.; VÍTEK, M.; PROVAZNÍK, I. Set of rules for genomic signal downsampling. *Computers In Biology And Medicine*. 2015. 64(p1). p. 1 - 7. ISSN 0010-4825. (IF(2014)=1,24).

SNOPKOVÁ, K.; SEDLÁŘ, K.; BOSÁK, J.; CHALOUPKOVÁ, E.; PROVAZNÍK, I.; ŠMAJS, D. Complete genome sequence of Pragia fontium 24613, an environmental bacterium from the family Enterobacteriaceae. *Genome Announcements*. 2015. 3(4). p. e00740-15 (1 p.). ISSN 2169-8287.

GERŽOVÁ, L.; BABÁK, V.; SEDLÁŘ, K.; FALDYNOVÁ, M.; VÍDEŇSKÁ, P.; ČEJKOVÁ, D.; NYGAARD JENSEN, A.; DENIS, M.; KEROUANTON, A.; RICCI, A.; CIBIN, V.; ÖSTERBERG, J.; RYCHLÍK, I. Characterization of antibiotic resistance gene abundance and microbiota composition in feces of organic and conventional pigs from four EU countries. *PLOS One*. 2015. 10(7). p. 1 - 10. ISSN 1932-6203. (IF(2014)=3,234).

Michal T. Kucewicz, B. Michael Berry, Mark R. Bower, Jan Cimbalnik, Vojtech Svehlik, S. Matt Stead, Gregory A. Worrell. Combined single neuron unit activity and local field potential oscillations in a human visual recognition memory task. *IEEE Transactions On Biomedical Engineering*. 2015. 2015. (9 p.). ISSN 0018-9294. (IF(2014)=2,347).

KRATOCHVÍLA, J.; JIŘÍK, R.; BARTOŠ, M.; STANDARA, M.; STARČUK, Z.; TAXT, T. Distributed capillary adiabatic tissue homogeneity model in parametric multi-channel blind AIF estimation using DCE-MRI. *Magnetic Resonance In Medicine*. 2015. -(-). p. 1 - 11. ISSN 0740-3194. (IF(2014)=3,571).

ŠKUTKOVÁ, H.; VÍTEK, M.; SEDLÁŘ, K.; PROVAZNÍK, I. Progressive alignment of genomic signals by multiple dynamic time warping. *Journal Of Theoretical Biology*. 2015. 2015(385). p. 20 - 30. ISSN 0022-5193. (IF(2014)=2,116).

PRESSMAN, G.S.; ORBAN, M.; LEINVEBER, P.; PAREKH, K.; SINGH, M.; KARA, T.; SOMERS, V.K. Effects of the Mueller Maneuver on Functional Mitral Regurgitation and Implications for Obstructive Sleep Apnea. *American Journal Of Cardiology*. 2015. 115(11). p. 1563 - 1567. ISSN 0002-9149. (IF(2014)=3,276).

SEDLÁŘ, K.; KOLEK, J.; ŠKUTKOVÁ, H.; BRANSKÁ, B.; PROVAZNÍK, I.; PATÁKOVÁ, P. Complete genome sequence of Clostridium pasteurianum NRRL B-598, a non-type strain producing butanol. *Journal Of Biotechnology*. 2015. 214(1). p. 113 - 114. ISSN 0168-1656. (IF(2014)=2,871).

BRAZDIL, M.; CIMBALNIK, J.; ROMAN, R.; SHAW, D. J.; STEAD, M. M; DANIEL, P.; JURAK, P.; HALAMEK, J. Impact of cognitive stimulation on ripples within human epileptic and non-epileptic hippocampus. *BMC Neuroscience*. 2015. 2015(1). p. 1 - 9. ISSN 1471-2202. (IF(2014)=2,665).

MISRA, R.; GARG, A.; ROY, S.; CHANOTIYA, C.; VASUDEV, P.; GHOSH, S. Involvement of an ent-copalyl diphosphate synthase in tissue-specific accumulation of specialized diterpenes in Andrographis paniculata. *Plant Science*. 2015. (240). p. 50 - 65. ISSN 0168-9452. (IF(2014)=3,607).

REN, L.; KUCEWICZ, M.; CIMBÁLNÍK, J.; MATSUMOTO, J.; BRINKMANN, B.; HU, W.; MARSH, R. Gamma oscillations precede interictal epileptiform spikes in the seizure onset zone. *Neurology*. 2015. 84(6). p. 602 - 608. ISSN 0028-3878. (IF(2014)=8,286).

Bachelor Degree Programme

Algoritmizace a programování
(doc. Ing. Jana Kolářová, Ph.D.)

Analýza biologických signálů
(doc. Ing. Jiří Kozumplík, CSc.)

Bioelektrické jevy
(doc. RNDr. Ing. Jiří Šimurda, CSc.)

Biochemie
(prof. RNDr. Eva Táborská, CSc.)

Bioinformatika
(prof. Ing. Ivo Provazník, Ph.D.)

Biostatistika
(doc. RNDr. Ladislav Dušek, Ph.D.)

Číslicové zpracování a analýza signálů
(prof. Ing. Jiří Jan, CSc.)

Číslicové zpracování signálů a obrazů
(prof. Ing. Jiří Jan, CSc.)

Ekologie v elektrotechnice
(doc. Ing. Jiří Rozman, CSc.)

Ekologie ve zdravotnictví
(doc. Ing. Jiří Rozman, CSc.)

Elektronické systémy a měření
(doc. Ing. Milan Chmelař, CSc.)

Lékařská diagnostická technika
(doc. Ing. Radim Kolář, Ph.D.)

Modely v biologii a epidemiologii
(Ing. Martin Vítek, Ph.D.)

Obecná biofyzika
(prof. MUDr. Vojtěch Mornstein, CSc.)

Patologická fyziologie
(prof. MUDr. Anna Vašků, CSc.)

Počítače a programování
(prof. Ing. Ivo Provazník, Ph.D.)

Praktika z bioinformatiky
(doc. Ing. Jana Kolářová, Ph.D.)

Radiologie a nukleární medicína
(prof. MUDr. Vlastmil Válek, CSc.)

Silnoproudá a přístrojová elektrotechnika
(doc. Ing. Milan Chmelař, CSc.)

Standardizace ve zdravotnictví
(doc. Ing. Milan Chmelař, CSc.)

Terapeutická a protetická technika
(doc. Ing. Jana Kolářová, Ph.D.)

Umělá inteligence v medicíně
(doc. Ing. Jiří Kozumplík, CSc.)

Úvod do biologie člověka
(prof. MUDr. Jindřich Vomela, CSc.)

Úvod do klinické medicíny
(doc. MUDr. Miroslav Souček, CSc.)

Úvod do medicínské informatiky
(prof. Ing. Ivo Provazník, Ph.D.)

Úvod do molekulární biologie a genetiky
(doc. Ing. Petr Dvořák, CSc.)

Základy anatomie a histologie
(doc. MUDr. Pavel Matonoha, CSc.)

Základy první pomoci
(MUDr. Lukáš Dadák)

Zdravotnická etika
(Mgr. Josef Kuře, Dr. phil.)

Zdravotnická legislativa a právo
(doc. Ing. Jiří Rozman, CSc.)

Zobrazovací systémy v lékařství
(doc. Ing. Aleš Drastich, CSc

Master Degree Programme

Analýza a interpretace biologických dat
(doc. Ing. Jiří Kozumplík, CSc.)

Analýza biologických sekvencí
(prof. Ing. Ivo Provazník, Ph.D.)

Analýza biomedicínských obrazů
(prof. Ing. Jiří Jan, CSc.)

Analýza signálů a obrazů
(prof. Ing. Jiří Jan, CSc.)

Bioetika
(Ing. Iva Pipalová)

Biofyzika
(doc. RNDr. Ing. Jiří Šimurda, CSc.)

Biologie člověka
(prof. MUDr. Jindřich Vomela, CSc.)

Diagnostika bio- a ekosystémů
(doc. Ing. Radim Kolář, Ph.D.)

Ekologické inženýrství
(doc. Ing. Jiří Rozman, CSc.)

Evoluční algoritmy
(doc. Ing. Jiří Kozumplík, CSc.)

Klasické zobrazovací systémy v medicíně a ekologii
(doc. Ing. Aleš Drastich, CSc.)

Klinická fyziologie
(prof. MUDr. Jindřich Vomela, CSc.)

Laboratorní technika v genomice a proteomice
(doc. Ing. Jana Kolářová, Ph.D.)

Medicínské informační systémy
(Ing. Miroslav Dvořák, CSc.)

Mikroskopická zobrazovací technika
(doc. Ing. Radim Kolář, Ph.D.)

Modelování biologických systémů
(Ing. Martin Vítek, Ph.D.)

Molekulární biologie
(doc. PharmDr. Petr Babula, Ph.D.)

Návrh a provoz komplexních systémů
(doc. Ing. Jiří Rozman, CSc.)

Počítačová podpora lékařské diagnostiky
(prof. Ing. Ivo Provazník, Ph.D.)

Pokročilá analýza biologických signálů
(doc. Ing. Jiří Kozumplík, CSc.)

Pokročilé metody v biostatistice
(doc. RNDr. Ladislav Dušek, Ph.D.)

Programování v bioinformatice
(doc. Ing. Jana Kolářová, Ph.D.)

Speciální lékařská a ekologická technika
(doc. Ing. Jiří Rozman, CSc.)

Systémová biologie
(prof. Ing. Ivo Provazník, Ph.D.)

Tomografické zobrazovací systémy
(doc. Ing. Aleš Drastich, CSc.)

Úvod do environmentalistiky
(RNDr. Mgr. Michal Bittner, Ph.D,)

Vizualizace biomedicínských dat
(Ing. Radovan Jiřík, Ph.D.)

Vyšší metody zpracování signálů
(prof. Ing. Jiří Jan, CSc.)

Základy metodologie výzkumu
(doc. Ing. Radim Kolář, Ph.D.)

Zdravotní péče
(prof. MUDr. Jindřich Vomela, CSc.)

Zdravotní péče v mimořádných situacích
(doc. MUDr. Vladimír Šrámek, Ph.D.)

Zdravotnické informační systémy
(Ing. Miroslav Dvořák, CSc.)

Doctoral Degree Programme

Moderní metody ve výzkumu elektrofyziologie
(prof. MUDr. Marie Nováková, Ph.D.)

Moderní přístupy v analýze biomedicínských obrazů
(doc. Ing. Radim Kolář, Ph.D.)

Nové trendy v analýze a klasifikaci biomedicínských dat (doc. Ing. Jiří Kozumplík, CSc.)

Pokročilá analýza rozsáhlých genomických dat
(prof. Ing. Ivo Provazník, Ph.D.)

Pokročilé mikroskopické techniky v biologii
(doc. PharmDr. Petr Babula, Ph.D.)

Vybrané problémy biomedicínského inženýrství
(prof. Ing. Ivo Provazník, Ph.D.)

Vyšší metody zpracování a analýzy signálů a obrazů
(prof. Ing. Jiří Jan, CSc.)

Laboratories

Laboratory of Electronics (manufacturing and testing of electromechanical and electronic components for research and student projects, Jiří Sekora)

Laboratory of Biophysics I and II (instruction in Biophysics, Bioelectric Phenomena, research on electrophysiology of cells, Vratislav Čmiel)

Laboratory of Biomedical Technology (instruction in Design and Operation of Complex Systems, Electronic Systems and Measurement, experimental research and student projects, Jiří Sekora)

Laboratory of Bionics (instruction in Human Biology, Biophysics, Clinical Physiology, Healthcare, Therapeutic and Prosthetic Technology, experimental measurements for research and student projects, Oto Janoušek)

Laboratory of Diagnostic Technology (instruction in Medical Diagnostic Technology, Diagnostics of bio- and ecosystems, experiments for research and student projects, Vratislav Harabiš)

Laboratory of Environmental Technology (instruction in Special Medical and Ecological Technology, Ecology in Electrical Engineering, Ecology in Healthcare, experiments for research and student projects, Jiří Rozman)

Laboratory of Functional Diagnostics (instruction in Electronic Systems and Measurements, research of brain and muscle electrophysiology, Marina Ronzhina)

Laboratory of Genomics and Proteomics I and II (a clean environment for isolation and handling of biological samples, measurement and diagnostics of DNA, RNA and proteins, instruction in Molecular Biology, research on bioinformatics, Helena Škutková)

Laboratory of Information Systems (instruction in Evolution Algorithms, Medical Information Systems, Artificial Intelligence in Medicine, Bioinformatics, Algorithmization and Programming, Computers and Programming, Analysis of Biological Sequences, Bioinformatics Practice, Denisa Maděránková)

Laboratory of Microscopy I and II (instruction in Microscopic Imaging Technology, experiments for research and student projects, research on optical coherent tomography, Jan Odstrčilík)

Laboratory of Rehabilitation Technology (experimental measurements for research and students projects, research on rehabilitation technology, Marina Ronzhina)

Laboratory of Ultrasound Tomography (research and measurement of ultrasonographic data, calibration of devices and ultrasound probes, Vratislav Harabiš)

Laboratory of Imaging Systems (instruction in Introduction in Medical Informatics, Medical Information Systems, experiments for research and student projects, Radim Kolář)

Laboratory of Image Processing (instruction in Analysis of Biological Signals, Bioinformatics, Conventional Imaging Systems in Medicine, Advanced Analysis of BIological Signals, Analysis and Interpretation of Biological Data, Digital Processing of Signals and Images, Tomography Imaging Systems, Jiří Sekora)

Laboratory of Signal Processing (instruction in Programming in Bioinformatics, Computer Support for Medical Diagnostics, Introduction in Medical Informatics, Analysis of Signals and Images, Biomedical Data Visualization, Analysis of Biomedical Images, Models in Biology and Epidemiology, System BIology, Digital Signal Processing and Analysis, Martin Vítek)

Department of Power Electrical Engineering

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Associate professors

Doc. Ing. Petr Baxant, Ph.D.
Doc. Ing. Vladimír Blažek, CSc.
Doc. RNDr. Oldřich Coufal, CSc.
Doc. Ing. Jiří Drápela, Ph.D.
Doc. Ing. Ilona Lázničková, Ph.D.
Doc. Ing. Petr Mastný, Ph.D.
Doc. Ing. Jaroslava Orságová, Ph.D.
Doc. Ing. Radek Škoda, Ph.D.
Doc. Ing. Petr Toman, Ph.D.

Lecturers

Ing. Branislav Bátora, Ph.D., Ing. Karel Katovský, Ph.D., Ing. Michal Krbal, Ph.D., Ing. Jan Macháček, Ph.D., Ing. Jiří Martinec, Ph.D., Ing. Martin Paar, Ph.D., Ing. Michal Ptáček, Ph.D., Ing. Lukáš Radil, Ph.D., Ing. Stanislav Sumec, Ph.D., Ing. Jan Škoda, Ph.D., Ing. David Topolánek, Ph.D.

Ph.D. Students

Ing. Tomáš Bajánek, Ing. Martin Belatka, Ing. Mayada Daboul, Ing. Štěpán Foral, Ing. Miroslav Haluza, Ing. Nail Khisamutdinov, Ing. Tomáš Kolacia, Ing. Marek Kopička, Ing. Petr Ličman, Ing. Jitka Matějková, Ing. Jan Morávek, Ing. Filip Novotný, Ing. Jan Novotný, Ing. Luděk Ondroušek, Mgr. Mikuláš Parma, Ing. Tomáš Pavelka, Ing. Jiří Pěcha, Ing. Jiří Pitron, Ing. Zdeněk Pospíšil, Ing. Václav Prokop, Ing. Josef Svoboda, Ing. Jan Šlezingr, Ing. Martin Štefanka, Ing. Jaroslav Štěpánek, Ing. René Vápeník, Ing. Jan Varmuža, Ing. Michal Vrána, Ing. Václav Vyčítal, Ing. Kinan Wannous, Ing. Vojtěch Wasserbauer, Ing. Miroslav Zeman

Administrative and Technical Staff

Ing. Filip Koval, Ing. Leoš Kukačka, Jitka Langerová, Ing. Lucie Langerová, Josef Němec, Ing. Ladislav Suk, Ing. Josef Šenk, CSc.

Main Interests

The department provides instruction in the Bachelor programme Power Electrical and Electronic Engineering (B-SEE) in cooperation with Department of Power Electrical and Electronic Engineering, and independently in the Master programme Power Electrical Engineering (M1-EEN). The offered courses are centred on conventional and renewable power sources, transmission and distribution of energy, electrical power utilization in light and heat sources, transient phenomena, solutions of system failures and liberalized energy market.

Research is focused on electrical power generation in conditions of sustainable development i.e. search for new ways of power generation from renewable sources and increasing operation efficiency of power sources, loss reduction and fast localization of network failures, impact of electrical appliances on electric energy quality, exploitation of hydrogen accumulation cycle in solar systems, load optimization in small variable-output power sources, optimization of the structure of power sources for services in conditions of liberalized market with electrical energy, technical and technological limits of inter-state power distribution, analysis of major system failures and appropriate measures, analysis of connection into the network, design and implementation of protection systems for indoor and outdoor illumination and evaluation systems.

The department cooperates in research and graduate and postgraduate training with a number of companies, e.g. Skupina E. ON, Skupina ČEZ, ČEPS, a.s., ABB, s.r.o., EGÚ Brno, a.s., KMB Systems s.r.o., MEgA – Měřící Energetické Aparáty, a.s., Teplárny Brno, a.s., Siemens, s.r.o., etc. There has been long-term cooperation in research and instruction with departments of power electrical engineering at all Czech and Slovak technical universities.

Major Achievements

In 2015 the department was involved in research conducted by the 'Centre for Research and Exploitation of Renewable Energy' (CVVOZE). Members of the department staff participated in 1 GAČR project, 7 TAČR projects, 2 OP VK projects, 1 international project with Texas A&M University Kontakt II and 41 projects on cooperation with industrial companies.

The major research project launched in 2015 is 'Energy in Conditions of Sustainable Development (EN-PUR)' financed from the National Sustainability Programme I, where the department is responsible for the research part 'Generation, Transmission, Distribution and Utilization of Electric Energy'.

In 2015 international assessment, power engineering laboratories of CVVOZE were recognized as research infrastructure and included in the Road map of large infrastructures in the Czech Republic for research, experimental development and innovation for 2016-2022. The research infrastructure of CVVOZE PowerLab became member of the international association 'European Distributed Energy Resources Laboratories e. V. (Derla)'.

Our most significant achievements published in recognized scientific journals and in proceedings of national and international conferences are design of a novel method of measuring voltage fluctuations and patented design of a method of localization of ground connections in distribution networks.

In 2015 we continued cooperation with E.ON Česká republika, s.r.o., dealing with issues of electric lines safety in the case of failures, and failure localization, with ČEZ Distribuce, a.s,, E.ON Distribuce, a.s. and PREdistribuce, a.s. in noise resistance of electrometers in the 2-150kHz band, and Lucis in development of new types of lighting devices. The department also cooperated with TU Graz and Aalto University of Technology in safety of electrical network in regard to contact voltage, and with Second University of Naples in quality assessment of electrical energy.

The department participated in the joint faculty project KISP – 'Complex innovation of study programmes and increasing of the quality of instruction' at FEEC BUT Brno.

Major Research Projects

Centre of Advanced Nuclear Technologies (CANUT) - TE01020455

Investigator: Karel Katovský

A Modular System for Complex Monitoring and Management in DC and Hybrid AC/DC Smart Networks - TH01020327

Investigator: Jiří Drápela

Elements for Smart Grids Deployment in Distribution Networks - TA04021490

Investigator: Petr Toman

A System of High Voltage Network Protection Using Current and Voltage Sensors with Standardized Digital Output IEC 61850-9-2 - TA03010444

Investigator: Jaroslava Orságová

Development of a Combined Failure Indicator - TA04021491

Investigator: David Topolánek

Selected Publications

ADINEH V. R.; COUFAL, O.; BARTLOVÁ, M. Calculation of net emission coefficient of electrical discharge machining arc plasmas in, mixtures of nitrogen with graphite, copper and tungsten. *Journal of Physics D: Applied Physics,* 2015, vol. 48, no. 5, p. 1-13. ISSN: 0022- 3727.

TOPOLÁNEK, D.; LEHTONEN, M.; ADZMAN, M.; TOMAN, P. Earth fault location based on evaluation of voltage sag at secondary side of medium voltage/ low voltage transformers. *IET GENER TRANSM DIS,* 2015, vol. 9, no. 14, p. 2069-2077. ISSN: 1751- 8687.

ŠKODA, J. Jak vybrat správný světelný zdroj do domácnosti? – Část 1. *Světlo,* 2015, č. 2/ 2015, s. 34-38. ISSN: 1212- 0812.

ŠKODA, J. Jak vybrat správný světelný zdroj do domácnosti? – Část 2. *Světlo,* 2015, č. 3/ 2015, s. 16-19. ISSN: 1212- 0812.

KLOC, P.; AUBRECHT, V.; BARTLOVÁ, M.; COUFAL, O.; RÜMPLER, C. On the Selection of Integration Intervals for the Calculation of Mean Absorption Coefficients. *Plasma Chemistry and Plasma Processing,* 2015, vol. 35, no. 6, p. 1097-1110. ISSN: 0272- 4324.

VRÁNA, M.; MORÁVEK, J.; MASTNÝ, P. Photovoltaic Power Plant Inspection and Diagnostic. *Informatyka, Automatyka, Pomiary w Gospodarce i Ochronie Środowiska,* 2015, vol. 2015, no. 3, p. 55-58. ISSN: 2083- 0157.

MASTNÝ, P.; MORÁVEK, J.; DRÁPELA, J. Practical Experience of Operational Diagnostics and Defectoscopy on Photovoltaic Installations in the Czech Republic. *ENERGIES,* 2015, no. 8, p. 11234-11253. ISSN: 1996- 1073.

KLOC, P.; AUBRECHT, V.; BARTLOVÁ, M.; COUFAL, O. Radiation transfer in air and air- Cu plasmas for two temperature profiles. *Journal of Physics D: Applied Physics,* 2015, vol. 48, no. 5, p. 1-13. ISSN: 0022- 3727.

ZÁVORKA, L.; ADAM, J.; KATOVSKÝ, K.; PRONSKIKH, V.; SOLNYSHKIN, A.; TSOUPKO-SITNIKOV, V.; ET AL. Validation of Monte Carlo Simulation of Neutron Production in a Spallation Experiment. *Annals of Nuclear Energy,* 2015, vol. 80, no. 1, p. 178-187. ISSN: 0306- 4549.

FORAL, Š.; SALAMON, D.; KATOVSKÝ, K. Vliv aditiv na tepelnou vodivost paliv lehkovodních reaktorů. *Bezpečnost jaderné energie. Státní úřad pro jadernou bezpečnost ČR, Úrad jadrového dozoru SR JF DL,* 2015, roč. 23, č. 5- 6, s. 147-153. ISSN: 1210- 7085.

Bachelor Degree Programme

Distribuce elektrické energie
(doc. Ing. Petr Toman, Ph.D.)

Ekonomika a ekologie elektroenergetiky
(Ing. Michal Ptáček, Ph.D.)

Jaderně energetická zařízení
(Ing. Karel Katovský, Ph.D.)

Ochrany a jištění zařízení
(doc. Ing. Petr Toman, Ph.D.)

Počítače a programování 2
(Ing. Stanislav Sumec, Ph.D.)

Projektování silových a datových rozvodů
(Ing. Branislav Bátora, Ph.D.)

Rozvodná zařízení
(doc. Ing. Jaroslava Orságová, Ph.D.)

Strojní zařízení elektráren
(Ing. Karel Katovský, Ph.D.)

Technická mechanika
(doc. Ing. Ilona Lázničková, Ph.D.)

Užití elektrické energie
(doc. Ing. Jiří Drápela, Ph.D.)

Výroba elektrické energie
(doc. Ing. Petr Mastný, Ph.D.)

Výroba a distribuce elektrické energie
(doc. Ing. Petr Toman, Ph.D.)

Master Degree Programme

Aplikace elektrického oblouku
(doc. Ing. Ilona Lázničková, Ph.D.)

Diagnostika v elektroenergetice
(doc. Ing. Jiří Drápela, Ph.D.)

Distribuční a průmyslové sítě
(doc. Ing. David Topolánek, Ph.D.)

Ekonomika elektroenergetiky
(Ing. Lukáš Radil, Ph.D.)

Elektrárny a teplárny
(doc. Ing. Jaroslava Orságová, Ph.D.)

Elektrické stanice a vedení
(doc. Ing. Jaroslava Orságová, Ph.D.)

Elektrotepelná technika
(doc. Ing. Ilona Lázničková, Ph.D.)

Integrované systémy chránění
(doc. Ing. Petr Toman, Ph.D.)

Jaderné elektrárny
(Ing. Karel Katovský, Ph.D.)

Kvalita elektrické energie a EMC
(doc. Ing. Jiří Drápela, Ph.D.)

Malé zdroje elektrické energie
(doc. Ing. Petr Mastný, Ph.D.)

Nekonvenční přeměny
(Ing. Lukáš Radil, Ph.D.)

Osvětlovací soustavy
(Ing. Jan Škoda, Ph.D.)

Power Systems
(doc. Ing. Petr Baxant, Ph.D.)

Projektování silových a datových rozvodů
(Ing. Branislav Bátora, Ph.D.)

Přechodné jevy
(doc. Ing. Vladimír Blažek, CSc.)

Přenosové sítě
(doc. Ing. Vladimír Blažek, CSc.)

Řízení elektrizačních soustav
(doc. Ing. Petr Toman, Ph.D.)

Světelná technika
(doc. Ing. Petr Baxant, Ph.D.)

Technika vysokých napětí
(Ing. Michal Krbal, Ph.D.)

Doctoral Degree Programme

Matematické modelování v elektroenergetice
(doc. Ing. Petr Toman, Ph.D.)

Vybrané problémy z výroby elektrické energie
(doc. Ing. Petr Mastný, Ph.D.)

Laboratories

Laboratory of Electrical Protection (instruction in Distribution Facilities, Electrical Stations and Lines, Protection and Security of Facilities, Integrated Protection Systems, preparation of measurements in real networks, research, Jaroslava Orságová)

Laboratory of Diagnostics (instruction in Diagnostics in Power Electrical Engineering, research on diagnostics and measusrement, Jiří Drápela)

Laboratory of Electrical Energy Quality and Electromagnetic Compatibility (instruction in Electrical Energy Quality and EMC and Diagnostics in Power Electrical Engineering, Jiří Drápela)

Laboratory of Appliance-Electrical Network Compatibility (impact of appliances on the distribution network under different network conditions, Jiří Drápela)

Laboratory of Heating Technology (instruction in Electrical Power Utilization and Electrical Heating Technology, Ilona Lázničková)

Laboratory of Light and Illumination Technology (instruction in Light Technology, Illumination Systems, Testing of Light Sources and Fittings, research projects, Jan Škoda)

Laboratory of Electrical Networks (instruction in Electrical Power Distribution, Transmission Networks, Electrical Stations and Line Networks, Distribution and Industrial Networks, research projects, Michal Ptáček)

Design Laboratory (instruction in Design of Power and Data Distribution Systems, training and research on modern electroinstallations, Branislav Bátora)

Laboratory of Electrical Power Generation (instruction in Electrical Power Generation, Power and Heating Plants, Small Sources of Electrical Power, diploma theses, research projects in small sources of electric power, Petr Mastný)

Laboratory of Ionizing Radiation (instruction in Nuclear Power Facilities, Karel Katovský)

Laboratory of Non-Conventional Energy Conversion (instruction in Ecology in Power Engineering, Small Electrical Power Sources, Non-Conventional Energy Conversion, diploma theses and dissertations, research of fuel cells, Petr Mastný)

Solar Energy Laboratory (research of full solar energy exploitation, development and verification of operating models in real operation conditions, Petr Mastný)

Ultra High Voltage Laboratories (instruction in Distribution Facilities, Electrical Stations and Lines, High Voltage Technology, testing by superimposed and pulse voltage, Jaroslava Orságová)

Computer Laboratories (2) (instruction in Computers and Programming 1 and 2, planning in power engineering, steady states and transient phenomena in electrification systems, Branislav Bátora)

Department of Electrical and Electronic Technology

Doc. Ing. Petr Bača, Ph.D.

Head

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Professors

Prof. Ing. Jiří Kazelle, CSc.
Prof. Ing. Jiří Vondrák, DrSc.

Associate Professors

Doc. Ing. Petr Bača, Ph.D.
Doc. Ing. Josef Jirák, CSc.
Doc. Ing. Jiří Maxa, Ph.D.
Doc. Ing. Vítězslav Novák, Ph.D.
Doc. Ing. Marie Sedlaříková, CSc.
Doc. Ing. Jiří Vaněk, Ph.D.
Doc. Ing. Petr Křivík, Ph.D

Lecturers

Ing. Ondřej Čech, Ph.D., Ing. Martin Frk, Ph.D., Ing. Ladislav Chladil, Ph.D., Ing. Tomáš Kazda, Ph.D., Ing. Jiří Libich, Ph.D., Ing. Helena Polsterová, CSc., Ing. Jiří Starý, Ph.D., Ing. Jiří Špinka

Ph.D. Students

Ing. Bayer Robert, Ing. Bílek Michal, Ing. Pavel Čudek, Ing. Daniel Frýda, Ing. Tomáš Gottwald, Ing. Jiří Hudec, Ing. Josef Hylský, Ing. Ivan Jakubis, Ing. Michal Jahn, Ing. Martin Juračka, Ing. Michl Kadlec, Ing. Miroslav Kunovjánek, Josef Máca, Ing. Mocharová Zuzana, Ing. Michal Musil, Ing. Peroutka Tomáš, Ing. David Pléha, Ing. Marek Solčanský, Ing. Dávid Strachala, Ing. Lucie Šimonová, Ing. Jiří Šubarda, Ing. Jiří Tichý, Ing. Pavel Tošer, Ing. Sebastian Vaculík, Ing. Petr Vyroubal, Ing. Jana Zimáková

Administrative and Technical Staff

František Chudáček, Ing. Kristýna Jandová, Ph.D., Ing. Petr Kahle, František Kořínek, Ing. Miroslav Zatloukal, Gabriela Dominiková, Martin Šturm

Main Interests

The department provides instruction in electrotechnical materials, manufacturing processes and their control, printed circuit board and surface mount technology, diagnostics, testing and reliability of electrotechnical materials and processes, quality assurance, designs of systems and alternative electrical power sources in the Bachelor and the Master programme Electrical, Electronic, Control and Communication Technology (EECR), in full-time and part-time form of study. Instruction in the subject Materials and Technical Documentation is provided to all first-year full-time and part-time students in the EECR Bachelor programme.

Research areas of interest are electrotechnical, electronic and optoelectronic materials and components, technologies, diagnostics and prognosis, electron microscopy, electrochemical power sources, lead and alkaline accumulators, development of new materials for lithium-ion batteries, electrocatalysts and ion-exchange membranes for fuel cells, thin-layer electrodes for electrochromic systems, photovoltaic systems, non-destructive diagnostics of defects and quality control, reliability and lifetime of solar cells, detection of signal electrons and methods of environmental scanning electron microscopy of atomic forces, lead-free soldering, quality and reliability of soldered joints, degradation and diagnostics of dielectric systems.

The department cooperates with a number of institutions – Technische Universität Wien, Padova University, Universität Ulm – Zentrum für Sonnenenergie und Wasserstoff-Forschung, École Polytechnique de Montréal, surface analysis workplace Nanolytics in Feldkirchen, Austria, Graphite AG Kropfmühl AG, Institute of Scientific Instruments AVČR, Institute of Inorganic Chemistry AVČR, Institute of Physical Chemistry AVČR, Institute of Macromolecular Chemistry AVČR, Bochemie Bohumín, EPRONA Rokytnice nad Jizerou, Elmarco Liberec, Solartec Rožnov pod Radhoštěm, ERD Praha, LINET Slaný, ENERG-SERVIS Brno, ČeMeBo Blansko, Honeywell Brno, ALPS Electric Czech Sebranice. The department also cooperates with INIFTA Universidad Nacional de La Plata, Argentina and Università degli Studi di Palermo, Italy in the programme KONTAKT.

Major Achievements

The department coorganized the 36th international conference 'Non-conventional Energy Sources' in Blansko 13-15 May 2015. The conference was organized in cooperation with the Czech Electrotechnical Society, group for chemical sources of electric energy.

Members of the department also participated in the meeting of Czech and Slovak colleagues, the 42th international conference 'Electrotechnology 2015', organized by the Faculty of Electrical Engineering and Informatics, Technical University in Košice, 27-29 May 2015 in Tatranská Lomnica, High Tatras.

The department organized the 16th international conference 'Advanced Batteries, Accumulators and Fuel Cells', 30 August-2 September 2015 under the auspices of American electrochemical group of The Electrochemical Society ECS and BUT Brno. The conference was followed by a workshop sponsored by Metrohm. More than 70 experts e.g. Guenther Fafilek from Vienna Technical University, Chen Shen-Ming from Taiwan University, Kim Jyong from Korea, Andrea Straková-Fedorková from Pavel Jozef Šafárik University, Košice attended. An outcome of the conference was a special issue of ECS Transactions, volume 70 with full texts of presented papers (published in Scopus).

A bilateral project of Ministry of Education, Czech Republic – Austria (Vienna Technical University) 'Development of Novel Lithium-ions Batteries for Electrical Energy Storage' was launched. The project included exchange placements for 3 Austrian and 3 Czech academics.

The TAČR project TA 04010085 'Flexible Autonomous Power Systems for Smart Textiles', focused on flexible electrodes for supercapacitors and accumulators continued.

We concluded a commercial contract on new materials for Li-S systems with Mr Marek Slávik from Graphene Batteries AG, Norway.

A NATO project proposal 'Development of New Cathodes for Stable and Safer Lithium-Sulfur Batteries' was submitted and currently is being reviewed.

The department was the chief investigator of project 'Specific Higher Education Research at BUT' (Materials and Technologies in Electrical Engineering II).

The department cooperated with the University of West Bohemia in Plzeň in the European Operational Programme project 'Partnership in Electrical and Mechanical Engineering', Priority Axis 7.2 'Tertiary Education, Research and Development'.

Research continued within the 'National Sustainability Programme I' for support of research, experimental development and innovations within the framework of the European OP VaVpI project 'Centre for Research and Utilization of Renewable Energy' (CVVOZE), research programme 2 – 'Chemical and Photovoltaic Energy Sources'.

We continued research and commercial activities in the accredited Testing Laboratory of CVVOZE where the department obtained accreditation for testing of VA characteristics of photovoltaic panels. In 2015 verification services for the state and operability of photovoltaic power stations were used by over 12 companies and over 200 photovoltaic panels of different types were tested. Results of condition analysis of the frst photovoltaic power station in the Czech Republic - FVE Dukovany were presented at one of the major European conferences on photovoltaics EU PVSEC 2015 Hamburg.

Major Research Projects

Project AKTION ČESKÁ REPUBLIKA – RAKOUSKO – ' Ionic Liquids for Intercalation Reactions of Lithium and Sodium Ions in Modern Batteries'

Investigator: Marie Sedlaříková

Project TA04010085 'Flexible Autonomous Power Systems for Smart Textiles'

Investigator: Marie Sedlaříková

A Specific Research Project – 'Materials and Technologies for Electrical Engineering' FEKT-S-11-7

Investigator: Petr Bača

A Specific Research Project – 'Optimization of the Perovskite Solar Cell on the Basis of TiO2/PbI2' (TiO2/CH3NH3PbI3) – FCH/FEKT-J-15-2871

Investigator: Michal Kadlec

Selected Publications

BAČA, P.; KŘIVÍK, P.; ZIMÁKOVÁ, J.; FRYDA, D. Effect of Compression on Negative Lead- Acid Battery Electrodes Doped with Glass Fibres. *INTERNATIONAL JOURNAL OF ELECTROCHEMICAL SCIENCE,* 2015, vol. 10, no. 1, p. 10307-10320. ISSN: 1452- 3981.

ŠKANTÁROVÁ, L.; ORIŇÁKOVÁ, R.; STRAKOVÁ FEDORKOVÁ, A.; BAČA, P.; SEDLAŘÍKOVÁ, M.; ORIŇÁK, A. Electrochemical Behaviour of Nanoscale Ni Modified Screen- Printed Carbon Electrodes in Corrosion Tests and Hydrogen Evolution Electrocatalysis. *INTERNATIONAL JOURNAL OF ELECTROCHEMICAL SCIENCE,* 2015, vol. 10, no. 1, p. 8569-8580. ISSN: 1452- 3981.

HUMANA, R.; ORTIZ, M.; THOMAS, J.; REAL, S.; SEDLAŘÍKOVÁ, M.; VONDRÁK, J.; VISINTIN, A. Characterization of anodes for lithium- ion batteries. *Journal of Solid State Electrochemistry,* 2015, vol. 8, no. 15, p. 3004-3011. ISSN: 1432- 8488.

KAZDA, T.; VONDRÁK, J.; SEDLAŘÍKOVÁ, M.; GÓMEZ-ROMERO, P.; MUSIL, M.; ČUDEK, P.; STRAKOVÁ FEDORKOVÁ, A.; KAŠPÁREK, V. The Influence of Solvents and Salts on the Properties of High- Voltage Cathode Materials. *INTERNATIONAL JOURNAL OF ELECTROCHEMICAL SCIENCE,* 2015, vol. 2015, no. 8, p. 6288-6301. ISSN: 1452- 3981.

LIBICH, J.; MÁCA, J.; SEDLAŘÍKOVÁ, M.; VONDRÁK, J.; STRAKOVÁ FEDORKOVÁ, A. Influence of New Aprotic Electrolytes on Negative Electrode Materials for Lithium- ion Batteries. *INTERNATIONAL JOURNAL OF ELECTROCHEMICAL SCIENCE,* 2015, vol. 2015(10), no. 7, p. 5264-5275. ISSN: 1452- 3981.

BAČA, P.; KŘIVÍK, P.; VACULÍK, S.; TOŠER, P. Negative lead- acid battery electrodes doped with glass fibres. *INTERNATIONAL JOURNAL OF ELECTROCHEMICAL SCIENCE,* 2015, vol. 10, no. 1, p. 2206-2219. ISSN: 1452- 3981.

KAZDA, T.; VONDRÁK, J.; DI NOTO, V.; SEDLAŘÍKOVÁ, M.; ČUDEK, P.; OMELKA, L.; ŠAFAŘÍKOVÁ, L.; KAŠPÁREK, V. Study of electrochemical properties and thermal stability of the high-voltage spinel cathode material for lithium- ion accumulators. *Journal of Solid State Electrochemistry,* 2015, vol. 19, no. 6, p. 1579-1590. ISSN: 1432- 8488.

MUSIL, M.; MICHÁLEK, J.; ABBRENT, S.; KOVÁŘOVÁ, J.; PŘÁDNÝ, M.; DOUBKOVÁ, L.; VONDRÁK, J.; SEDLAŘÍKOVÁ, M. New type of gel polyelectrolytes based on selected methacrylates and their characteristics. Part I. Copolymers with (3-(trimethoxysilyl)propyl methacrylate). *Electrochimica Acta,* 2015, vol. 2015, no. 155, p. 183-195. ISSN: 0013- 4686.

KADLEC, M.; VANĚK, J.; SIONOVÁ, M.; WEITER, M. Processing and Optimization of the Perovskite Solar Cell. *ECS Transactions,* 2015, vol. 2015, no. 70, p. 255-260. ISSN: 1938- 5862.

ZIMÁKOVÁ, J.; VACULÍK, S.; FRYDA, D.; BAČA, P. Degradation Mechanisms in the Lead Acid Battery Causing Premature Capacity Loss. In *ESC Transaction. ECS Transactions.* USA: ECS, 2015. p. 21-25. ISSN: 1938- 5862.

LIBICH, J.; MÁCA, J.; SEDLAŘÍKOVÁ, M.; VONDRÁK, J. Lithium-Titanate as a Negative Electrode for Lithium-Ion Batteries. In *ECS Transactions. ECS Transactions.* Pennington, New Jersey 08534-2839, USA: The Electrochemical Society, 2015. p. 61-67. ISSN: 1938- 5862.

VACULÍK, S.; ZIMÁKOVÁ, J.; FRYDA, D.; BAČA, P. Effect of Additives in the Electrolyte Added before the Formation of Lead- Acid Battery. In *ECS Transaction. ECS Transactions.* USA: ECS transaction, 2015. p. 43-46. ISSN: 1938- 5862.

KAZDA, T.; ČUDEK, P.; VONDRÁK, J.; SEDLAŘÍKOVÁ, M.; TICHÝ, J.; SLÁVIK, M. Lithium- sulphur accumulator based on structure of conductive carbon fibres. In *ECS Transactions. ECS Transactions.* 2015. p. 121-126. ISSN: 1938- 5862.

FRYDA, D.; ZIMÁKOVÁ, J.; VACULÍK, S.; BAČA, P. Investigation of Influence of Ebonex on the Formation of Lead- Acid Accumulator Positive Electrode. In *ECS Transaction. ECS Transactions.* USA: ECS Transaction, 2015. p. 37-42. ISSN: 1938- 5862.

MÁCA, J.; HLAVA, K.; VONDRÁK, J.; SEDLAŘÍKOVÁ, M. Application of Fire Retardants in Electrolytes for Lithium Ion Batteries. In *ECS Transaction. ECS Transactions.* 70. USA: The electrochemical society, 2015. p. 105-111. ISSN: 1938- 5862.

JAHN, M.; SEDLAŘÍKOVÁ, M.; VONDRÁK, J. Thin Layers of Lead for Use in Lithium Cells as the Negative Electrode. In *ECS Transaction. ECS Transactions.* Pennington, New Jersey 08534-2839, USA: The electrochemical society, 2015. p. 89-93. ISSN: 1938- 5862.

KAZDA, T.; VONDRÁK, J.; SEDLAŘÍKOVÁ, M.; VISINTIN, A.; TICHÝ, J.; ČUDEK, P.; HUMANA, R. Study of the influence of the scandium doping to the properties of high, voltage LiNi0.5Mn1. 5O4 cathode. In *ECS Transactions. ECS Transactions.* 2015. p. 113-119. ISSN: 1938- 5862.

KŘIVÍK, P. Temperature Changes During Pulse Charging of Lead Acid Battery in Oxygen Cycle Regime. In *16th International Conference on Advanced Batteries, Accumulators and Fuel Cells, ABAF 2015. ECS Transactions.* USA: ECS, 2015. p. 3-12. ISBN: 978-80-214-5109- 4. ISSN: 1938- 5862.

JANDOVÁ, K.; JANDA, M. SIMULATION OF THE INFLUENCE OF HAIL MECHANICAL ACTION ON PHOTOVOLTAIC PANELS. *ECS Transaction,* 2015, vol. 1, no. 70, p. 239-243. ISSN: 1938- 6737.

VANÝSEK, P.; NOVÁK, V.; CHLADIL, L. Investigation of Vanadium Oxidation States in Sulfuric Acid by Voltammetry and Electrochemical Impedance Spectroscopy. In *ECS Transactions. ECS Transactions.* Pennington: The Electrochemical Society, 2015. p. 13-20. ISSN: 1938- 5862.

CHLADIL, L.; VANÝSEK, P.; ČECH, O. Effect of Zinc Ions on the Second Voltage Plateau of Non-Sintered Ni(OH) 2 Electrodes. In *ECS Transactions. ECS Transactions.* Pennington: The Electrochemical Society, 2015. p. 53-57. ISSN: 1938- 5862.

STRACHALA, D.; HYLSKÝ, J.; FRK, M. Determination of the Temperature Coefficient of Volume Expansion Heat - Transfer Fluids by Using Refractometer. In *16th International Conference on Advanced Batteries, Accumulators and Fuel Cells (ABAF 2015). ECS Transactions.* USA: ECS Transaction, 2015. p. 213-220. ISBN: 978-80-214-5109- 4. ISSN: 1938- 5862.

VANĚK, J.; CHOBOLA, Z.; LUŇÁK, M. Low- Frequency Noise Diagnostic of Silicon Concentrator Photovoltaic Cell With, Very High Efficiency. In *ECS Trans. 2015 70(1). ECS Transactions.* USA: ECS Transaction, 2015. p. 245-253. ISSN: 1938- 5862.

HYLSKÝ, J.; STRACHALA, D.; VANĚK, J. Analysis of Photovoltaic Modules after 20 Years in Service. In *16th International Conference on Advanced Batteries, Accumulators and Fuel Cells (ABAF 2015. ECS Transactions.* USA: ECS Transaction, 2015. p. 229-237. ISBN: 978-80-214-5109- 4. ISSN: 1938- 5862.

JURAČKA, M.; GOTTWALD, T.; VONDRÁK, J.; SEDLAŘÍKOVÁ, M. Lithium Sulphur Batteries. In *ECS Transections. ECS Transactions.* Pennington, New Jersey, 08534-2839, USA: Electrochemical Society, 2015. p. 283-288. ISBN: 978-80-214-5109- 4. ISSN: 1938- 5862.

GOTTWALD, T.; JURAČKA, M.; VONDRÁK, J.; SEDLAŘÍKOVÁ, M. Graphitic Carbon as a Part of Anode Material for Rechargeable Sodium Ion Batteries. In *ECS Transaction. ECS Transactions.* Pennington, New Jersey 08534-2839, USA: Electrochemical Society, 2015. p. 275-282. ISSN: 1938- 5862.

ZIMÁKOVÁ, J.; VACULÍK, S.; FRYDA, D.; BAČA, P. The importance of observation of structural changes of lead acid battery active mass in special applications in the mining industry. *Acta Montanistica Slovaca,* 2015, no. 20, p. 165-171. ISSN: 1335- 1788.

PLÉHA, D.; MUSIL, M. Nonwoven Separators Fabrication and Analysis Methods. In *ECS Transactions. ECS Transactions.* USA: Electrochemical Society, 2015. p. 2-7. ISBN: 978-1-56677-988- 3. ISSN: 1938- 5862.

CHOBOLA, Z.; LUŇÁK, M.; VANĚK, J.; HULICIUS, E.; KUSÁK, I. Low- frequency noise measurements used for quality assessment of GaSb based laser diodes prepared by molecular beam epitaxy. *Journal of Electrical Engineering,* 2015, vol. 66, no. 4, p. 226-230. ISSN: 1335- 3632.

LIBICH, J.; SEDLAŘÍKOVÁ, M.; VONDRÁK, J. Lithiated Graphite Materials for Negative Electrode of Lithium- Ion Batteries. *Surface Engineering and Applied Electrochemistry,* 2015, vol. 51, no. 2, p. 196-201. ISSN: 1934- 8002.

Bachelor Degree Programme

Diagnostika a zkušebnictví
(doc. Ing. Josef Jirák, CSc.)

Elektrotechnické materiály a výrobní procesy
(prof. Ing. Jiří Kazelle, CSc.)

Materiály a komponenty pro biomedicínu
(doc. Ing. Marie Sedlaříková, CSc.)

Materiály a technická dokumentace
(doc. Ing. Josef Jirák, CSc.)

Návrh a konstrukce elektrotechnických zařízení
(doc. Ing. Vítězslav Novák, Ph.D.)

Návrhové systémy plošných spojů
(doc. Ing. Petr Bača, Ph.D.)

Plošné spoje a povrchová montáž
(Ing. Jiří Starý, Ph.D.)

Počítačové projektování výrob, logistika a ekologie výroby (doc. Ing. Jiří Vaněk, Ph.D.)

Počítačová podpora technických a manažerských prací (doc. Ing. Jiří Maxa, Ph.D.)

Řízení a kontrola jakosti
(Ing. Helena Polsterová, CSc.)

Řízení jakosti a metrologie
(Ing. Helena Polsterová, CSc.)

Spolehlivost v elektrotechnice
(Ing. Helena Polsterová, CSc.)

Master Degree Programme

Alternativní zdroje energie
(doc. Ing. Jiří Vaněk, Ph.D.)

Diagnostické metody v elektrotechnice
(doc. Ing. Josef Jirák, CSc.)

Ekologie výroby
(doc. Ing. Petr Bača, Ph.D.)

Klimatotechnologie
(Ing. Martin Frk, Ph.D.)

Materiály pro biomedicínské aplikace
(doc. Ing. Marie Sedlaříková, CSc.)

Mechanical Desktop
(doc. Ing. Jiří Maxa, Ph.D.)

Montážní a propojovací technologie
(Ing. Jiří Starý, Ph.D.)

Obnovitelné zdroje energie
(Ing. Petr Křivík, Ph.D.)

Počítačové návrhové systémy
(Ing. Vítězslav Novák, Ph.D.)

Properties and Production of Electrotechnic Materials
(doc. Ing. Josef Jirák, CSc.)

Řízení a správa dat
(doc. Ing. Jiří Maxa, Ph.D.)

Spolehlivost a jakost
(Ing. Helena Polsterová, CSc.)

Struktura a vlastnosti materiálů
(doc. Ing. Josef Jirák, CSc.)

Technologické projektování a logistika
(doc. Ing. Jiří Vaněk, Ph.D.)

Třírozměrné modelování a simulace
(doc. Ing. Jiří Maxa, Ph.D.)

Výrobní procesy
(prof. Ing. Jiří Kazelle, CSc.)

Základy spolehlivosti elektrotechnických výrob
(Ing. Helena Polsterová, CSc.)

Doctoral Degree Programme

Elektrotechnické materiály, materiálové soustavy a výrobní procesy (prof. Ing. Jiří Kazelle, CSc.)

Vybrané diagnostické metody, spolehlivost, jakost (doc. Ing. Josef Jirák, CSc.)

Laboratories

Laboratory of Alkaline Electrochemical Power Sources (research and development of modern alkaline accumulators (Ni-Cd, Ni-MH) and oxygen-hydrogen fuel cells with alkaline or polymer electrolyte, Vítězslav Novák)

Laboratory of Diagnostics of Photovoltaic Panels (testing of photovoltaic panels and systems in precisely defined conditions, Jiří Vaněk)

Laboratory of Diagnostic Methods (diagnostics of materials and testing methods, experiments for semester projects, Bachelor and Master theses, Martin Frk)

Laboratory of Electrical Diagnostic Methods (diagnostic methods in electrical engineering and climatotechnology, experimental measurements of very small currents and diagnostics of electro-insulating fluids, Martin Frk)

Laboratory of Electrode Materials 1,3 (preparation of specimen and electrode mass for Li-ion, Ni-Cd, Ni-MH and Ni-Zn batteries and supercondensors, thin-film deposition by chemical methods, preparation of polymer gel electrolytes, Marie Sedlaříková)

Laboratory of Electrode Materials 2 (research and measurement of materials for electrochemical sources, mainly Li-ion, Ni-Cd, Ni-MH and Ni-Zn batteries, supercondensors and polymer gel electrolytes for Li-pol batteries, Marie Sedlaříková)

Laboratory of Electrode Materials 1,3 (preparation of specimen and electrode mass for Li-ion, Ni-Cd, Ni-MH and Ni-Zn batteries and supercondensors, thin-film deposition by chemical methods, preparation of polymer gel electrolytes, Marie Sedlaříková)

Laboratory of Electrode Materials 2 (research and measurement of materials for electrochemical sources, mainly Li-ion, Ni-Cd, Ni-MH and Ni-Zn batteries, supercondensors and polymer gel electrolytes for Li-pol batteries, Marie Sedlaříková)

Laboratory of Electrotechnical Materials 2 (computer modelling and measurement of parameters of semiconductor and dielectric materials, instruction in Electrotechnical Materials and Manufacturing, Material Structure and Properties, Zdenka Rozsívalová, Martin Frk)

Laboratory of Photovoltaic Systems (testing of electrical properties of photovoltaic cells, Jiří Vaněk)

Laboratory of Microscopy Techniques (research of systems for detection of signal electrons, specimen observations in scanning electrode microscope under higher pressure in specimen chamber (VP-SEM) and microscope of atomic forces (AFM), Josef Jirák, Pavel Čudek)

Laboratory of Renewable Sources (testing of electrical and mechanical properties of photovoltaic cells, laboratory instruction in Renewable Energy Sources and Alternative Energy Sources, Jiří Vaněk)

Laboratory of Lead-Acid Accumulators 1,2 (research and development of new applications of lead-acid accumulators for hybrid electromobiles and as renewable energy storage, Petr Bača)

Laboratory of Printed Circuit and Surface Mount Technology (instruction in Printed Circuit and Surface Mount Technology, Jiří Starý)

Laboratory of Soldering (research and development of lead-free soldered connections reliability and surface wettability, instruction in Interconnection and Assembly Technology, Jiří Starý)

Laboratory of Printed Circuits, PROTOCAD and Photoprocesses (laboratory production of printed circuit boards and microsections, chemical coating analysis, laboratory instruction in Printed Circuits and Surface Mount Technology and Interconnection and Assembly Technology, Jiří Starý)

Department of Physics

Prof. Ing. Lubomír Grmela, CSc.

Head

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Professors

Prof. Ing. Lubomír Grmela, CSc.
Prof. Ing. Pavel Koktavý, CSc., Ph.D.
Prof. RNDr. Ing. Josef Šikula, DrSc.
Prof. RNDr. Pavel Tománek, CSc.

Associate Professors

Doc. RNDr. Milada Bartlová, Ph.D.
Doc. RNDr. Pavel Hruška, CSc.
Doc. Ing. Karel Liedermann, CSc.
Doc. Mgr. Jan Pavelka, CSc., Ph.D
Doc. Ing. Petr Sedlák, Ph.D.
Doc. Ing. Vlasta Sedláková. Ph.D.

Lecturers

Ing. Jitka Brüstlová, CSc., RNDr. Pavel Dobis, CSc., Ing. Vladimír Holcman, Ph.D., Ing. Robert Macků, Ph.D., Ing. Pavel Škarvada, Ph.D., RNDr. Naděžda Uhdeová, Ph.D.

Research Staff

Ing. Jiří Majzner, Ph.D., Ing. Pavel Tofel, Ph.D.

Ph.D. Students

Mgr. Naděžda Bogatyreva, Ing. Kamil Brož, Ing. Michal Jurčík, Ing. Pavel Kaspar, Ing. Marián Klampár, Ing. Martin Kopecký, Ing. Tomáš Kuparowitz, Mgr. Aneta Lontrasová, Ing. Alexander Podshivalov, Ing. Elena Prokopyeva, Mgr. Dinara Sobola, Ing. Milan Spohner, Ing. Jiří Šicner, Ing. Ondřej Šik, Ing. L'ubomír Škvarenina, Ing. Marek Vondra

Administrative and Technical Staff

Mgr. Naděžda Bogatyreva, Ing. Miloš Chvátal, Ing. Marián Klampár, Ing. Alexandr Knápek, Ph.D., Miroslav Sadovský, Ing. Petr Sadovský, Ph.D., Ing. Ondřej Šik, Ing. Tomáš Trčka, Ing. Alena Václavíková, Radimír Vrba

Main Interests

In 2015 the department provided tuition in Bachelor programme courses Physics 1 and Physics 2 (full-time and part-time study), Physics for students of information technology, Physics 1 and 2 for the programme Biomedical Technology and Bioinformatics, Physics for Audio Engineering, and Physics in Electrical Engineering (in English for the programme English in Electrical Engineering). The courses offered in the Master programme included Nanotechnology, Modern Physics, Solid Phase Physics and Non-Destructive Diagnostics, Physics of Dielectrics for FEEC, Nanostructures and Spectroscopic Methods for Non-Destructive Diagnostics (for FEEC) and Optics (for FIT).

Assignments for Physical Practice and multimedia study materials were being updated for instruction in the computer room and for student self-study.

Research was centred on basic and applied research of the physical parameters of semiconductor and dielectric materials and components and nanosensors. The main areas of interest were noise spectroscopy, local characterization with nanodistinction, measurement of nonlinearities, design of quality and reliability indicators and dielectric spectroscopy. Significant results were achieved in research on the characteristics of acoustic and electromagnetic emission sensors.

The department cooperated with European and Japanese laboratories in the field of noise spectroscopy and nanotechnology, and in research on dielectrics, with American universities in Orlando and Rapid City in nanometrology, and with leading Czech laboratories in the development and enhancement of the parameters of CdTe radiation detectors.

Contract research has been expanding. Our major partners have been the world leaders On Semiconductor, AVX, Kyocera and NEE, a.s.

Our top laboratory equipment includes the electron microscope LYRA with 1 nm distinction, alfa analyzer Novocontrol for measurement of dielectric spectra over 12 frequency orders, infrared spectrometer-Nicolet, workstation for experimental study of semiconductor and dielectric samples at low temperatures (up tp 10K), optical spectroscopy by SNOM, spectral analyzers of signals for a whole technical frequency band, the automatic meter of characteristics and non- linearities Keithley 4200 and a vacuum system for research on autoemission cathodes in electron microscopy.

Major Achievements

The department participated in the Regional Centre for Research and Development CZ.1.05/2.1.00/03.0072 'Centre for Sensor, Information and Communication Systems' (SIX). Our two laboratories were included in the project: Laboratory of Noise, Dielectric Spectroscopy and Electromagnetic Emissons and Laboratory of Nanometrology.

We cooperated in the start-up project of excellence CZ.1.05/1.1.00/02.0068 STI CEITEC, groups 1-7 'Optoelectronic Characterization of Nanostructures', with chief investigator Professor Lubomír Grmela. Project outcomes in 2015 were 3 publications in impact journals, 4 papers in conference proceedings WoS and two research reports.

The department was involved in 1 GAČR project, 1 TAČR project and 1 INGO project and a BUT specific research grant and 7 commercial contracts with industrial companies.

The GAČR project, in cooperation with Charles University Prague, was focused on emission detectors surface passivation. The TAČR project, with Třinec Iron and Steel Works and VŠB Ostrava, involved surface defects of continuously cast billets.

The BUT specific research project deals with the methodology of enhancing the quality of optoelectronic materials and components.

The commercial contracts dealt with temperature measurement in transistors and resistors, monitoring of electromagnetic emission in rocks deformation, solar collectors deformaion and methods of detection of small metal particles for analyses in rubber industry.

Major Research Projects

Passivation of CdTe/CdZnTe Surfaces in Emission Detectors – GAČR 15-052595

Investigator: Lubomír Grmela

Enhancement of Surface Quality of Cast Billets– TAČR TA04010312

Investigator at UFYZ : Lubomír Grmela

Participation in European Optical Society Committees – INGO II

Investigator Pavel Tománek

Centre of Sensor, Information and Communication Systems (SIX) – CZ.1.05/2.1.00/03.0072

Co-investigators at UFYZ: Lubomír Grmela, Vladimír Holcman

Central European Institute of Technology - European Centre of Excellence CEITEC CZ.1.05/1.1.00/02.0068

Group Leader 1-7 : Lubomír Grmela

Selected Publications

BAI, Y.; MATOUŠEK, A.; TOFEL, P.; BIJALWAN, V.; NAN, B.; HUGHES, H.; BUTTON, T. (Ba,Ca)(Zr,Ti)O3lead-free piezoelectric ceramics— The critical role of processing on properties. *JOURNAL OF THE EUROPEAN CERAMIC SOCIETY,* 2015, vol. 35, no. 13, p. 3445-3456. ISSN: 1873- 619X.

DALLAEVA, D.; TOMANEK, P.; PROKOPYEVA, E.; KASPAR, P.; GRMELA, L.; SKARVADA, P. AFM imaging of natural optical structures. *Proceedings of SPIE,* 2015, vol. 9442, no. 9442, p. 944209- 1 (944209-8 p.) ISSN: 0277- 786X.

MACKŮ, R.; KOKTAVÝ, P.; SEDLÁK, P.; SMULKO, J.; TRAWKA, M. Analytical fluctuation enhanced sensing by resistive gas sensors. *Sensors and Actuators B: Chemical,* 2015, vol. 2015, no. 213, p. 390-396. ISSN: 0925-4005.

ADINEH V. R.; COUFAL, O.; BARTLOVÁ, M. Calculation of net emission coefficient of electrical discharge machining arc plasmas in, mixtures of nitrogen with graphite, copper and tungsten. *Journal of Physics D: Applied Physics,* 2015, vol. 48, no. 5, p. 1-13. ISSN: 0022- 3727.

HORVÁTH, T.; KOČÍ, L.; JURČÍK, M.; FILKA, M. Coexistence GPON, NG-PON, and CATV systems. *International Journal of Engineering Trends and Technology,* 2015, vol. 21, no. 2, p. 61-66. ISSN: 2231- 5381.

RAMAZANOV, S.; TALU, S.; DALLAEVA, D.; STACH, S.; RAMAZANOV, G. Epitaxy of silicon carbide on silicon: micromorphological analysis of growth surface evolution. *SUPERLATTICES AND MICROSTRUCTURES,* 2015, vol. 2015, no. 85, p. 395-402. ISSN: 0749- 6036.

DALLAEVA, D.; RAMAZANOV, S.; RAMAZANOV, G.; AKHMEDOV, R.; TOMÁNEK, P. Characterizing SiC- AlN semiconductor solid solutions with indirect and direct bandgaps. *Proceedings of SPIE,* 2015, vol. 9450, no. 9450, p. 94501R- 1 (94501R-6 p.) ISSN: 0277- 786X.

ELHADIDY, H.; GRILL, R.; FRANC, J.; ŠIK, O.; MORAVEC, P.; SCHNEEWEISS, O. Ion electromigration in CdTe Schottky Metal-Semiconductor- Metal Structure. *SOLID STATE IONICS,* 2015, vol. 277, no. 27, p. 20-25. ISSN: 0167- 2738.

KASPAR, P.; PROKOPYEVA, E.; TOMÁNEK, P. Local Field Measurement of Optical Characteristics of Organic Phantoms. *DGaO- PROCEEDINGS,* 2015, vol. 2015, no. 2015, p. 1-2. ISSN: 1614- 8436.

DALLAEVA, D.; RAMAZANOV, S.; PROKOPYEVA, E.; TOMÁNEK, P.; GRMELA, L. Local topography of optoelectronic substrates prepared by dry plasma etching process. *Proceedings of SPIE,* 2015, vol. 9442, no. 9442, p. 9442081-9442086. ISSN: 0277- 786X.

STACH, S.; DALLAEVA, D.; TALU, S.; KASPAR, P.; TOMÁNEK, P.; GIOVANZANA, S.; GRMELA, L. Morphological features in aluminum nitride epilayers prepared by magnetron sputtering. *MATERIALS SCIENCE-POLAND,* 2015, vol. 33, no. 1, p. 175-184. ISSN: 0137- 1339.

OUJEZSKÝ, V.; ŠKORPIL, V.; JURČÍK, M. Network Tomography Overview and Botnet Network Estimation, Part I. *Access Server,* 2015, vol. 13, no. 6, p. 1-4. ISSN: 1214- 9675.

KLOC, P.; AUBRECHT, V.; BARTLOVÁ, M.; COUFAL, O.; RÜMPLER, C. On the Selection of Integration Intervals for the Calculation of Mean Absorption Coefficients. *Plasma Chemistry and Plasma Processing,* 2015, vol. 35, no. 6, p. 1097-1110. ISSN: 0272- 4324.

PROKOPYEVA, E.; KASPAR, P.; TOMÁNEK, P.; GRMELA, L. Optical properties of metal nanoparticles used in biosensors. *Proceedings of SPIE,* 2015, vol. 9442, no. 944217, p. 944217- 1 (944217-7 p.) ISSN: 0277- 786X.

KASPAR, P.; PROKOPYEVA, E.; TOMÁNEK, P.; GRMELA, L. Optical scattering in muscle tissue and its utilisation. *Proceedings of SPIE,* 2015, vol. 9442, no. 9442, p. 94420I1 (94420I7 p.) ISSN: 0277- 786X.

KUBERSKÝ, P.; SEDLÁK, P.; HAMÁČEK, A.; NEŠPŮREK, S.; KUPAROWITZ, T.; ŠIKULA, J.; MAJZNER, J.; SEDLÁKOVÁ, V.; GRMELA, L.; SYROVÝ, T. Quantitative fluctuation- enhanced sensing in amperometric NO2 sensors. *Chemical Physics,* 2015, vol. 456, no. 1, p. 111-117. ISSN: 0301- 0104.

KLOC, P.; AUBRECHT, V.; BARTLOVÁ, M.; COUFAL, O. Radiation transfer in air and air- Cu plasmas for two temperature profiles. *Journal of Physics D: Applied Physics,* 2015, vol. 48, no. 5, p. 1-13. ISSN: 0022- 3727.

DALLAEVA, D.; TOMÁNEK, P.; ŠKARVADA, P.; GRMELA, L. Realization of microscale detection and localization of low light emitting spots in monocrystalline silicon solar cells. *Proceedings of SPIE,* 2015, vol. 9450, no. 9450, p. 94501O- 1 (94501O-7 p.) ISSN: 0277- 786X.

DALLAEVA, D.; SADOVSKÝ, P.; TOMÁNEK, P. Role of Surface Features of Butterfly Wings in Optical Properties Characterization. *DGaO- PROCEEDINGS,* 2015, vol. 2015, no. 2015, p. 1-2. ISSN: 1614- 8436.
ŠKARVADA, P.; MACKŮ, R.; DALLAEVA, D.; SEDLÁK, P.; GRMELA, L.; TOMÁNEK, P. SEM and AFM imaging of solar cells defects. *Proceedings of SPIE,* 2015, vol. 9450, no. 9450, p. 1-6. ISSN: 0277- 786X.

SEDLÁKOVÁ, V.; ŠIKULA, J.; MAJZNER, J.; SEDLÁK, P.; KUPAROWITZ, T.; BUERGLER, B.; VAŠINA, P. Supercapacitor equivalent electrical circuit model based on charges redistribution by diffusion. *Journal of Power Sources,* 2015, vol. 2015, no. 286, p. 58-65. ISSN: 0378- 7753.

ŠKVARENINA, Ľ. Šumová a optická spektroskopia monokryštalických kremíkových solárnych článkov. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 17, č. 4, s. 136-142. ISSN: 1213-1539.

PROKOPYEVA, E.; KASPAR, P.; TOMÁNEK, P. The study of polarization properties of meat. *DGaO-PROCEEDINGS,* 2015, vol. 2015, no. 2015, p. 1-2. ISSN: 1614- 8436.

Bachelor Degree Programme

Fyzika 1
(RNDr. Pavel Dobis, CSc.)

Fyzika 2
(doc. RNDr. Milada Bartlová, Ph.D.)

Fyzika pro H-AEI
(doc. Ing. Karel Liedermann, CSc.)

Fyzika pro J-AUD
(prof. Ing. Pavel Koktavý, CSc., Ph.D.

Fyzika pro T-IBP
(prof. Ing. Lubomír Grmela, CSc.)

Fyzika pro informatiky
(prof. Ing. Lubomír Grmela, CSc.)

Fyzikální semináře BFYS a BFY
(Ing. Jitka Brüstlová, CSc.)

Master Degree programme

Fyzika pevné fáze
(prof. Ing. Pavel Koktavý, CSc., Ph.D.)

Moderní fyzika
(doc. Ing. Karel Liedermann, CSc.)

Fyzikální optika pro informatiky
(doc. RNDr. Pavel Hruška, CSc.)

Nanotechnologie
(prof. RNDr. Pavel Tománek, CSc.)

Nedestruktivní diagnostika a fyzika dielektrik
(Ing. Vladimír Holcman, Ph.D.)

Doctoral Degree Programme

Rozhraní a nanostruktury
(prof. RNDr. Pavel Tománek, CSc.)

Spektroskopické metody pro nedestruktivní diagnostiku (doc. Ing. Karel Liedermann, CSc.)

Laboratories

Czech Electronic Noise Research Laboratory (low-frequency noise, noise spectroscopy, development of non-destructive diagnostic methods and indicators of the reliability of materials and microelectronic components, research of sensors and acoustic and electromagnetic emission methods, Josef Šikula)

Laboratory of Dielectric Relaxation Spectroscopy (dielectric relaxation spectroscopy, monitoring of molecular dynamics of dielectric materials, Karel Liedermann)

Laboratory of Physics (instruction in Physics 1, Physics 2 and Physics for Information Technology, Physics for Audio Engineers, laboratory exercises for Physics of Solids and Non-Destructive Diagnostics of Materials, Semiconductors and Physics of Dielectrics, Pavel Dobis)

Laboratory of Optical Nanometrology – SIX (contactless investigation of local optical and electrical characteristics of optoelectronic and photonic structures with horizontal superresolution by scanning optical near field microscopy, Vladimír Holcman)

Laboratory of Noise Diagnostics (research of fluctuation processes in solids, mainly electronic components, electroinsulation and construction materials, diagnostics of semiconductor components and electroinsulation materials by partial charges using electromagnetic and acoustic emissions for diagnostics of fissures, Pavel Koktavý)

Laboratory of Noise Dielectric Spectroscopy and Electromagnetic Emission – SIX (experimental and theoretical research of stochastic processes and carrier transport as a basis for novel advanced technologies, nanosensorics, development of non-destructive diagnostics and modern methods of electronic components and structures service time estimation, Lubomír Grmela)

Department of Languages

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Associate Professors

Doc. PhDr. Milena Krhutová, Ph.D.

Lecturers

PaedDr. Alena Baumgartnerová, PhDr. Petra Fiĺová, Ph.D., PhDr. Marcela Borecká, Mgr. et Ing. Eva Ellederová, Kenneth Froehling, M.A., Mgr. Jaromír Haupt, Ph.D., Ing. Martin Jílek, Mgr. Miroslav Kotásek, Ph.D., Mgr. Petra Langerová, Mgr. Jana Kopecká, PhDr. Ludmila Neuwirthová, Ph.D., Mgr. Pavel Reich, Ph.D., Mgr. Šárka Rujbrová, Mgr. Pavel Sedláček, PhDr. Milan Smutný, Ph.D., Bc. Magdalena Šedrlová, Mgr. Agata Walek, Mgr. Petra Zmrzlá, Ph.D., Mgr. Marie Žouželková Bartošová

Administrative and Technical Staff

Miroslava Purová

Main Interests

In 2015 the first graduates in the philological study area ‘English in Electrical Engineering and Informatics’ completed their studies.

The programme ‘English in Electrical Engineering and Informatics’ provides education in the professional language of various disciplines of electrical engineering and information technology - the theory of linguistics and specific language skills. The programme, unique in the Czech Republic, educates graduates with specific interdisciplinary knowledge and skills required in the current job market. The subjects Introduction in Linguistics, Professional Style in Czech and English, Practical English 1-5, Grammar Structures, Discourse Analysis, Linguistics Pragmatics, Translation Exercises were introduced and instruction materials produced. The department provides instruction in professional English for all specializations in the Bachelor and Master programmes EECR, the Ph.D. programme and the interdisciplinarty programmes BT-BIO and AUDIO. The courses are focused on professional English in electrical engineering and information technology, social skills and competences in a professional language.

Research of English as a language of profession continued and its results have been gradually implemented in the teaching materials. Professional discourse analysis considered not only the pragmatic approach, but also the sociolinguistic approach taking into account the environment where English is used as a first or a second language.

Major Achievements

In 2015 the department’s activities centred on the new Bachelor programme ‘English in Electrical Engineering and Informatics’, mainly the third-year students who were the first to take the state examinations and defend their Bachelor theses. This required new instruction materials, rules and regulations for state examinations and choice of study areas. Language courses created for this programme are based on long-term research on the specific discourse in English as a professional language of electrical engineering and information and communication technology. The research outcomes are implemented in the courses and in a highly specific methodology required for this type of instruction. From now on research will also focus on compounds in English for medicine and producers strategies in professional communication.

The department participated in the OPVK faculty project ‘Complex Innovation of Study Programmes’ and created instruction materials for subjects English for Engineering, English for IT, English for Life etc. in the study programmes EECR and BT BIO.

Our research results were presented at a conference in Zagreb and at national professional conferences.

Selected Publications

KOTÁSEK, M.: Artificial Intelligence in Science Fiction as a Model of Posthuman Situation of Mankind, ISSN 1337 9690.

Bachelor Degree Programme

Praktická angličtina
(Mgr. Pavel Sedláček, Mgr et Ing Eva Ellederová, Mgr. Petra Langerová, PhDr. Ludmila Neuwirthová, Ph.D.)

Úvod do lingvistiky
(PhDr. Milan Smutný, Ph.D.)

Angličtina – mluvnická cvičení
(PaedDr. Alena Baumgartnerová)

Jazyk odborného stylu v češtině a angličtině
(Mgr. Miroslav Kotásek, Ph.D.)

Jazyk jako diskurz ve vědě a technice
(doc. PhDr. Milena Krhutová, Ph.D.)

Lingvistická pragmatika
(Mgr. Jaromír Haupt, Ph.D.)

Diskurzní analýza
(Mgr. Petra Zmrzlá, Ph.D.)

Angličtina pro inženýry
(PhDr. Ludmila Neuwirthová, Ph.D.)

Kulturní studia I
(Mgr. Pavel Sedláček)

Kulturní studia II
Kenneth A.Froehling, M.A.

Angličtina pro bakaláře- mírně pokročilí 1
(PaedDr. Alena Baumgartnerová)

Angličtina pro bakaláře- mírně pokročilí 2
(PaedDr. Alena Baumgartnerová)

Angličtina pro bakaláře- středně pokročilí 1
(Mgr. Agata Walek)

Angličtina pro bakaláře- středně pokročilí 2
(Mgr. Pavel Sedláček)

Angličtina pro Evropu
(PhDr. Milan Smutný, Ph.D.)

Etika podnikání
(Ing. Martin Jílek)

Inženýrská pedagogika a didaktika
(Ing. Martin Jílek)

Kultura projevu a tvorba textů
(Ing. Martin Jílek)

Kurs profesní angličtiny pro elektroinženýrství a informatiku (PhDr. Milan Smutný, Ph.D.)

Laboratorní didaktika
(Ing. Martin Jílek)

Manažerské účetnictví
(Ing. Martin Jílek)

Němčina pro mírně pokročilé
(Mgr. Pavel Sedláček)

Němčina pro pokročilé
(Mgr. Pavel Sedláček)

Němčina pro začátečníky
(Mgr. Pavel Sedláček)

Pedagogická psychologie
(Ing. Martin Jílek)

Manažerské účetnictví
(Ing. Martin Jílek)

Ruština pro mírně pokročilé
(PaedDr. Alena Baumgartnerová)

Ruština pro začátečníky
(PaedDr. Alena Baumgartnerová)

Španělština pro mírně pokročilé
(PhDr. Marcela Borecká)

Španělština pro začátečníky
(PhDr. Marcela Borecká)

Master Degree Programme

Angličtina pro Evropu
(PhDr. Milan Smutný, Ph.D.)

Angličtina pro život
(Mgr. Pavel Sedláček, Kenneth Froehling, M.A.)

Etika podnikání
(Ing. Martin Jílek)

Kultura projevu a tvorba textů
(Ing. Martin Jílek)

Kurs profesní angličtiny pro elektroinženýrství a informatiku (PhDr. Milan Smutný, Ph.D.)

Manažerské účetnictví
(Ing. Martin Jílek)

Němčina pro mírně pokročilé
(Mgr. Pavel Sedláček)

Němčina pro pokročilé
(Mgr. Pavel Sedláček)

Němčina pro začátečníky
(Mgr. Pavel Sedláček)

Manažerské účetnictví
(Ing. Martin Jílek)

Ruština pro začátečníky
(PaedDr. Alena Baumgartnerová)

Španělština pro začátečníky
(PhDr. Marcela Borecká)

Doctoral Degree Programme

Angličtina pro doktorandy
(Mgr. Petra Zmrzlá, Ph.D.)

Angličtina pro doktorandy FIT
(doc. PhDr. Milena Krhutová, Ph.D.)

Department of Mathematics

Doc. RNDr. Zdeněk Šmarda, CSc.

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Professors

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Prof. RNDr. Jan Chvalina, DrSc.

Associate Professors

Doc. RNDr. Jaromír Baštinec, CSc.
Doc. RNDr. Dana Hliněná, Ph.D.
Doc. RNDr. Edita Kolářová, Ph.D.
Doc. RNDr. Martin Kovár, Ph.D.
Doc. RNDr. Zdeněk Šmarda, CSc.

Lecturers

RNDr. Petr Fuchs, Ph.D., Ing. Michal Fusek, Ph.D., Mgr. Irena Hlavičková, Ph.D., RNDr. Vlasta Krupková, CSc., Mgr. Michal Novák, Ph.D., RNDr. Zdeněk Svoboda, CSc., Mgr. Marie Tomšová, Mgr. Jiří Vítovec, Ph.D.

Ph.D. Students

Mgr. Štěpán Křehlík, Ing. Marie Klimešová, Hanna Demchenko, Mgr. Jan Šafařík, Mgr. Kristýna Mencáková, Ing. Jiřina Rauerová, Mgr. David Staněk, RNDr. Bedřich Smetana, Mgr. Gabriela Vanžurová

Administrative and Technical Staff

Eva Šimečková

Main Interests

The department provides instruction in courses for full-time and part-time Bachelor students (Mathematics 1, Mathematics 2, Mathematics 3, Selected Chapters in Mathematics i., II., Mathematics in Electrical Engineering), full-time and part-time Master students (Modern Numerical Methods, Matrix and Tensor Calculus, Random Processes, Differential Equations in Electrical Engineering, Probability, Statistics and Operations Research, Coding in Informatics). The department also provided instruction in two Ph.D. courses (Discrete Processes in Electrical Engineering, Probability, Stochastic Processes, Operations Research) and in a number of courses in the Bachelor programme at the Faculty of Information Technology.

Research was conducted on the basis of contracts with international partners - the team of Professor D. Khusainov, Institute of Dynamical System Modelling, Faculty of Cybernetics, Kiev State University, the team of Professor I. Dzalladova, Institute of Mathematics, Faculty of Information Systems and Technologies, Kiev National Economic University. The department cooperates with leading world experts – Professor L. Berezansky, Beer-Sheva University, Israel, Professor Ch. Nowak, Alpen-Adria University, Klagenfurt, Professor S. Stevic, Serbian Academy of Sciences, Belgrade, Professor S. Siegmund, Technical University Dresden, Professor Miroslav Fečkan, Comenius University, Bratislava, Professor I. Cristeou, School of Applied Sciences, University of Nova Gorica, Slovenia, Professor Vassilios Tsiantos, Eastern Macedonia and Thrace University of Technology (TEI Kavala), Greece.

Research on dynamical systems was focused on study of sufficient stability conditions for perturbed linear discrete equations with multiple delays. Also studied was representation of solutions of delayed differential and discrete systems and initial conditions for solubility of the Cauchy problem for systems of ordinary differential equations. Attention was paid to designs of novel numerical algorithms for functional differential and partial differential equations representing equations of mathematical physics.

Acitivies in fuzzy structures focused on construction of new classes of uninorms and their specific properties, approximation of measured values by applying aggregation operators and solution of an open problem on triangular norms.

Study of algebraic hyperstructures centred on multi automatics as actions of binary hyperstructures on suitable state objects and construction of transition neural networks. Attention was paid to transfer of classical algebraic results to the theory of ambiguous structures (Noether hyper circles and closed operators in hyper circles).

Major Achievements

The department was involved in 1 GAČR project and 1 specific research project..

In dynamic systems, new integral criteria were adopted for detection of the existence of positive solutions of differential equations with delayed argument as well as expanding solutions analysis for certain classes of linear functional differential equations. Criteria were derived to establish the existence of unbounded solutions. Sufficient conditions were determined for uniform exponential stability of linear systems with variable coefficients. Explicit results are attained using the Bohl–Perron theorem. Compared with other results, the resultant criterion does not insert a so called M-matrix to define stability. To detect the existence of positive solutions of linear differential equations with delayed argument, new integral criteria were derived.

A symmetric system modelled by two Schrödinger equations was examined, and sufficient conditions were defined for existence of periodic and chaotic solutions. Evidence is based on Melnikov-type analysis topological degree.

In numerical applications, an iterative algorithm was proposed for solution of nonlinear partial differential equations based on convolution integral. Convergence analysis of iterative scheme was defined

In algebraic hyperstructures, results were derived for systems and ambiguous structures of matrices, and examples of weak matrices (Hv-matrices) constructed from ordered semigroups were found. Conditions were defined for utilization of Mesarovic-Takahara structured systems and multi automatics in analysis of processes and signals.

In 2015 members of the department published 20 papers in impact journals and 6 papers were registered in Scopus and WoS.

Major Research Projects

Oscillatory and Asymptotic Characteristics of Differential Equations – GAČR 201/08/0469

Investigator: Josef Diblík

Representation of Dynamic Systems Solution, Numerical Algorithms – FEKT - S-14-2200

Investigator: Zdeněk Šmarda

Selected Publications

LIN, R.; ZHAO, Y.; ŠMARDA, Z.; KHAN, Y.; WU, Q. Newton-Kantorovich and Smale uniform type convergence theorem for a deformed Newton method in Banach spaces. *Abstract and Applied Analysis.* 2014. 2013(ID 923898). p. 1 - 8. ISSN 1085-3375. (IF(2013)=1,274).

MEDVEĎ, M.; POSPÍŠIL, M.; ŠKRIPKOVÁ, L. On exponential stability of nonlinear fractional multidelay integro-differential equations defined by pairwise permutable matrices. *APPLIED MATHEMATICS AND COMPUTATION.* 2014. 227(1). p. 456 - 468. ISSN 0096-3003. (IF(2013)=1,6).

BAŠTINEC, J.; BEREZANSKY, L.; DIBLÍK, J.; ŠMARDA, Z. On a delay population model with a quadratic nonlinearity without positive steady state. *APPLIED MATHEMATICS AND COMPUTATION.* 2014. 2014(227). p. 622 - 629. ISSN 0096-3003. (IF(2013)=1,6).

KŘEHLÍK, Š. Vlastnosti kvazi-multiautomatů tvořených hypergrupou lineárních diferenciálních operátorů v Jacobiho tvaru. *South Bohemia Mathematical Letters.* 2014. 2014(1). p. 1 - 9. ISSN 1804-1450.

FEČKAN, M.; POSPÍŠIL, M. Persistence of periodic orbits in periodically forced impact systems. *Mathematica Slovaca.* 2014. 64(1). p. 101 - 118. ISSN 0139-9918. (IF(2013)=0,451).

STEVIČ, S.; DIBLÍK, J.; ŠMARDA, Z. On periodic and solutions converging to zero of some systems of differential-difference equations. *APPLIED MATHEMATICS AND COMPUTATION.* 2014. 2014(227). p. 43 - 49. ISSN 0096-3003. (IF(2013)=1,6).

TOBOLOVÁ, M.; CHMELAŘ, M.; PROVAZNÍK, I.; ŘEZNÍČEK, Z.; KABEŠ, R.; BAŠTINEC, J. Testing the Effects of Micro-Pulse Stimulation on Blood Circulation Using the Thermodynamic Sensors. *Journal of Biosensors & Bioelectronics.* 2014. 5(147). p. 1 - 7. ISSN 2155-6210.

FARAZ, N.; KHAN, Y.; ŠMARDA, Z. A novel iterative scheme and its application to differential equations. *The Scientific World Journal.* 2014. 2014(ID 605376). p. 1 - 5. ISSN 1537-744X. (IF(2013)=1,219).

HLINĚNÁ, D.; KALINA, M.; KRÁĽ, P. A class of implications related to Yager's f-implications. *INFORMATION SCIENCES.* 2014. 2014(260). p. 171 - 184. ISSN 0020-0255. (IF(2013)=3,893).

DIBLÍK, J.; STAVROULAKIS, I.; CHATZARAKIS, G.; MILIARAS, G. Classification of neutral difference equations of any order with respect to the asymptotic behavior of their solutions. *APPLIED MATHEMATICS AND COMPUTATION.* 2014. 2014(227). p. 77 - 89. ISSN 0096-3003. (IF(2013)=1,6).

DIBLÍK, J.; IRIČANIN, B.; STEVIČ, S.; ŠMARDA, Z. Note on the existence of periodic solutions of a class of systems of differential-difference equations. *APPLIED MATHEMATICS AND COMPUTATION.* 2014. 2014(232). p. 922 - 928. ISSN 0096-3003. (IF(2013)=1,6).

KOVÁR, M.; CHERNIKAVA, A. On the Proof of the Existence of Undominated Strategies in Normal Form Games. *AMERICAN MATHEMATICAL MONTHLY.* 2014. 121(04). p. 332 - 337. ISSN 0002-9890. (IF(2013)=0,315).

DIBLÍK, J.; HALFAROVÁ, H. General explicit solution of planar weakly delayed linear discrete systems and pasting its solutions. *Abstract and Applied Analysis.* 2014. 2013(2013). p. 1 - 37. ISSN 1085-3375. (IF(2013)=1,274).

BRANČÍK, L.; KOLÁŘOVÁ, E. Application of Stochastic Differential-Algebraic Equations in Hybrid MTL Systems Analysis. *Elektronika Ir Elektrotechnika.* 2014. 20(5). p. 41 - 45. ISSN 1392-1215. (IF(2013)=0,445).

NOVÁK, M. n-ary hyperstructures constructed from binary quasi-ordered semigroups. *Analele Stiintifice Ale Universitatii Ovidius Constanta, Seria Matematica.* 2014. 2014 (22)(3). p. 147 - 168. ISSN 1224-1784. (IF(2013)=0,23).

DIBLÍK, J.; MORÁVKOVÁ, B. Representation of the solutions of linear discrete systems with constant coefficients and two delays. *Abstract and Applied Analysis.* 2014. 2014(1). p. 1 - 19. ISSN 1085-3375. (IF(2013)=1,274).

DIBLÍK, J.; VÍTOVEC, J. Asymptotic behavior of solutions of systems of dynamic equations on time scales in a set whose boundary is a combination of strict egress and strict ingress points. *APPLIED MATHEMATICS AND COMPUTATION.* 2014. 238(6). p. 289 - 299. ISSN 0096-3003. (IF(2013)=1,6).

FUSEK, M.; MICHÁLEK, J. Statistical analysis of type I multiply left-censored samples from exponential distribution. *JOURNAL OF STATISTICAL COMPUTATION AND SIMULATION.* 2014. 2014(5). p. 1 - 16. ISSN 0094-9655. (IF(2013)=0,713).

LIN, R.; REN, H.; ŠMARDA, Z.; WU, Q.; KHAN, Y.; HU, J. New families of third-order iterative methods for finding multiple roots. *Journal of Applied Mathematics.* 2014. 2014(ID 812072). p. 1 - 9. ISSN 1110-757X. (IF(2013)=0,72).

CHVALINA, J.; MAYEROVÁ, Š. On certain proximities and preorderings on the transposition hypergroups of linear first-order partial differential operators. *Analele Stiintifice Ale Universitatii Ovidius Constanta, Seria Matematica.* 2014. 2014(22). p. 85; (19 p.). ISSN 1224-1784. (IF(2013)=0,23).

VÍTOVEC, J. Critical oscillation constant for Euler-type dynamic equations on time scales. *APPLIED MATHEMATICS AND COMPUTATION.* 2014. 243(7). p. 838 - 848. ISSN 0096-3003. (IF(2013)=1,6).

HLINĚNÁ, D.; KRÁĽ, P.; KALINA, M. Pre-orders and Orders Generated by Conjunctive Uninorms. *Communications in Computer and Information Science.* 2014. 2014(444). p. 307 - 316. ISSN 1865-0929.

STEVIČ, S.; DIBLÍK, J.; IRIČANIN, B.; ŠMARDA, Z. On a solvable system of rational difference equations. *JOURNAL OF DIFFERENCE EQUATIONS AND APPLICATIONS.* 2014. 2014(20)(5-6). p. 811 - 825. ISSN 1023-6198. (IF(2013)=0,861).

DIBLÍK, J.; NOWAK, C.; SIEGMUND, S. A general Lipschitz uniqueness criterion for scalar ordinary differential equations. *Electronic Journal of Qualitative Theory of Differential Equations.* 2014. 34(2014). p. 1 - 6. ISSN 1417-3875. (IF(2013)=0,638).

RAJMIC, P.; HOŠEK, J.; FUSEK, M.; ANDREEV, S.; STECÍK, J. Simplified Probabilistic Modelling and Analysis of Enhanced Distributed Coordination Access in IEEE 802.11. *Computer Journal.* 2014. 57(11). p. 1 - 13. ISSN 1460-2067.

BAŠTINEC, J.; KHUSAINOV, D.; DEMCHENKO, H. Optimal control of the heating process without delay. *Bulletin Kiev University, series: physics and Mathematics.* 2014. 2014(1). p. 203 - 206. ISSN 1812-5409.

FEČKAN, M.; POSPÍŠIL, M. Note on fractional difference Gronwall inequalities. *Electronic Journal of Qualitative Theory of Differential Equations.* 2014. 2014(44). p. 1 - 18. ISSN 1417-3875. (IF(2013)=0,638).

DIBLÍK, J.; CHUPÁČ, R.; RŮŽIČKOVÁ, M. Existence of unbounded solutions of a linear homogenous system of differential equations with two delays. *DISCRETE AND CONTINUOUS DYNAMICAL SYSTEMS-SERIES B.* 2014. 19(2014). p. 2447 - 2459. ISSN 1531-3492. (IF(2013)=0,628).

DIBLÍK, J.; KÚDELČÍKOVÁ, M.; JANGLAJEW, K. An explicit coefficient criterion for the existence of positive solutions to the linear advanced equation. *DISCRETE AND CONTINUOUS DYNAMICAL SYSTEMS-SERIES B.* 2014. 19(2014). p. 2461 - 2468. ISSN 1531-3492. (IF(2013)=0,628).

DIBLÍK, J. A note on explicit criteria for the existence of positive solutions to the linear advanced equation \dot (t) = c(t)x(t + \tau). *APPLIED MATHEMATICS LETTERS.* 2014. 35(2014). p. 72 - 76. ISSN 0893-9659. (IF(2013)=1,48).

DIBLÍK, J.; FEČKAN, M.; POSPÍŠIL, M. On the new control functions for linear discrete delay systems. *SIAM JOURNAL ON CONTROL AND OPTIMIZATION.* 2014. 65(1). p. 1745 - 1760. ISSN 0363-0129. (IF(2013)=1,389).

DIBLÍK, J.; DZHALLADOVA, I.; RŮŽIČKOVÁ, M. Stabilization of company-s income modeled by a system of discrete stochastic equations. *Advances in Difference Equations.* 2014. 2014(2014). p. 1 - 8. ISSN 1687-1847. (IF(2013)=0,634).

DIBLÍK, J.; KÚDELČÍKOVÁ, M. New explicit integral criteria for the existence of positive solutions to the linear advanced equation $\dot x(t) = c (t) x (t + \tau)$. *APPLIED MATHEMATICS LETTERS.* 2014. 38(2014). p. 144 - 148. ISSN 0893-9659. (IF(2013)=1,48).

JÍROVÁ, A.; VÁVROVÁ, M.; FUSEK, M.; JÁROVÁ, K. Residues of selected organohalogen pollutants in the South Moravian rivers, Czech Republic. *Fresenius Environmental Bulletin.* 2014. 23(12B). p. 3410 - 3415. ISSN 1018-4619. (IF(2013)=0,527).

STEVIČ, S.; DIBLÍK, J.; IRIČANIN, B.; ŠMARDA, Z. Solvability of nonlinear difference equations of the fourth order. *Electronic Journal of Differential Equations.* 2014. 2014(264). p. 1 - 14. ISSN 1072-6691. (IF(2013)=0,419).

Bachelor Degree Programme

Matematický seminář
(RNDr. Petr Fuchs, Ph.D.)

Matematika 1
(doc. RNDr. Edita Kolářová, CSc.)

Matematika 2
(prof. RNDr. Jan Chvalina, DrSc.)

Matematika 3
(Mgr. Irena Hlavičková, Ph.D.)

Vybrané partie z matematiky I.
(doc. RNDr. Zdeněk Šmarda, CSc.)

Vybrané partie z matematiky II.
(doc. RNDr. Zdeněk Šmarda, CSc.)

Matematika v elektrotechnice
(RNDr. Petr Fuchs, Ph.D.)

Master Degree Programme

Diferenciální rovnice a jejich použití v elektrotechnice
(prof. RNDr. Josef Diblík, DrSc.)

Maticový a tenzorový počet
(doc. RNDr. Martin Kovár, Ph.D.)

Moderní numerické metody
(doc. RNDr. Jaromír Baštinec, CSc.)

Pravděpodobnost, statistika a operační výzkum
(doc. RNDr. Jaromír Baštinec, CSc.)

Náhodné procesy
(doc. RNDr. Jaromír Baštinec,CSc.)

Kódování v informatice
(RNDr. Petr Fuchs, Ph.D.)

Doctoral Degree Programme

Diskrétní procesy v elektrotechnice
(prof. RNDr. Josef Diblík, DrSc.)

Statistika, stochastické procesy, operační výzkum
(doc. RNDr. Jaromír Baštinec, CSc.)

Laboratories

Computer Laboratories (2) (instruction in Computers and Programming 2, simulation of application mathematical thematic wholes using Matlab, Maple, Mathematica, Petr Fuchs)

Computer Laboratory for Mathematical Modelling (data simulation and processing using StatSoft and MapleSim, Michal Novák)

Department of Microelectronics

Doc. Ing. Jiří Háze, Ph.D.

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Prof. Ing. Jaroslav Boušek, CSc.
Prof. Ing. Jaromír Brzobohatý, CSc.
Prof. Ing. René Kizek, Ph.D.
Prof. Ing. Vladislav Musil, CSc.
Prof. Ing. Radimír Vrba, CSc.

Associate Professors

Doc. RNDr. Vojtěch Adam, Ph.D.
Doc. Ing. Lukáš Fujcik, Ph.D.
Doc. Ing. Jiří Háze, Ph.D.
Doc. Ing. Jaromír Hubálek, Ph.D.
Doc. Ing. Jaroslav Kadlec, Ph.D.
Doc. Ing. Fabian Khateb, Ph.D.
Doc. RNDr. Pavel Kopel, Ph.D.
Doc. Ing. Radek Kuchta, Ph.D.
Doc. Ing. Pavel Legát, CSc.
Doc. Ing. Josef Šandera, Ph.D.
Doc. Ing. Pavel Šteffan, Ph.D.
Doc. Ing. Ivan Szendiuch, CSc.
Doc. RNDr. Libuše Trnková, CSc.
Doc. Ing. František Urban, CSc.
Doc. Ing. Radek Vlach, Ph.D.

Lecturers

Ing. Martin Adámek, Ph.D., Ing. Jana Drbohlavová, Ph.D., Ing. Edita Hejátková, Ing. Vilém Kledrowetz, Ph.D., Ing. Radovan Novotný, Ph.D., Ing. Michal Pavlík, Ph.D., Ing. Jan Prášek, Ph.D., Ing. Roman Prokop, Ph.D., Ing. Michal Řezníček, Ph.D., Ing. Ondřej Sajdl, Ph.D., Ing. Martin Šťáva, Ph.D.

Research Workers

M.Sc. Amitava Moulick, Ph.D., Ing. Nabhan Khatib, Ph.D., Ing. Pavel Neužil, Ph.D., Stella Vallejos Vargas, Dr.

Ph.D. Students

Ing. Jaromír Ambrož, Salma Bay Abo Dabbous, Ing. Ondřej Čožík, Ing. Vojtěch Dvořák, Ing. Pavel Hejlek, Ing. Jiří Hofman, Ing. Milan Holík, Ing. Ondřej Chmela, Ing. David Jaroš, Ing. Michal Kerndl, Ing. Martin Klíma, Ing. Stanislav Krátký, Mgr. Zdeňka Kuchtová, Ing. Hana Kynclová, Ing. Radek Lang, Ing. Vladimír Levek, Ing. Ladislav Macháň, Ing. Milan Matějka, Ing. Barbora Mojrová, Ing. Michal Nicák, Ing. Václav Novotný, Ing. Alexandr Otáhal, Ing. Marián Pristach, Ing. Kateřina Přikrylová, Ing. Boleslav Psota, Ing. Karel Ptáček, Ing. Jiří Pulec, Ing. Zdeněk Pytlíček, Ing. Bc. Pavel Řihák, Ing. Jiří Sedláček, Ing. Josef Skácel, Ing. Jakub Somer, Ing. Ladislav Šeliga, Ing. Radek Vala, Ing. Jan Valíček, Ing. Tomáš Vejmola, Ing. David Veverka, Ing. Doaa Yahya, Ing. Laila Znbill, Ing. Jaromír Žák

Administrative and Technical Staff

Ing. Marek Bohrn, Ph.D., Ing. Martin Buršík, Ph.D., Mgr. Jana Helena Církvová, Ing. Ondřej Frantík, Ph.D., Jarmila Fučíková, Ing. Imrich Gablech, Ing. Radim Hrdý, Ph.D., Ing. Jaroslav Jankovský, PhDr. Jarmila Jurášová, Jana Karásková, Ing. Petr Kosina, Ph.D., Ing. Petra Majzlíková, Ph.D., Mgr. Eva Martincová, Ph.D., RNDr. Michal Masařík, Ph.D., Ing. Břetislav Mikel, Ph.D., Bc. David Nejezchleb, Ing. Jan Pekárek, Ph.D., Ing. Jana Pekárková, Ph.D., Mgr. Michaela Pekarová, Petra Procházková DiS, MUDr. Lucie Rajská, Ing. Vojtěch Svatoš, Dr.techn. Ing. Helena Šimůnková, Ying Xu, MBA, Mgr. Ondřej Zítka

Main Interests

In 2015 the department provided instruction in basic subjects, mainly on electronic components and circuits, and subjects specialized in design of integrated circuits and microelectronic technology in the new system of Bachelor and follow-up Master degree programmes.

Basic and applied research was centred on investigation of integrated circuits, sensors and microelectronic technologies. The main areas of interest included:

- design of voltage, current and mixed mode circuits
- design of circuits with switched capacitors and switched currents
- basic research of memristors, memcapacitors and meminductors
- MEMS structures design and CoventorWare simulation
- methods of signal evaluation for chemo-sensors, optosensors and biosensors, mainly gases and toxic substances
- advanced component, surface and sensor technology
- microelectrodes modified by nanostructures (nanotubes, nanocolumns) using advanced nanotechnologies
- simulation and evaluation of 3D linking systems reliability
- novel methods of thixotropic material nonvacuum deposition in 3D circuits
- reliability of lead-free solders
- advanced methods of semiconductor chips interconnection and packaging
- simulation of electronic kits and packals in ANSYS
- non-conventional application of thick films (sensors, attenuators, shielding, antennas etc).

The department closely cooperated (student exchange placements) with Technical University in Sofia (Bulgaria), TU Ilmenau and IMMS Erfurt, Germany, and maintained research cooperation with Autoflug, Hamburg, Catalonia University Rovira i Virgili in Tarragona, research laboratory IMEC-KHBO in Belgium, UC Berkeley, UC San Diego, Politecnico Di Torino, and TU Dresden.

WIth Pbt Rožnov pod Radhoštěm, the department worked on new cleaning methods in electronics directly related to manufacture of modern cleaning equipment (with focus on cleaning after soldering and cleaning of templates). Prototypes of sensors developed on the principle of balance thermodynamics (cooperation with HIT s.r.o.) were tested. In cooperation with TU Wien new types of flow sensors were implemented by the LTCC.

With Fill Factory, Rožnov pod Radhoštěm (former Solartec) and research centre ISC Konstanz, we started research on the effect of the surface structure of crystalline quartz cells on their properties.

Major Achievements

The department's staff participated in 3 projects of the 7FP European programmes ARTEMIS JU and ENIAC JU, 3 GAČR, 3 MPO and 1TAČR project.

In June 2015 the department co-organized the international conference 'Electronic Devices and Systems EDS 2015' with participation of Czech and international experts. There were 60 papers on microelectronics and technology.

The group involved in microelectronic technology headed by I.Szendiuch and the company REHM (Dr. Bell) focused on lead-free solders and the influence of controlled atmosphere on the service life and long-term reliability of lead-free soldered connections. Cooperation with Pbt Rožnov and manufacturing companies in the TAČR project on cleaning methods continued in compliance with the requirements of environmental management. Another area of interest was modelling of thermal stress in soldered connections and packaging in ANSYS, including contacting and modelling of semiconductor chip connections. Cooperation with industrial partners started. Design of a unique balance sensor conducted in the framework of a MPO project was completed. Prototypes were tested in industrial applications, and results were presented on Web of Science (ISI). The project 'Board on Board' (EU Euripides) supervised by the French company Thales centred on a new type of substrates on the basis of printed circuit boards in 3D configuration.

The team LabSensNano (Laboratory of Microsensors and Nanotechnology) led by J.Hubálek, involved in the 'Centre of Applied Research SIX' and the Central European Technological Institute, continued research and development of chemical sensors and biosensors for medical and environmental applications, using micro- and nanotechnologies.The group verified a new method of construction of bolometer using the MEMS technology, highly sensitive to remote IR radiation. The development of the 'Lab on a chip' technology continued for ultrafast analysis in a mobile device dimensions, developed procedures for using nanoparticles in air filtration and for medical purposes. The group also developed a technology for creating 3D sensitive sensors of gases from nanostructures. Research results were published in a number of impact journals and presented on Web of Science (ISI).

The team working on custom integrated circuits led by L. Fujcik focused on the development of intelligent submicron structures and systems for modern microsensors and low-input and low-voltage applications. In the framework of the GAČR project P102/11/1379 a concept of small signal digitization was designed and implemented on chip. This universal integrated circuit is to be primarily used for MEMS microsensor signal processing MEMS in vibration diagnostics of rotating machines. A patent was awarded for this structure and results were published in impact journals.

The joint research team of the Department of Microelectronics, CROSS Zlín and NETWORK GROUP, s.r.o. continued work on a sensor for dynamic weighing of vehicles.

The department maintained cooperation with BD Sensors, s.r.o. on the development of a new low-pressure and vacuum pressure sensor.

Another area of cooperation with industrial partners centred on wireless networks and communication protocols with the aim to develop reliable identification systems based on wireless technology by MICRORISC s.r.o.

Research led by Professor Biolek continued within the framework of GAČR 14-19865S and COST LD15033 projects and focused on memsystems, particularly memristors. In cooperation with Technical University Dresden, NamLab Dresden and HP laboratories in Palo Alto, USA models of TiO2 and NbO memristors produced in Brno were characterized and optimized for simulation of extremely extensive memristor networks emulating neuromorphological systems for massive analog parallel computations. Experiments revealed complex nonlinear dynamics of these systems. Theoretical processing led to formulation of new circuit theorems. Results were published in prestigious impact journals.

Major Research Projects

DeNeCoR Devices for Neurocontrol and Neurorehabilitation – ENIAC JU Project 7H13014 (FP7)

Investigator: Radimír Vrba

Theory and Application of Memristors – LD15033, Ministry of Education project

Investigator: Dalibor Biolek

Research and Development of Digitally Tunable Mixed Mode Integrated Circuits – GAČR 102/09/1628

Investigator: Radimír Vrba

Research and Development of Novel Analog Integrated Circuit Principles for Implementable and Portable Battery Operated Biomedical Devices - GA15-21942S

Investigator: Fabian Khateb

WIM Development of a Novel Sensor on the Basis of a Change in Characteristics of Optical Fibers for Application in Systems of High-Speed Dynamic Weighing of Vehicles – TA ČR TA01030859

Investigator: Jaroslav Kadlec

Selected Publications

BIOLEK, Z.; BIOLEK, D.; BIOLKOVÁ, V. (Co) content in Circuits with Memristive Elements. *IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS I- REGULAR PAPERS,* 2015, vol. 62, no. 2, p. 488-496. ISSN: 1549- 8328.

KUMNGERN, M.; KHATEB, F.; KULEJ, T. A digitally programmable gain amplifier for ultra-low- power applications. *ANALOG INTEGRATED CIRCUITS AND SIGNAL PROCESSING,* 2015, vol. 85, no. 3, IF: 0, 468, p. 433-443. ISSN: 0925- 1030.

HOFMAN, J.; HÁZE, J.; SHARP, R.; HOLMES-SIEDLE, A. A Method for In-Situ, Total Ionising Dose Measurement of Temperature Coefficients of Semiconductor Device Parameters. *IEEE TRANSACTIONS ON NUCLEAR SCIENCE,* 2015, vol. 62, no. 6, p. 2525-2531. ISSN: 0018- 9499.

ANNANOUCHM F. E.; ZOUHAIR, H.; VALLEJOS VARGAS, S; UMEK, P.; GUTTMANN, P.; BITTENCOURT, C.; LLOBET, E. Aerosol-assisted CVD-grown WO3 nanoneedles decorated with copper oxide nanoparticles for the selective and humidity- resilient detection of H2S. *ACS applied materials & interfaces,* 2015, vol. 7, no. 12, p. 6842-6851. ISSN: 1944- 8252.

BIOLEK, D.; BIOLKOVÁ, V.; KOLKA, Z.; DOBEŠ, J. Analog Emulator of Genuinely Floating Memcapacitor with Piecewise- Linear Constitutive Relation. *CIRCUITS SYSTEMS AND SIGNAL PROCESSING,* 2015, vol. 2015, no. 4, p. 1-20. ISSN: 0278- 081X.

ELIÁŠ, M.; KLOC, P.; JAŠEK, O.; MAZÁNKOVÁ, V.; TRUNEC, D.; HRDÝ, R.; ZAJÍČKOVÁ, L. Atmospheric pressure barrier discharge at high temperature: Diagnostics and carbon, nanotubes deposition. *Journal of Aplied Physics,* 2015, vol. 117, no. 10, p. 103301- 1 (103301-10 p.) ISSN: 0021- 8979.

SOMER, J.; ŠTEKOVIČ, M.; URBAN, F.; ŠANDERA, J.; SZENDIUCH, I. Bonding of zero- shrink LTCC with alumina ceramics. *SOLDERING & SURFACE MOUNT TECHNOLOGY,* 2015, vol. 27, no. 4, p. 157-163. ISSN: 0954- 0911.

KULEJ, T.; KHATEB, F. Bulk-driven adaptively-biased OTA in 0. 18 um CMOS. *Electronics Letters,* 2015, vol. 2015 (51), no. 6, IF: 0. 930, p. 458-459. ISSN: 0013- 5194.

BIOLEK, Z.; BIOLEK, D.; BIOLKOVÁ, V.; KOLKA, Z. Comments on Pinched Hysteresis Loops of Memristive Elements. *Radioengineering,* 2015, vol. 2015, no. 4, p. 962-967. ISSN: 1210- 2512.

ŠOTNER, R.; JEŘÁBEK, J.; LANGHAMMER, L.; POLÁK, J.; HERENCSÁR, N.; PROKOP, R.; PETRŽELA, J.; JAIKLA, W. Comparison of two solutions of quadrature oscillators with linear control of frequency of oscillation employing modern commercially available devices. *CIRCUITS SYSTEMS AND SIGNAL PROCESSING,* 2015, vol. 34, no. 11, p. 3449-3469. ISSN: 0278- 081X.

VALLEJOS VARGAS, S; GRACIA, I.; BRAVO, J.; FIGUERAS, E.; HUBALEK, J.; CANE, C. Detection of volatile organic compounds using flexible gas sensing devices based on tungsten oxide nanostructures functionalized with Au and Pt nanoparticles. *Talanta,* 2015, vol. 139, no. 15407, p. 27-34. ISSN: 0039- 9140.

DUBEN O., BOUSEK J., DEDINA J., KRATZER J. Dielectric barrier discharge plasma atomizer for hydride generation atomic absorption spectrometry- Performance evaluation for selenium. *Spectrochimica Acta Part B,* 2015, vol. 111, no. 9, p. 57-63. ISSN: 0584- 8547.

BIOLEK, Z.; BIOLEK, D.; BIOLKOVÁ, V. Differential Equations of Ideal Memristors. *Radioengineering,* 2015, vol. 24, no. 2, p. 369-377. ISSN: 1210- 2512.

KHATEB, F.; LAHIRI, A.; PSYCHALINOS, C.; KUMNGERN, M.; KULEJ, T. Digitally programmable low- voltage highly linear transconductor based on promising CMOS structure of differential difference current conveyor. *AEU - International Journal of Electronics and Communications,* 2015, vol. 2015 (69), no. 7, IF: 0. 601, p. 1010-1017. ISSN: 1434- 8411.

HORKÝ, P.; KIZEK, R.; TMEJOVÁ, K.; KENŠOVÁ, R.; CERNEI, N.; KUDR, J.; RUTTKAY-NEDECKÝ, B.; SAPÁKOVÁ, E.; ADAM, V. Effect of Heat Stress on the Antioxidant Activity of Boar Ejaculate Revealed by Spectroscopic and Electrochemical Methods. *INTERNATIONAL JOURNAL OF ELECTROCHEMICAL SCIENCE,* 2015, vol. 10, no. 8, p. 6610-6626. ISSN: 1452- 3981.

PAŇKO, V.; BANÁŠ, S.; BURTON, R.; PTÁČEK, K.; DIVÍN, J.; DOBEŠ, J. Enhanced Model of Nonlinear Spiral High Voltage Divider. *Radioengineering,* 2015, vol. 24, no. 1, p. 130-136. ISSN: 1210- 2512.

KOLKA, Z.; BIOLEK, D.; BIOLKOVÁ, V. Enhanced PSpice Model of TiO2 Memristor. *INTERNATIONAL JOURNAL OF MATERIALS,* 2015, vol. 2, no. 1, p. 25-28. ISSN: 2313- 0555.

KHATEB, F.; KUBÁNEK, D.; PSYCHALINOS, C.; TSIRIMOKOU, G. Fractional-order filters based on low- voltage DDCCs. *Microelectronics Journal,* 2016, vol. 2, no. 1, IF: 0. 836, p. 1-10. ISSN: 0026- 2692.

SHARMA VK., JELEN F., TRNKOVA, L. Functionalized Solid Electrodes for Electrochemical Biosensing of Purine Nucleobases and Their Analogues: A Review. *SENSORS,* 2015, vol. 15, no. 1, p. 1564-1600. ISSN: 1424- 8220.

DRBOHLAVOVÁ, J.; KYNCLOVÁ, H.; HRDÝ, R.; PŘIKRYLOVÁ, K.; SVATOŠ, V.; HUBÁLEK, J. Gold Nanostructured Surface for Electrochemical Sensing and Biosensing: Does Shape Matter?. *ANALYTICAL LETTERS,* 2016, vol. 49, no. 1, p. 135-151. ISSN: 0003- 2719.

SMILEK, J.; KYNCLOVÁ, H.; SEDLÁČEK, P.; PRÁŠEK, J.; KLUČÁKOVÁ, M. Characterization of Nanoporous Membranes with Controlled Permeability. *Czech chemical society symposium series,* 2015, vol. 13, no. 2, p. 133-137. ISSN: 2336- 7202.

SOLOVEI, D.; ŽÁK, J.; MAJZLÍKOVÁ, P.; SEDLÁČEK, J.; HUBÁLEK, J. Chemical Sensor Platform for Non-Invasive Monitoring of Activity and Dehydration. *SENSORS,* 2015, vol. 15, no. 1, p. 1479-1495. ISSN: 1424-8220.

KOLKA, Z.; BIOLEK, D.; BIOLKOVÁ, V. Improved Model of TiO2 Memristor. *Radioengineering,* 2015, vol. 24, no. 2, p. 378-383. ISSN: 1210- 2512.

PSOTA, B.; OTÁHAL, A.; SZENDIUCH, I. Influence of the cavities on the PCB mechanical properties. *CIRCUIT WORLD,* 2015, vol. 41, no. 2, p. 1-6. ISSN: 0305- 6120.

OTÁHAL, A.; SZENDIUCH, I.; ŠIMEK, V.; CRHA, A.; RŮŽIČKA, R. Inovace procesu pokovení průchozích otvorů v DPS. *DPS Elektronika od A do Z,* 2016, č. 1/ 2016, s. 2-3. ISSN: 1805- 5044.

HUBÁLEK, J. Iterative Precise Conductivity Measurement with IDEs. *SENSORS,* 2015, vol. 15, no. 5, p. 12080-12091. ISSN: 1424- 8220.

BIOLEK, D.; BIOLKOVÁ, V.; KOLKA, Z. Kmitočtová analýza filtrů se spínanými kapacitory v SPICE programech metodou rozštěpení uzlu. *Slaboproudý obzor,* 2015, roč. 71, č. 3, s. 6-9. ISSN: 0037- 668X.

Annanouch, F. E.; Gracia, I; Figueras, Llober, E.; Cane, C..; VALLEJOS VARGAS, S. Localized aerosol- assisted CVD of nanomaterials for the fabrication of monolithic gas sensor microarrays. *Sensors and Actuators B: Chemical,* 2015, vol. 216, no. 18270, p. 374-383. ISSN: 0925- 4005.

PEKÁREK, J.; VRBA, R.; PRÁŠEK, J.; JAŠEK, O.; MAJZLÍKOVÁ, P.; PEKÁRKOVÁ, J.; ZAJÍČKOVÁ, L. MEMS Carbon Nanotubes Field Emission Pressure Sensor with simplified design: performance and field emission properties study. *IEEE SENSORS JOURNAL,* 2015, vol. 15, no. 3, p. 1430-1436. ISSN: 1530- 437X.

ŽÁK, J.; HADAŠ, Z.; PEKÁREK, J.; DUŠEK, D.; SVATOŠ, V.; JANÁK, L.; PRÁŠEK, J. Model- based design of artificial zero power cochlear implant. *MECHATRONICS,* 2015, vol. 31, no. NA, p. 30-41. ISSN: 0957- 4158.

BIOLEK, D.; KOLKA, Z.; BIOLKOVÁ, V.; BIOLEK, Z.; NOSEK, J. Modelování a simulace rozsáhlých memristivních sítí. *Slaboproudý obzor,* 2015, roč. 71, č. 4, s. 1-6. ISSN: 0037- 668X.

MACHÁŇ, L.; ŠTEFFAN, P. Multichannel Laboratory Device for Measurement of Smart Concrete Material Properties. *Advanced Materials Research, (online),* 2015, vol. 1124, no. 200, p. 249-256. ISSN: 1662- 8985.

VALLEJOS VARGAS, S; GRACIA, I.; FIGUERAS, E.; CANE, C. Nanoscale Heterostructures Based on Fe2O3@WO3- x Nanoneedles and Their Direct Integration into Flexible Transducing Platforms for Toluene Sensing. *ACS applied materials & interfaces,* 2015, vol. 7, no. 33, p. 18638-18649. ISSN: 1944- 8252.

MOZALEV, A.; VAZQUEZ, R.; BENDOVÁ, M.; PYTLÍČEK, Z.; LLOBET, E.; HUBÁLEK, J. Porous-alumina-assisted formation of 3- D nanostructured niobium oxide films for advanced sensing applications. *Procedia Engineering,* 2015, vol. 2015, no. 120, p. 435-438. ISSN: 1877- 7058.

BIOLEK, Z.; BIOLEK, D. Použití memristivního obvodu k měření kapacit. *Slaboproudý obzor,* 2015, roč. 71, č. 4, s. 7-10. ISSN: 0037- 668X.

KUBÁNEK, D.; KHATEB, F.; TSIRIMOKOU, G.; PSYCHALINOS, C. Practical Design and Evaluation of Fractional- Order Oscillator Using Differential Voltage Current Conveyors. *CIRCUITS SYSTEMS AND SIGNAL PROCESSING,* 2016, vol. 2016 (), no., IF: 1. 118, p. 1-10. ISSN: 0278- 081X.

VALA, R.; ŘIHÁK, P. Problematika oprav FBGA komponentů, jejich výměna a následná analýza. *DPS Elektronika od A do Z,* 2015, roč. 6., č. 3, s. 36-37. ISSN: 1805- 5044.

BIOLEK, D.; BIOLEK, Z.; BIOLKOVÁ, V.; KOLKA, Z. Reliable Modeling of Ideal Generic Memristors via State-Space Transformation. *Radioengineering,* 2015, vol. 24, no. 2, p. 393-407. ISSN: 1210- 2512.

ROUBAL, Z.; MARCOŇ, P.; SZABÓ, Z.; SAJDL, O.; VESELÝ, I.; ZEZULKA, F. Remote measurement and performance modeling for smart grid. *Journal of the Technical University at Plovdiv. Fundamental Sciences and Applications,* 2015, vol. 1, no. 21, p. 111-114. ISSN: 1310- 8271.

MAJZLÍKOVÁ, P.; ZAJÍČKOVÁ, L.; HUBÁLEK, J.; SEDLÁČEK, J.; PRÁŠEK, J.; PEKÁREK, J.; SVATOŠ, V.; BANNOV, A.; JAŠEK, O.; SYNEK, P.; ELIÁŠ, M. Sensing Properties of Multiwalled Carbon Nanotubes Grown in MW Plasma Torch: Electronic and Electrochemical Behavior, Gas Sensing, Field Emission, IR Absorption. *SENSORS,* 2015, vol. 15, no. 2, p. 2644-2661. ISSN: 1424- 8220.

ZEZULKA, F.; SZABÓ, Z.; VESELÝ, I.; MARCOŇ, P.; BRADÁČ, Z.; SAJDL, O. Smart Energo Model. *IFAC-PapersOnLine (ELSEVIER),* 2015, vol. 48, no. 4, p. 404-408. ISSN: 2405- 8963.

BIOLEK, Z.; BIOLEK, D.; BIOLKOVÁ, V. Specification of one classical fingerprint of ideal memristor. *Microelectronics Journal,* 2015, vol. 46, no. 1, p. 298-300. ISSN: 0026- 2692.

ČÍHALOVÁ, K.; CHUDOBOVA, D.; KIZEK, R.; MICHÁLEK, P.; MOULICK, A.; GURÁŇ, R.; KOPEL, P.; ADAM, V. Staphylococcus aureus and MRSA Growth and Biofilm Formation after Treatment with Antibiotics and SeNPs. *INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES,* 2015, vol. 16, no. 10, p. 24656-24672. ISSN: 1422-0067.

KOMÍNKOVÁ, M.; KIZEK, R.; MICHÁLEK, P.; ČÍHALOVÁ, K.; GURÁŇ, R.; CERNEI, N.; NEJDL, L.; ŠMERKOVÁ, K.; DOSTÁLOVÁ, S.; CHUDOBOVA, D.; HEGER, Z.; VESELÝ, R.; GUMULEC, J.; KYNICKÝ, J.; XHAXHIU, K.; ZÍTKA, O.; ADAM, V. Study of Linkage between Glutathione Pathway and the Antibiotic Resistance of Escherichia coli from Patients' Swabs. *INTERNATIONAL JOURNAL OF MOLECULAR SCIENCES,* 2015, vol. 16, no. 4, p. 7210-7229. ISSN: 1422- 0067.

KHATEB, F.; KUMNGERN, M.; VLASSIS, S.; PSYCHALINOS, C.; KULEJ, T. Sub- volt fully balanced differential difference amplifier. *JOURNAL OF CIRCUITS SYSTEMS AND COMPUTERS,* 2015, vol. 2015 (24), no. 1, IF: 0. 250, p. 1550005- 1 (1550005-18 p.) ISSN: 0218- 1266.

PIETRIKOVÁ, A.; LUKÁCS, P.; JAKUBÉCZYOVÁ, D.; BALLÓKOVÁ, B.; POTENCKI, J.; TOMASZEWSKI, G.; PEKÁREK, J.; PŘIKRYLOVÁ, K.; FIDES, M. Surface analysis of polymeric substrates used for inkjet printing technology. *CIRCUIT WORLD,* 2016, vol. 42, no. 1, p. 9-16. ISSN: 0305- 6120.

ASCOLI, A.; TETZLAFF, R.; BIOLEK, Z.; KOLKA, Z.; BIOLKOVÁ, V.; BIOLEK, D. The Art of Finding Accurate Memristor Model Solutions. *IEEE Journal on Emerging and Selected Topics in Circuits and Systems,* 2015, vol. 5, no. 2, p. 133-142. ISSN: 2156- 3357.

FERNANDEZ, C.; HEGER, Z.; KIZEK, R.; RAMAKRISHNAPPA, T.; BORUN, A.; FAISAL, N. The Electrochemical Oxidation of Paracetamol and Its Voltammetric Sensing in Biological Samples Based on Screen Printed Graphene Electrodes. *INTERNATIONAL JOURNAL OF ELECTROCHEMICAL SCIENCE,* 2015, vol. 10, no. 9, p. 7440-7452. ISSN: 1452- 3981.

KHATEB, F. The experimental results of the bulk-driven quasi-floating- gate MOS transistor. *AEU - International Journal of Electronics and Communications,* 2015, vol. 2015 (69), no. 1, IF: 0. 601, p. 462-466. ISSN: 1434- 8411.

KHATEB, F.; KUMNGERN, M.; BAY ABO DABBOUS, S.; KULEJ, T.; LAHIRI, A. Ultra low-voltage low- power current conveyor transconductance amplifier. *INDIAN JOURNAL OF PURE & APPLIED PHYSICS,* 2015, vol. 2015 (53), no. 07, IF: 0. 766, p. 478-487. ISSN: 0019- 5596.

BIOLEK, Z.; BIOLEK, D.; BIOLKOVÁ, V.; KOLKA, Z. Variation of a classical fingerprint of ideal memristor. *International Journal of Circuit Theory and Applications.,* 2015, vol. 2015, no. EV, p. 1-5. ISSN: 0098- 9886.

ČOŽÍK, O.; KADLEC, J. Zabezpečení komunikace senzorického systému. *Slaboproudý obzor,* 2015, roč. 71, č. 2, s. 1-7. ISSN: 2336- 5773.

KULEJ, T.; KHATEB, F. 0.4-V bulk-driven differential- difference amplifier. *Microelectronics Journal,* 2015, vol. 2015 (46), no. 5, IF: 0. 836, p. 362-369. ISSN: 0026- 2692.

KHATEB, F.; KULEJ, T.; KUMNGERN, M. 0.5- V DTMOS Median Filter. *AEU - International Journal of Electronics and Communications,* 2015, vol. 69, no. 11, IF: 0. 601, p. 1733-1736. ISSN: 1434- 8411.

KUMNGERN, M.; KHATEB, F. 0.5-V fully differential current conveyor using bulk-driven quasi-floating- gate technique. *IET Circuits, Devices and Systems,* 2016, vol. 10, no. 1, IF: 0. 521, p. 78-86. ISSN: 1751- 858X.

KHATEB, F.; VLASSIS, S.; KUMNGERN, M.; PSYCHALINOS, C.; KULEJ, T.; VRBA, R.; FUJCIK, L. 1 V Rectifier based on bulk-driven quasi-floating- gate differential difference amplifiers. *CIRCUITS SYSTEMS AND SIGNAL PROCESSING,* 2015, vol. 2015 (34), no. 7, IF: 1. 118, p. 2077-2089. ISSN: 0278- 081X.

KHATEB, F.; KUMNGERN, M.; KULEJ, T. 1-V inverting and non-inverting loser-take- all circuit and its applications. *CIRCUITS SYSTEMS AND SIGNAL PROCESSING,* 2015, vol. 2015 (34), no. 8, IF:1.118, p. 1-15. ISSN: 0278- 081X.

Bachelor Degree Programme

Analogové elektronické obvody
(prof. Ing. Dalibor Biolek, CSc.)

Diagnostika a testování elektronických systémů
(Ing. Michal Pavlík, Ph.D.)

Digitální obvody a mikroprocesory
(doc. Ing. Lukáš Fujcik, Ph.D.)

Elektronické součástky
(prof. Ing. Jaroslav Boušek, CSc.)

Návrh vakuových soustav pro technologie
v mikroelektronice (doc. Ing. Josef Šandera, Ph.D.)

Mikroelektronické praktikum
(doc. Ing. Josef Šandera, Ph.D.)

Mikroelektronika a technologie součástek
(doc. Ing. Ivan Szendiuch, CSc.)

Mikrosenzory a mikromechanické systémy
(doc. Ing. Jaromír Hubálek, Ph.D.)

Modelování a počítačová simulace
(prof. Ing. Dalibor Biolek, CSc.)

Návrh a konstrukce elektronických přístrojů
(prof. Ing. Vladislav Musil, CSc.)

Návrh analogových integrovaných obvodů
(doc. Ing. Jiří Háze, Ph.D.)

Optoelektronika a optické komunikace
(doc. Ing. František Urban, CSc.)

Podnikatelské minimum
(doc. Ing. Pavel Legát, CSc.)

Master Degree Programme

Analogové integrované obvody
(doc. Ing. Jiří Háze, Ph.D.)

Aplikovaná počítačová technika
(Ing. Radovan Novotný, Ph.D.)

Digitální integrované obvody
(doc. Ing. Pavel Štefan, Ph.D.)

Integrovaná optoelektronika
(doc. Ing. František Urban, CSc.)

Konstrukce a technologie elektronických zařízení
(prof. Ing. Vladislav Musil, CSc.)

Metody návrhu analogových integrovaných obvodů
(Ing. Roman Prokop, Ph.D.)

Metody návrhu digitálních integrovaných obvodů
(doc. Ing. Lukáš Fujcik, Ph.D.)

Microelectronics in English
(prof. Ing. Jaromír Brzobohatý, CSc.)

Mikroelektronické prvky a struktury
(prof. Ing. Vladislav Musil, CSc.)

Modelování a simulace v mikroelektronice
(doc. Ing. Jaroslav Kadlec, Ph.D.)

Moderní technologie elektronických obvodů
a systémů (doc. Ing. Ivan Szendiuch, CSc.)

Návrh elektronických přístrojů
(doc. Ing. Radek Kuchta, CSc.)

Nové obvodové principy pro návrh integrovaných
systémů (doc. Ing. Fabian Khateb, Ph.D.)

Podnikatelské minimum
(doc. Ing. Pavel Legát, CSc.)

Praktické minimum podnikatele
(doc. Ing. Pavel Legát, CSc.)

Řízení jakosti
(Ing. Radovan Novotný, Ph.D.)

Teorie vzájemného převodu analogového a
číslicového signálu (doc. Ing. Jiří Háze, Ph.D.)

Vakuová technika
(prof. Ing. Jaroslav Boušek, CSc.)

Výroba součástek a konstrukčních prvků
(doc. Ing. Ivan Szendiuch, CSc.)

Doctoral Degree Programme

Mikroelektronické systémy
(prof. Ing. Vladislav Musil, CSc.)

Mikroelektronické technologie
(doc. Ing. Jaromír Hubálek, Ph.D

Laboratories

Laboratory of Electronic Components (instruction in Electronic Components, Petr Kosina, Jaroslav Boušek). New measuring devices were provided by ON Semiconductor.

Laboratory of Analog Circuits and Microelectronic Practice (instruction in Analog Integrated Circuits and Microelectronic Practice, Jiří Háze, Josef Šandera)

Laboratory of Microsensors and Nanotechnologies (research laboratory of chemistry, chemical sensors and biosensors, development of electronic devices, electron microscopy and lithography, dispersive X-ray spectroscopy, Jaromír Hubálek)

Laboratory of Microelectronic Mount Technology and Casing (thick films, solder surface mount, lead-free soldering and casing, instruction in Microelectronics and Component Technology, Manufacturing of Components and Construction Elements, Modern Technology of Electronic Circuits and Systems, student projects, Ivan Szendiuch)

Laboratory of Vacuum Technology (research and development laboratory, Jaroslav Boušek, Josef Šandera)

Laboratory of Microsensors (instruction in Microsensors and Micromechanical Systems, Biosensors, Jaromír Hubálek)

Design Laboratory of Electronic Devices and Systems (instruction in Digital Circuits and Microprocessors, Electronic Systems, student projects, Pavel Šteffan)

Design Laboratory of Integrated Circuits (instruction in Design of Analog Integrated Circuits and Design of Digital Integrated Circuits, student projects, Roman Prokop)

Laboratory of Optoelectronics and Laser Technology (instruction in Optoelectronics, student projects, František Urban)

Computer Laboratory (computer exercises for various subjects, self-study, Internet, David Nejezchleb)

Laboratory for Semiconductor Components Characterization – Testing of Chips (instruction in Manufacturing of Components and Construction Elements, student projects, Jaromír Hubálek)

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Prof. Ing. Lubomír Brančík, CSc.
Prof. Ing. Stanislav Hanus, CSc.
Prof. Ing. Miroslav Kasal, CSc.
Prof. Dr. Ing. Zdeněk Kolka
Prof. Ing. Aleš Prokeš, Ph.D.
Prof. Dr. Ing. Zbyněk Raida
Prof. Ing. Milan Sigmund, CSc.
Prof. Ing. Otakar Wilfert, CSc.

Associate Professors

Doc. Ing. Tomáš Frýza, Ph.D.
Doc. Ing. Tomáš Kratochvíl, Ph.D.
Doc. Ing. Jaroslav Láčík, Ph.D.
Doc. Ing. Roman Maršálek, Ph.D.
Doc. Ing. Jiří Petržela, Ph.D.
Doc. Ing. Jiří Šebesta, Ph.D.

Lecturers

Ing. Viera Biolková, Ing. Jiří Dřínovský, Ph.D., Ing. Lucie Hudcová, Ph.D., Ing. Ivana Jakubová, Ing. Michal Kubíček, Ph.D., Ing. Martin Slanina, Ph.D., Dr. Techn. Ivan Starkov, Ing. Martin Štumpf, Ph.D., Ing. Tomáš Urbanec, Ph.D.

Research Workers

Ing. Jiří Blumenstein, Ph.D., Ing. Libor Boleček, Ph.D., Dr. Techn. Vojtěch Derbek, doc. Ing. Pavol Galajda, CSc., Ing. Tomáš Götthans, Ph.D., Ing. Milan Guzan, Ph.D, Dr. Aniruddha Chandra, Ing. Petr Kadlec, Ph.D., Dr. Ing. Christoph Mecklenbräuker, Ing. Tomáš Mikulášek, Ph.D., Ing. Jiří Miloš, Ph.D., Ing. Ladislav Polák, Ph.D., doc. RNDr. Jitka Poměnková, Ph.D., Ing. Aleš Povalač, Ph.D., Ing. Jan Puskely, Ph.D., Ing. Vladimír Šeděnka, Ph.D., Ing. Roman Šotner, Ph.D.

Ph.D. Students

Ing. Nawfal Al-Zubaidi R-Smith, Ing. Peter Barcík, Ing. Miroslav Cupal, Ing. Vojtěch Dluhý, Ing. Aleš Dobesch, Ing. Michal Harvánek, Ing. Vladimír Hebelka, Ing. Martin Hrabina, Ing. Patrik Hubka, Ing. Ondřej Kaller, Ing. Edward Kasem, Ing. Eva Klejmová, Ing. Martin Kotol, Ing. Jan Král, Ing. David Krutílek, Ing. Zenon Kuder, MSc., Ing. Jan Kufa, Ing. Martin Kufa, Ing. Pavel Kukolev, Ing. Jiří Lambor, Ing. Demian Lekomtcev, Ing. Tobiáš Malach, Ing. Roman Mego, Ing. Michal Mrnka, Ing. Martin Pospíšil, Ing. Miroslav Staněk, Ing. Lenka Tejmlová, Ing. Petr Vašina, Ing. Jan Vélim, Ing. Josef Vychodil, Ing. Ondřej Zach, Ing. Filip Záplata

Administrative and Technical Staff

Ing. Josef Báňa, Ing. Philip Bělohlávek, Bohuslava Raidova, Petra Šípová, Aleš Vanžura, Jaroslav Voráč

Main Interests

Research is focused on modern electronic circuits, novel signal processing methods, microwave circuits and antennas. Our areas of interest are mobile, satellite and optical communications, digital television technology and video technology, microprocessor technology, low-frequency and audio electronics, and electromagnetic compatibility (EMC).

In 2015 research was financed through 5 projects of Czech Science Foundation (GA ČR) and 6 projects of the Technology Agency of the Czech Republic (TA ČR). The department was involved in a project of Ministry of Industry and Trade (MPO ČR) and 3 internal grants of Brno University of Technology.

The department staff participated in 2 European projects FP7 STREP and CATRENE EU, 7 projects of international cooperation COST, 1 SoMoPro project of the South Moravian Centre for International Mobility, and cooperated in contracts for leading international partners (Volkswagen AG, CISC Semiconductor GmbH) and over 20 direct contracts for Czech companies (Škoda Auto, Evektor, CSRS, MSV Elektronika).

Research results are immediately incorporated in Bachelor, Master and doctoral degree programmes. Upgrading of the educational process was supported by the ESF development projects and the operational programme OP VK, co-financed by Ministry of Education.

The department cooperates with many organizations and societies. Staff members are engaged in the committee of the Czech and Slovak section of IEEE and Radioengineering Society. There has been active cooperation with the Czech Electrotechnical Society. The department supports activities of the Student Section of IEEE at Brno University of Technology and Radioclub OK2KOJ, and is a collective member of the international organization AMSAT.

Major Achievements

The department participates, in cooperation with Departments of Telecommunications, Microelectronics, Theoretical and Experimental Electrical Engineering and Physics, in the regional 'Centre of Applied Research SIX' (Centre of Sensor, Information and Communication Systems). The centre has been in operation since 2013, and besides institutional support it uses national and European grants to employ research staff and Ph.D. students. Research teams of the centre's two sections – microwave technology and wireless technology – participate in several TA ČR projects on applied research, and in projects of the European Agency CATRENE.

In 2015 the department joint free international activities of COST (IC1407 Advanced Characterisation and Classification of Radiated Emissions in Densely Integrated Technologies (ACCREDIT), IC1105 3D Content Creation, Coding and Transmission over Future Media Networks (3D-ConTourNet) and IC1305 Network for Sustainable Ultrascale Computing (NESUS).

The department was involved in national basic and applied research projects, in an international projects H2020 ADWICE (Advanced Wireless Technologies for Clever Engineering), CATRENE CORTIF (Coexistence of RF Transmissions in the Future) a FP7 STREP nanoCOPS (Nanoelectronic COupled Problems Solutions).

Cooperation with Volkswagen AG, Germany and CISC Semiconductor GmbH, Austria continued as well as national cooperation with Škoda Auto, Evektor, CSRS, IMA, MSV Elektronika etc.

Major Research Projects

Advanced Wireless Technologies for Clever Engineering (ADWICE) – European project H2020-WIDESPREAD-2014-1 č. 662140

Investigator: Zbyněk Raida

Coexistence of RF Transmissions In the Future (CORTIF) – European project CATRENE no. CA116

Investigator: Tomáš Kratochvíl

Nanoelectronic Coupled Problems Solutions (nanoCOPS) – European project FP7 STREP no. 619166

Investigator: Tomáš Kratochvíl

Chaotic Tangles in Subsystems of Radiofrequency Channel – National basic research project GA ČR no. 15/22712S

Investigator: Jiří Petržela

Hybrid Wireless Technology for Municipal Networks– National applied research project MPO ČR no- RF-TI4/148

Investigator: Zdeněk Kolka

Selected Publications

ASCOLI, A.; TETZLAFF, R.; BIOLEK, Z.; KOLKA, Z.; BIOLKOVÁ, V.; BIOLEK, D. The Art of Finding Accurate Memristor Model Solutions. *IEEE Journal on Emerging and Selected Topics in Circuits and Systems,* 2015, vol. 5, no. 2, p. 133-142. ISSN: 2156- 3357.

BARCÍK, P.; WILFERT, O.; LEITGEB, E.; HUDCOVÁ, L. OPTIMAL DISTRIBUTION OF THE OPTICAL INTENSITY WITHIN A LASER BEAM FOR OPTICAL WIRELESS COMMUNICATIONS. *IET Optoelectronics,* 2015, vol. 9, no. 5, p. 263-268. ISSN: 1751- 8768.

BARTOŠ, M. Optimalizace váhové funkce amplitudy WLFM radarových pulsů pomocí genetického algoritmu. *ElectroScope - http://www.electroscope.zcu. cz,* 2015, roč. 2015, č. 1, s. 1-5. ISSN: 1802- 4564.

BIOLEK, D.; BIOLEK, Z.; BIOLKOVÁ, V.; KOLKA, Z. Reliable Modeling of Ideal Generic Memristors via State-Space Transformation. *Radioengineering,* 2015, vol. 24, no. 2, p. 393-407. ISSN: 1210- 2512.

BIOLEK, D.; BIOLKOVÁ, V.; KOLKA, Z.; DOBEŠ, J. Analog Emulator of Genuinely Floating Memcapacitor with Piecewise- Linear Constitutive Relation. *CIRCUITS SYSTEMS AND SIGNAL PROCESSING,* 2015, vol. 2015, no. 4, p. 1-20. ISSN: 0278- 081X.

BIOLEK, D.; KOLKA, Z.; BIOLKOVÁ, V.; BIOLEK, Z.; NOSEK, J. Modelování a simulace rozsáhlých memristivních sítí. *Slaboproudý obzor,* 2015, roč. 71, č. 4, s. 1-6. ISSN: 0037- 668X.

BIOLEK, Z.; BIOLEK, D.; BIOLKOVÁ, V. Specification of one classical fingerprint of ideal memristor. *Microelectronics Journal,* 2015, vol. 46, no. 1, p. 298-300. ISSN: 0026- 2692.

BIOLEK, Z.; BIOLEK, D.; BIOLKOVÁ, V. Differential Equations of Ideal Memristors. *Radioengineering,* 2015, vol. 24, no. 2, p. 369-377. ISSN: 1210- 2512.

BIOLEK, Z.; BIOLEK, D.; BIOLKOVÁ, V.; KOLKA, Z. Comments on Pinched Hysteresis Loops of Memristive Elements. *Radioengineering,* 2015, vol. 2015, no. 4, p. 962-967. ISSN: 1210- 2512.

BIOLEK, Z.; BIOLEK, D.; BIOLKOVÁ, V.; KOLKA, Z. Variation of a classical fingerprint of ideal memristor. *International Journal of Circuit Theory and Applications.,* 2015, vol. 2015, no. EV, p. 1-5. ISSN: 0098- 9886.

BOLEČEK, L.; ŘÍČNÝ, V. Influence of Stereoscopic Camera System Alignment Error on the Accuracy of 3D Reconstruction. *Radioengineering,* 2015, vol. 24, no. 2, p. 610-620. ISSN: 1210- 2512.

CUPAL, M.; RAIDA, Z. Bezdrátový přenos energie uvnitř automobilu. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 17, č. 6, s. 180-185. ISSN: 1213- 1539.

GÖTTHANS, T.; PETRŽELA, J. New class of chaotic systems with circular equilibrium. *NONLINEAR DYNAMICS,* 2015, vol. 2015, no. 04, p. 1-7. ISSN: 0924- 090X.

GUZAN, M. Variations of boundary surface in Chua' s circuit. *Radioengineering,* 2015, vol. 24, no. 3, p. 814-823. ISSN: 1210- 2512.

HEININGER, H.; PROKEŠ, A. Inductively Coupled Sensing Nodes. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, no. 1, p. 1-5. ISSN: 1213- 1539.

CHANDRA, A. et al. Double threshold- based cooperative spectrum sensing for a cognitive radio network with improved energy detectors. *IET Communications,* 2015, vol. 9, no. 18, p. 2216-2226. ISSN: 1751- 8628.

CHANDRA, A.; BLUMENSTEIN, J.; MIKULÁŠEK, T.; VYCHODIL, J.; MARŠÁLEK, R.; PROKEŠ, A.; ZEMEN, T.; MECKLENBRÄUKER, C. Serial subtractive deconvolution algorithms for time-domain ultra wide band in- vehicle channel sounding. *IET Intelligent Transport Systems,* 2015, vol. 9, no. 9, p. 870-880. ISSN: 1751- 9578.

JEŘÁBEK, J.; ŠOTNER, R.; DOSTÁL, T.; VRBA, K. Simple Resistor-less Generator Utilizing Z- copy Controlled Gain Voltage Differencing Current Conveyor for PWM Generation. *Elektronika Ir Elektrotechnika,* 2015, vol. 21, no. 5, p. 28-34. ISSN: 1392- 1215.

KOLKA, Z.; BIOLEK, D.; BIOLKOVÁ, V. Enhanced PSpice Model of TiO2 Memristor. *INTERNATIONAL JOURNAL OF MATERIALS,* 2015, vol. 2, no. 1, p. 25-28. ISSN: 2313- 0555.

KOLKA, Z.; BIOLEK, D.; BIOLKOVÁ, V. Improved Model of TiO2 Memristor. *Radioengineering,* 2015, vol. 24, no. 2, p. 378-383. ISSN: 1210- 2512.

KORÁB, P.; POMĚNKOVÁ, J. Access to credit of SMES in the Czech republic during the financial crisis and in the post- crisis period. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis,* 2015, vol. 63, no. 4, p. 1297-1302. ISSN: 1211- 8516.

KOTOL, M. Výkonová bilance laserového dálkoměru. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 17, č. 3, s. 1-4. ISSN: 1213- 1539.

KRUTÍLEK, D.; MRNKA, M.; HEBELKA, V.; RAIDA, Z. Integrovaná dvoupásmová flíčkovo- monopólová anténa. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 17, č. 2, s. 33-36. ISSN: 1213- 1539.

KUČEROVÁ, Z.; POMĚNKOVÁ, J. Financial and Trade Integration of Selected EU Regions: Dynamic Correlation and Wavelet Approach. *Journal of Economics,* 2015, vol. 63, no. 7, p. 686-704. ISSN: 0013- 3035.

KUKOLEV, P.; CHANDRA, A.; MIKULÁŠEK, T.; PROKEŠ, A.; ZEMEN, T.; MECKLENBRÄUKER, C. In-vehicle channel sounding in the 5.8- GHz band. *EURASIP Journal on Wireless Communications and Networking,* 2015, vol. 2015, no. 1, p. 1-9. ISSN: 1687- 1499.

LEKOMTCEV, D.; MARŠÁLEK, R. Evaluation of Kolmogorov - Smirnov Test and Energy Detector Techniques for Cooperative Spectrum Sensing in Real Channel Conditions. *TELFOR Journal,* 2015, vol. 7, no. 1, p. 31-36. ISSN: 1821- 3251.

MLÝNEK, P.; MIŠUREC, J.; FUJDIAK, R.; KOLKA, Z.; POSPÍCHAL, L. Heterogeneous Networks for Smart Metering – Power Line and Radio Communication. *Elektronika Ir Elektrotechnika,* 2015, vol. 21, no. 2, p. 85-92. ISSN: 1392- 1215.

MRNKA, M.; RAIDA, Z. Enhanced Gain Dielectric Resonator Antenna Based on the Combination of Higher Order Modes. *IEEE Antennas and Wireless Propagation Letters,* 2015, vol. PP, no. 99, p. 1-4. ISSN: 1536- 1225.

PETRŽELA, J. Chaotic behaviour of state variable filters with saturation- type integrators. *Electronics Letters,* 2015, vol. 51, no. 15, p. 1159-1161. ISSN: 0013- 5194.

PÍTRA, K.; RAIDA, Z.; LÁČÍK, J. Low-Profile Circularly Polarized Antenna Exploiting Fabry- Perot Resonator Principle. *Radioengineering,* 2015, vol. 24, no. 4, p. 898-905. ISSN: 1210- 2512.

POLÁK, L.; KALLER, O.; KLOZAR, L.; ŠEBESTA, J.; KRATOCHVÍL, T. Exploring and Measuring Possible Co-Existences between DVB-T2- Lite and LTE Systems in Ideal and Portable Fading Channels. *J APPL RES TECHNOL,* 2015, vol. 13, no. 1, p. 32-44. ISSN: 1665- 6423.

POLÁK, L.; KLOZAR, L.; KALLER, O.; ŠEBESTA, J.; SLANINA, M.; KRATOCHVÍL, T. Study of Coexistence between Indoor LTE Femtocell and Outdoor-to-Indoor DVB-T2- Lite Reception in a Shared Frequency Band. *EURASIP Journal on Wireless Communications and Networking,* 2015, vol. 2015, no. 114, p. 1-14. ISSN: 1687-1499.

POMĚNKOVÁ, J.; MARŠÁLEK, R. Empirical evidence of ideal filter approximation: pheriperal and selected EU countries application. *PRAGUE ECON PAP,* 2015, no. 5, p. 485-502. ISSN: 1210- 0455.

POVODA, L.; BURGET, R.; MAŠEK, J.; CVRK, L. Automatické rozpoznávanie emócií z českého textu pomocou umelej inteligencie. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 17, č. 1, s. 15-18. ISSN: 1213- 1539.

PUSKELY, J.; URBANEC, T.; MIKULÁŠEK, T.; RAIDA, Z.; BARTYZAL, J.; ŘEŘICHA, V. Novel Planar Horn Antenna for 75/ 85 GHz Experimental Wireless Link. *Radioengineering,* 2015, vol. 24, no. 3, p. 681-687. ISSN: 1210- 2512.

SLEZÁK, J.; GÖTTHANS, T. Design of Passive Analog Electronic Circuits Using Hybrid Modified UMDA algorithm. *Radioengineering,* 2015, vol. 2015 (24), no. 1, p. 161-170. ISSN: 1210- 2512.

STANĚK, M.; SIGMUND, M. Psychological Stress Detection in Speech Using Return-to- opening Phase Ratios in Glottis. *Elektronika Ir Elektrotechnika,* 2015, vol. 21, no. 5, p. 59-63. ISSN: 1392- 1215.

STANĚK, M.; SIGMUND, M. Finding the Most Uniform Changes in Vowel Polygon Caused by Psychological Stress. *Radioengineering,* 2015, vol. 24, no. 2, p. 604-609. ISSN: 1210- 2512.

ŠEVČÍK, B.; BRANČÍK, L. Signaling Technique Using Inverse Exponential Function for High-Speed On- Chip Interconnects. *WSEAS TRANSACTIONS on COMMUNICATIONS,* 2015, vol. 14, no. 54, p. 470-476. ISSN: 1109-2742.

ŠOTNER, R.; HERENCSÁR, N.; JEŘÁBEK, J.; VRBA, K.; DOSTÁL, T.; JAIKLA, W.; METIN, B. Novel first-order all-pass filter applications of z- copy voltage differencing current conveyor. *INDIAN JOURNAL OF PURE & APPLIED PHYSICS,* 2015, vol. 53, no. 8, p. 537-545. ISSN: 0019- 5596.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; DOSTÁL, T.; VRBA, K. Design of Z-copy controlled- gain voltage differencing current conveyor based adjustable functional generator. *Microelectronics Journal,* 2015, vol. 46, no. 2, p. 143-152. ISSN: 0026- 2692.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; PETRŽELA, J.; DOSTÁL, T.; VRBA, K. First- order adjustable transfer sections for synthesis suitable for special purposes in constant phase block approximation. *AEU - International Journal of Electronics and Communications,* 2015, vol. 69, no. 9, p. 1334-1345. ISSN: 1434- 8411.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; VRBA, K. Design of the simple oscillator with linear tuning and pi/ 4 phase shift based on emulator of the modified current differencing unit. *IEICE Electronics Express,* 2015, vol. 12, no. 19, p. 1-7. ISSN: 1349- 2543.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; VRBA, K.; DOSTÁL, T. Features of multi-loop structures with OTAs and adjustable current amplifier for second-order multiphase/ quadrature oscillators. *AEU - International Journal of Electronics and Communications,* 2015, vol. 69, no. 5, p. 814-822. ISSN: 1434- 8411.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; VRBA, K.; LAHIRI, A.; DOSTÁL, T. Study of Small- signal Model of Simple CMOS Amplifier with Instability Compensation of Positive Feedback Loop. *Measurement Science Review,* 2015, vol. 15, no. 3, p. 139-151. ISSN: 1335- 8871.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; ŽÁK, T.; JAIKLA, W.; VRBA, K. Modified Current Differencing Unit and its Application for Electronically Reconfigurable Simple First- order Transfer Function. *ADV ELECTR COMPUT EN,* 2015, vol. 15, no. 1, p. 3-10. ISSN: 1582- 7445.

ŠOTNER, R.; JEŘÁBEK, J.; LANGHAMMER, L.; POLÁK, J.; HERENCSÁR, N.; PROKOP, R.; PETRŽELA, J.; JAIKLA, W. Comparison of two solutions of quadrature oscillators with linear control of frequency of oscillation employing modern commercially available devices. *CIRCUITS SYSTEMS AND SIGNAL PROCESSING,* 2015, vol. 34, no. 11, p. 3449-3469. ISSN: 0278- 081X.

ŠOTNER, R.; PETRŽELA, J.; JEŘÁBEK, J.; DOSTÁL, T. Reconnection-less OTA- based Biquad Filter with Electronically Reconfigurable Transfers. *Elektronika Ir Elektrotechnika,* 2015, vol. 21, no. 3, p. 33-37. ISSN: 1392-1215.

ŠTUMPF, M. Analysis of Dispersive Power-Ground Structures Using the Time- Domain Contour Integral Method. *IEEE Transaction on Electromagnetic Compatibility,* 2015, vol. 57, no. 2, p. 224-231. ISSN: 0018- 9375.

ŠTUMPF, M.; LAGER, I. The Time- Domain Optical Theorem in Antenna Theory. *IEEE Antennas and Wireless Propagation Letters,* 2015, vol. 14, no. 1, p. 895-897. ISSN: 1536- 1225.

ŠTUMPF, M.; RAIDA, Z. Pulsed Electromagnetic Waves Between Parallel Plates: The Modal-Expansion and Generalized- Ray Approaches. *IEEE Antennas & Propagation Magazine,* 2015, vol. 56, no. 6, p. 90-101. ISSN: 1045- 9243.

VŠETULA, P.; RAIDA, Z.; LÁČÍK, J. Multi-objective synthesis of filtering dipole array based on tuning- space mapping. *Radioengineering,* 2015, vol. 24, no. 3, p. 688-694. ISSN: 1210- 2512.

VYCHODIL, J. Princip a zabezpečení platebních karet. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 17, č. 3, s. 60-64. ISSN: 1213- 1539.

ZÁPLATA, F.; KASAL, M. Efficient spectral power estimation on an arbitrary frequency scale. *Radioengineering,* 2015, vol. 2015, no. 1, p. 178-184. ISSN: 1210- 2512.

Bachelor Degree Programme

Analogové elektronické obvody
(prof. Ing. Lubomír Brančík, CSc.)

Elektromagnetická kompatibilita
(Ing. Jiří Dřínovský, Ph.D.)

Elektromagnetické vlny, antény a vedení
(prof. Dr. Ing. Zbyněk Raida)

Elektronické praktikum
(Ing. Ivana Jakubová)

Impulzová a číslicová technika
(doc. Ing. Tomáš Frýza, Ph.D.)

Komunikační systémy
(prof. Ing. Aleš Prokeš, Ph.D.)

Mikroprocesorová technika a embedded systémy
(doc. Ing. Tomáš Frýza, Ph.D.)

Mikrovlnná technika
(doc. Ing. Jaroslav Láčík, Ph.D.)

Moderní bezdrátová komunikace
(doc. RNDr. Jitka Poměnková, Ph.D.)

Napájení elektronických zařízení
(Ing. Michal Kubíček, Ph.D.)

Návrh analogových filtrů
(doc. Ing. Jiří Petržela, Ph.D.)

Nízkofrekvenční a audio elektronika
(doc. Ing. Tomáš Kratochvíl, Ph.D.)

Počítače a programování 1
(doc. Ing. Jiří Šebesta, Ph.D.)

Počítače a programování 2
(doc. Ing. Jiří Šebesta, Ph.D.)

Počítačové řešení elektronických obvodů
(prof. Dr. Ing. Zdeněk Kolka)

Počítačové řešení komunikačních subsystémů
(Ing. Petr Kadlec, Ph.D.)

Rádiové a mobilní komunikace
(prof. Ing. Stanislav Hanus, CSc.)

Rádiové přijímače a vysílače
(prof. Ing. Aleš Prokeš, Ph.D.)

Signály a soustavy
(prof. Ing. Milan Sigmund, CSc.)

Vysokofrekvenční technika
(Ing. Tomáš Urbanec, Ph.D.)

Základy optických komunikací a optoelektronika
(Ing. Lucie Hudcová, Ph.D.)

Základy televizní techniky
(prof. Ing. Stanislav Hanus, CSc.)

Master Degree Programme

Advanced radio communication systems
(doc. RNDr. Jitka Poměnková, Ph.D.)

CAD v mikrovlnné technice
(prof. Dr. Ing. Zbyněk Raida)

Digitální televizní a rozhlasové systémy
(doc. Ing. Tomáš Kratochvíl, Ph.D.)

Kvantová a laserová elektronika
(Ing. Lucie Hudcová, Ph.D.)

Mikrokontrolery pro pokročilé aplikace
(Ing. Aleš Povalač, Ph.D.)

Návrh antén a rádiových spojů
(doc. Ing. Jaroslav Láčík, Ph.D.)

Počítačové a komunikační sítě
(prof. Dr. Ing. Zdeněk Kolka)

Mikroprocesory s architekturou ARM
(Ing. Aleš Povalač, Ph.D.)

Programovatelné logické obvody
(Ing. Michal Kubíček, Ph.D.)

Radiofrekvenční identifikace
(Dr. Techn. Vojtěch Derbek)

Radioelektronická měření
(Ing. Jiří Dřínovský, Ph.D.)

Radiolokační a radionavigační systémy
(doc. Ing. Jiří Šebesta, Ph.D.)

Směrové a družicové spoje
(prof. Ing. Miroslav Kasal, CSc.)

Softwarové rádio
(doc. Ing. Roman Maršálek, Ph.D.)

Systémy mobilních komunikací
(Ing. Martin Slanina, Ph.D.)

Teorie elektronických obvodů
(doc. Ing. Jiří Petržela, Ph.D.)

Teorie rádiové komunikace
(doc. Ing. Roman Maršálek, Ph.D.)

Videotechnika a multimediální technika
(Ing. Martin Slanina, Ph.D.)

Doctoral Degree Programme

Moderní digitální bezdrátová komunikace
(prof. Ing. Milan Sigmund, CSc.)

Návrh moderních elektronických obvodů
(prof. Dr. Ing. Zdeněk Kolka)

Laboratories

Laboratory of Analog Electronic Circuits (instruction in analog electronics, Ivana Jakubová, Lubomír Brančík, Jiří Petržela, Roman Šotner)

Laboratory of Electromagnetic Compatibility EMC (research and instruction in EMC and pre-certifying tests of interference and resistance according to European norms, Jiří Dřínovský)

Laboratory of Low-Frequency Applications (research and instruction in audio technology, low-frequency electronics and power supply systems for electronic devices, Tomáš Kratochvíl, Michal Kubíček)

Laboratory of Signals and Digital Technology (research and instruction in signals and digital technology, Viera Biolková, Milan Sigmund, Tomáš Frýza)

Laboratory of Microprocessor Technology (instruction in microprocessor and microcomputer technology, Tomáš Frýza, Aleš Povalač)

Laboratory of Communication Systems (research and instruction in communication systems, data transmission, Aleš Prokeš)

Laboratory in Optoelectronics and Photonics (research and instruction in optoelectronics, photonics and optical communications, Otakar Wilfert, Lucie Hudcová)

Laboratory of TV and Video Technology (research and instruction in digital TV and video technology, Tomáš Kratochvíl, Martin Slanina, Ladislav Polák)

Laboratory of Microwave Technology (research and instruction in microwave technology and special electronic components, Tomáš Urbanec, Jiří Dřínovský)

Laboratory of Mobile Communication (research and instruction in mobile wireless communication, Stanislav Hanus, Martin Slanina, Jiří Miloš)

Laboratory of Antennas and Electromagnetic Field (research and instruction in EM fields, antennas and design of radio links, Jaroslav Láčík, Tomáš Mikulášek)

Laboratory of Radio Relay and Satellite Communication (research and instruction in radio and satellite communication, radiolocation and navigation, Miroslav Kasal, Filip Záplata)

Laboratory for Student Research (student projects, theses, self-study, Jiří Šebesta)

Electronic Technology Laboratory (dry and wet techniques for printed circuit boards, photographic production of patterns, Aleš Vančura, Jaroslav Voráč)

Computer Laboratories (two laboratories for computer-aided exercises in circuits, signals and systems, special areas of radioelectronics and communication technology, Josef Báňa)

Research Laboratory of Experimental Satellite Communication (research and development of subsystems for satellite communication and navigation, telemetric and command stations of experimental AMSAT satellites, Miroslav Kasal)

Research Laboratory of Numerical Methods (applied electromagnetism and electromagnetic field modelling, Zbyněk Raida, Petr Kadlec)

Research Laboratory of Optical Communications (research in measurement, testing and design of light-transmitting and atmospheric optical connectors, Otakar Wilfert, Lucie Hudcová)

Research Laboratory of Signal Processing (digital radio communication and methods for digital signal processing, Roman Maršálek)

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Doc. Ing. Jiří Mišurec, CSc.

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Doc. Ing. Radim Burget, Ph.D.
Doc. Ing. Dan Komosný, Ph.D.
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Doc. Ing. Norbert Herencsar, Ph.D.
Doc. Ing. Ivo Lattenberg, Ph.D.
Doc. Ing. Jiří Mišurec, CSc.,
Doc. Ing. Vít Novotný, Ph.D.
Doc. Mgr. Pavel Rajmic, Ph.D.
Doc. Ing. Kamil Říha, Ph.D.
Doc. Ing. Vladislav Škorpil, CSc.
Doc. Ing. Václav Zeman, Ph.D.

Lecturers

Ing. Miroslav Balík., Ph.D., Ing. Vladimír Červenka, Ph.D., Ing. Petr Číka, Ph.D., Ing. Radim Číž, Ph.D., Mgr. Radka Havlíková, Ing. Jan Hajný, Ph.D., Ing. Pavel Hanák, Ph.D., Ing. Jan Jeřábek, Ph.D., Ing. Jiří Hošek, Ph.D., Ing. Jan Jeřábek, Ph.D., Ing. Martin Koutný, Ph.D., Ing. Ondřej Krajsa, Ph.D., Ing. David Kubánek, Ph.D., Ing. Lukáš Malina, Ph.D., Ing. Zdeněk Martinásek, Ph.D., Ing. Jiří Mekyska, Ph.D., Ing. Petr Mlýnek, Ph.D., Ing. Jiří Přinosil, Ph.D., Ing. Jiří Schimmel, Ph.D., Ing. Petr Sysel, Ph.D., Ing. Pavel Šilhavý, Ph.D., Ing. Milan Šimek, Ph.D.

Research, Technical and Administrative Staff

RNDr. Petr Bílek, Ing. Miroslav Botta, Ing. Vlastimil Člupek, Ing. Pavel Dvořák, Ing. Jakub Frolka, Ing. Martin Hasmanda, Ing. Tomáš Horváth, Ing. Jan Karásek, Ph.D., Ing. Dominik Kováč, Ing. Radko Krkoš, Ing. Aleš Křupka, Ing. David Kurc, Ing. Lukáš Langhammer, Magda Lounková, Ing. Václav Mach, Jitka Hošková, Ing. Nermin Makhlouf, Ing. Lukáš Malina, Ph.D., Ing. Jan Mašek, Ing. Pavel Mašek, Ing. Jiří Mekyska, Ph.D., Ing. Jiří Minář, Ing. Ľubomír Mráz, Ing. Petr Münster, Ph.D., Jana Nosková, Ing. Bohumil Novotný, Lukáš Pazdera, Robert Pernica, Ing. Jiří Sobek, Ing. Jakub Šedý, Jitka Šichová, Ing. Radim Šifta, Ing. Miroslava Taušová, Ing. Václav Uher, Ing. Pavel Vajsar, Ing. Martin Zukal

Ph.D. Students

Ing. Petr Blažek, Ing. Rastislav Červeňák, Ing. Milan Čučka, Ing. Vlastimil Člupek, Ing. Jan Dvořák, Ing. Marie Daňková, Ing. Petr Dzurenda, Ing. Jakub Frolka, Ing. Petr Frenštátský, Ing. Radek Fujdiak, Ing. Zoltán Galáž, Ing. Pavol Harár, Ing. Ondřej Havliš, Ing. Tomáš Horváth, Ing. Tomáš Chvátal, Ing. Juraj Jakubík, Ing. Tomáš Kiska, Ing. Lukáš Kočí, Ing. Dávid Kondicz, Ing. Martin Kenyeres, Ing. Dominik Kováč, Ing. Martin Leixner, Ing. Lukáš Langhammer, Ing. Petr Ležák, Ing. Zdeněk Mžourek, Ing. Pavel Mašek, Ing. Jan Mašek, Ing. Jiří Minář, Ing. Michaela Novosadová, Ing. Bohumil Novotný, Ing. Adam Olejár, Ing. Václav Oujezský, Ing. Tamás Pál, Ing. Ondřej Pavelka, ing. Tomáš Pavlíček, Ing. Lukáš Povoda, Ing. Josef Polák, Ing. David Smékal, Ing. David Troják, Ing. František Urban, Ing. Marek Veselý, Ing. Petr Vitner, Ing. Lukáš Vlček, Ing. Aliaksandr Yeftsifeyeu, Ing. Kryštof Zeman

Main Interests

The department has been developing the Bachelor study area Teleinformatics and the Master study area Telecommunication and Information Technology. Instruction seeks balance of all areas of communications, includes computer systems and network, design of network applications in different programming languages. Students are instructed in design of analog and digital circuits, microprocessors and signal processors and their applications. They can specialize in multimedia informatics, i.e. digital processing of speech, music or images. A follow-up Ph.D. study area Teleinformatics iss offered.

Another Bachelor programme is Audio Engineering where instruction is provided jointly with Janáček Academy of Music and Performing Arts in Brno. It is an interdisciplinary programme preparing specialists in sound technology, sound signal processing and studio recording, with insight into music and arts. The Master degree programme was accredited in 2015.

Instruction started in new programme Information Safety (IBEP). It is centred on safety of information and communication technologies (ICT), i.e. security of networks and Internet. The students will learn how to configurate and manage extensive computer infrastructures and use ethical hacking to test computer network resistance. The programme includes attractive subjects in cryptography of programming or network operational systems, economics and software legislative. It is an interdisciplinary programme provided jointly with Faculty of Law, Masaryk University in Brno and Faculty of Management, Brno University of Technology. The graduates will be able to find jobs not only in purely technical positions, but also commercial, consultancy or management positions.

The department has been successful in obtaining funding from various educational and research programmes. In 2015 our research and development teams were involved in projects relating to basic and applied research yielding nearly 34 million CZK. A research team has been very successful in providing up-to-date multimedia services via mobile and wireless networks. Several members of the team are involved in industrial research of the programme of the Ministry of Industry and Trade and Technology Agency of the Czech Republic. Close cooperation continued with companies GiTy a.s., Webnode s.r.o., Saturn Holešov, 2N Telekomunikace, MegA, a.s. - Měřicí Energetické aparáty, TTC telekomunikace. The department also participated in projects conducted with commercial companies T-Mobile, Honeywell, and Telekom Austria and was involved in activities of the 'Centre of Sensor, Information and Communication Systems - SIX'.

Major Achievements

The main research interests of the department are converged information and communication systems focused on multimedia informatics, electronic systems for medical technology. In 2015 the department achieved very good results:

Solution of cryptographic protection of communication and information systems of data networks, security of electronic archives.

Design and implementation of algorithms for digital processing of speech and music signals for telecommunication and multimedia applications, embedded systems for acoustic signal processing, and software for these systems.

Communication systems for crisis management in cities and municipalities (e.g. monitoring of pollution and snow loads on roofs), agricultural activity (soil retention monitoring, landslides).

Development of electronic devices for medical data transmission and processing, design and implementation of algorithms for processing and analysis of biomedical signals (NMR and CT tomography and ultrasound) and 3D modelling of parts of human body for diagnostics and surgery.

Research and development of telemetric systems, remote data collection systems, systems for wireless sensor networks, networks for industrial data collection and control (smart grids of power plants, waterworks, transportation, etc.).

Design and optimization of algorithms for digital processing of signals (digital filters, signal detection, spectral analysis, etc.), implementation of algorithms for digital signal processing in signal processors and microcontrollers.

Design of optical networks and industrial applications, measurement and monitoring of optical network.

Research and design of systems of speech and image processing, security of multimedia systems archives, evaluation of emotions in speech and mimics using genetic programming.

Major Research Projects

Research of Cryptographic Primitives for Secure Authentication and Protection of Digital Identity – GAČR GP14-25298P

Investigator: Jan Hajný

Integration Server with Cryptographic Protection – MPO FR-TI4/647

Investigator: Kamil Vrba

Research and Development of a Technology for Detection of Emotions in Unstructured Data – MPO FR-TI4/151

Investigator: Zdeněk Smékal

Localization and Classification of Vibrations by Using an Optical Fiber Sensor over Large Distances – MPO FR-TI4/696

Investigator: Vít Novotný

TeleCalmPlus: The Smoke in the Chimney – An Intelligent Sensor-based Telecare Solution for Homes – IVF-NSC Project No.21280013

Investigator: Milan Šimek

Selected Publications

KENYERES, M.; KENYERES, J.; ŠKORPIL, V. A message failure analysis of systems executing average consensus algorithm. *European Scientific Journal,* 2015, vol. 11, no. 21, p. 56-62. ISSN: 1857- 7881.

KHADDOUR, H.; SCHIMMEL, J.; RUND, F. A Novel Combined System of Direction Estimation and Sound Zooming of Multiple Speakers. *Radioengineering,* 2015, vol. 24, no. 2, p. 583-592. ISSN: 1210- 2512.

FUJDIAK, R.; MLÝNEK, P.; MIŠUREC, J. Advanced Encryption Standard v Nízko- výkonových Zařízeních. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 17, č. 2, s. 37-44. ISSN: 1213- 1539.

DROTÁR, P.; GAZDA, J.; SMÉKAL, Z. An experimental comparison of feature selection methods on two- class biomedical datasets. *COMPUTERS IN BIOLOGY AND MEDICINE,* 2015, vol. 66, no. 1, p. 1-10. ISSN: 0010-4825.

MLÝNEK, P.; MIŠUREC, J.; KOUTNÝ, M.; FUJDIAK, R.; JEDLIČKA, T. Analysis and Experimental Evaluation of Power Line Transmission Parameters for Power Line Communication. *Measurement Science Review,* 2015, vol. 15, no. 2, p. 64-71. ISSN: 1335- 8871.

BURDA, K. Anonymizační síť Tor. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 17, č. 4, s. 124-135. ISSN: 1213- 1539.

HAJNÝ, J.; DZURENDA, P.; MALINA, L. Attribute- based credentials with cryptographic collusion prevention. *Security and Communication Networks,* 2015, vol. 8, no. 18, p. 3836-3846. ISSN: 1939- 0114.

ČLUPEK, V.; FROLKA, J. Autentizace na hardwarově omezených zařízeních. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 17, č. 6, s. 185-192. ISSN: 1213- 1539.

DVOŘÁK, P.; BARTUŠEK, K.; KROPATSCH, W.; SMÉKAL, Z. Automated Multi- Contrast Brain Pathological Area Extraction from MR Images. *J APPL RES TECHNOL,* 2015, vol. 13, no. 1, p. 58-69. ISSN: 1665- 6423.

POVODA, L.; BURGET, R.; MAŠEK, J.; CVRK, L. Automatické rozpoznávanie emócií z českého textu pomocou umelej inteligencie. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 17, č. 1, s. 15-18. ISSN: 1213- 1539.

POLÁK, J.; LANGHAMMER, L.; JEŘÁBEK, J. Behavioral modeling of Digitally Adjustable Current Amplifier. *International Journal of Advances in Telecommunications, Electrotechnics, Signals and Systems,* 2015, vol. 4, no. 1, p. 1-7. ISSN: 1805- 5443.

VLČEK, L. Behavioural approach to operation of access control systems and its vulnerabilities. *Access Server,* 2015, vol. 13, no. 5, p. 1-7. ISSN: 1214- 9675.

HORVÁTH, T.; KOČÍ, L.; JURČÍK, M.; FILKA, M. Coexistence GPON, NG-PON, and CATV systems. *International Journal of Engineering Trends and Technology,* 2015, vol. 21, no. 2, p. 61-66. ISSN: 2231- 5381.

ŠOTNER, R.; JEŘÁBEK, J.; LANGHAMMER, L.; POLÁK, J.; HERENCSÁR, N.; PROKOP, R.; PETRŽELA, J.; JAIKLA, W. Comparison of two solutions of quadrature oscillators with linear control of frequency of oscillation employing modern commercially available devices. *CIRCUITS SYSTEMS AND SIGNAL PROCESSING,* 2015, vol. 34, no. 11, p. 3449-3469. ISSN: 0278- 081X.

ARGANDA-CARRERAS, I.; TURAGA, S. C.; BERGER, D. R.; CIRESAN, D.; GIUSTI, A.; GAMBARDELLA, L. M.; SCHMIDHUBER, J.; LAPTEV, D.; DWIVEDI, S.; BUHMANN, J. M.; LIU, T.; SEYEDHOSSEINI, M.; TASDIZEN, T.; KAMENTSKY, L.; BURGET, R.; UHER, V.; TAN, X.; SUN, C.; PHAM, T.; BAS, E.; UZUNBAS, M. G.; CARDONA, A.; SCHINDELIN, J.; SEUNG H. S. Crowdsourcing the creation of image segmentation algorithms for connectomics. *Frontiers in Neuroanatomy,* 2015, vol. 9, no. 142, p. 1-13. ISSN: 1662- 5129.

LEŽÁK, P. Decentralised Hash Function. *International Journal of Computer Science and Network Security,* 2015, vol. 15, no. 8, p. 16-20. ISSN: 1738- 7906.

DROTÁR, P.; MEKYSKA, J.; REKTOROVÁ, I.; MASAROVÁ, L.; SMÉKAL, Z.; FAÚNDEZ ZANUY, M. Decision support framework for Parkinsons disease based on novel handwriting markers. *IEEE TRANSACTIONS ON NEURAL SYSTEMS AND REHABILITATION ENGINEERING,* 2015, vol. 23, no. 3, p. 508-516. ISSN: 1534-4320.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; VRBA, K. Design of the simple oscillator with linear tuning and pi/4 phase shift based on emulator of the modified current differencing unit. *IEICE Electronics Express,* 2015, vol. 12, no. 19, p. 1-7. ISSN: 1349- 2543.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; DOSTÁL, T.; VRBA, K. Design of Z-copy controlled- gain voltage differencing current conveyor based adjustable functional generator. *Microelectronics Journal,* 2015, vol. 46, no. 2, p. 143-152. ISSN: 0026- 2692.

DUTTA, M. K.; SINGH, A.; BURGET, R. Digital Ownership Tags Based on Biometric Features of Iris and Fingerprint for Content Protection and Ownership of Digital Images and Audio Signals. *MULTIMEDIA TOOLS AND APPLICATIONS,* 2015, vol. 79, no. 19, p. 20-31. ISSN: 1380- 7501.

ŠIFTA, R.; MÜNSTER, P.; SYSEL, P.; HORVÁTH, T.; NOVOTNÝ, V.; KRAJSA, O. Distributed fiber- optic sensor for detection and localization of acoustic vibrations. *METROL MEAS SYST,* 2015, vol. [22], no. [1], p. 111-118. ISSN: 0860- 8229.

KENYERES, M.; KENYERES, J.; ŠKORPIL, V. Effect of the speed of the algorithm' s convergence on the quality of distributed computing in WSN. *Access Server,* 2015, vol. 2015, no. 1, p. 1-5. ISSN: 1214- 9675.

KENYERES, M.; DANHEL, T.; KENYERES, J.; ŠKORPIL, V. Effects of system topologies attributes on average consensus algorithm - part I. *Access Server,* 2015, vol. 2015, no. 2, p. 1-10. ISSN: 1214- 9675.

MALINA, L.; VIVES-GUASCH, A.; CASTELLA-ROCA, J.; VIEJO, A.; HAJNÝ, J. Efficient Group Signatures for Privacy- Preserving Vehicular Networks. *TELECOMMUNICATION SYSTEMS,* 2015, vol. 58, no. 4, p. 293-311. ISSN: 1018- 4864.

KOMOSNÝ, D.; VOZŇÁK, M.; KATHIRAVELU, G.; SATHU, H. Estimation of Internet Node Location by Latency Measurements - The Underestimation Problem. *Information Technology and Control,* 2015, vol. 44, no. 3, p. 279-286. ISSN: 1392- 124X.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; VRBA, K.; DOSTÁL, T. Features of multi-loop structures with OTAs and adjustable current amplifier for second-order multiphase/ quadrature oscillators. *AEU - International Journal of Electronics and Communications,* 2015, vol. 69, no. 5, p. 814-822. ISSN: 1434- 8411.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; PETRŽELA, J.; DOSTÁL, T.; VRBA, K. First- order adjustable transfer sections for synthesis suitable for special purposes in constant phase block approximation. *AEU - International Journal of Electronics and Communications,* 2015, vol. 69, no. 9, p. 1334-1345. ISSN: 1434- 8411.

KHATEB, F.; KUBÁNEK, D.; PSYCHALINOS, C.; TSIRIMOKOU, G. Fractional-order filters based on low- voltage DDCCs. *Microelectronics Journal,* 2016, vol. 2, no. 1, IF: 0. 836, p. 1-10. ISSN: 0026- 2692.

MLÝNEK, P.; MIŠUREC, J.; FUJDIAK, R.; KOLKA, Z.; POSPÍCHAL, L. Heterogeneous Networks for Smart Metering – Power Line and Radio Communication. *Elektronika Ir Elektrotechnika,* 2015, vol. 21, no. 2, p. 85-92. ISSN: 1392- 1215.

SINGH, A.; DUTTA, M.; PARTHASARATHI, M.; UHER, V.; BURGET, R. Image Processing Based Automatic Diagnosis of Glaucoma using Wavelet Features of Segmented Optic Disc from Fundus Image. *COMPUTER METHODS AND PROGRAMS IN BIOMEDICINE,* 2015, vol. 122, no. 2, p. 1-12. ISSN: 0169- 2607.

ELFMARKOVA, N.; GAJDOŠ, M.; MRAČKOVÁ, M.; MEKYSKA, J.; MIKL, M.; REKTOROVÁ, I. Impact of Parkinson' s disease and levodopa on resting state functional connectivity related to speech prosody control. *PARKINSONISM & RELATED DISORDERS,* 2015, vol. 2015, no. 1, p. 1-4. ISSN: 1353- 8020.

KENYERES, M.; KENYERES, J.; ŠKORPIL, V. Impact of the stochastic features of the Push- Sum protocol on the variance of its convergence rate. *Access Server,* 2015, vol. 2015, no. 3, p. 1-4. ISSN: 1214-9675.

MALINA, L.; HAJNÝ, J.; ZEMAN, V. Light-weight group signatures with time- bound membership. *Security and Communication Networks,* 2015, vol. 2015, no. 0, p. 1-14. ISSN: 1939- 0114.

DVOŘÁK, P.; MENZE, B. Local Structure Prediction with Convolutional Neural Networks for Multimodal Brain Tumor Segmentation. *Lecture Notes in Computer Science,* 2015, vol. 8965, no. 1, p. 1-12. ISSN: 0302- 9743.

KŘUPKA, A.; ŘÍHA, K. Minimal prerequisites for measuring two- dimensional contour roundness in a particle classification context. *POWDER TECHNOLOGY,* 2015, vol. 284, no. 1, p. 486-495. ISSN: 0032- 5910.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; ŽÁK, T.; JAIKLA, W.; VRBA, K. Modified Current Differencing Unit and its Application for Electronically Reconfigurable Simple First- order Transfer Function. *ADV ELECTR COMPUT EN,* 2015, vol. 15, no. 1, p. 3-10. ISSN: 1582- 7445.

UHLÍŘ, D.; KOVÁČ, D.; HOŠEK, J. Multi Service Proxy: Mobile Web Traffic Entitlement Point in 4G Core Network. *International Journal of Advances in Telecommunications, Electrotechnics, Signals and Systems,* 2015, vol. 4, no. 2, p. 55-59. ISSN: 1805- 5443.

MAŠEK, P.; UHLÍŘ, D.; ZEMAN, K.; MAŠEK, J.; BOUGIOUKLIS, C.; HOŠEK, J. Multi-Radio Mobile Device: Evaluation of Hybrid Node Between WiFi and LTE Networks. *International Journal of Advances in Telecommunications, Electrotechnics, Signals and Systems,* 2015, vol. 4, no. 2, p. 49-54. ISSN: 1805- 5443.

Smékal, Z., Mžourek, Z. Najde větší uplatnění v oboru číslicového zpracování signálů teorie pravděpodobnosti nebo matematická statistika?. *Sdělovací technika,* 2016, roč. 2016, č. 2, s. 34-38. ISSN: 0036- 9942.

DZURENDA, P.; MARTINÁSEK, Z.; MALINA, L. Network Protection Against DDoS Attacks. *International Journal of Advances in Telecommunications, Electrotechnics, Signals and Systems,* 2015, vol. 4, no. 1, p. 8-14. ISSN: 1805- 5443.

OUJEZSKÝ, V.; ŠKORPIL, V.; JURČÍK, M. Network Tomography Overview and Botnet Network Estimation, Part I. *Access Server,* 2015, vol. 13, no. 6, p. 1-4. ISSN: 1214- 9675.

ATASOYU, M.; METIN, B.; KUNTMAN, H.; HERENCSÁR, N. New Current-Mode Class 1 Frequency- Agile Filter for Multi Protocol GPS Application. *Elektronika Ir Elektrotechnika,* 2015, vol. 21, no. 5, p. 35-39. ISSN: 1392-1215.

ŠOTNER, R.; HERENCSÁR, N.; JEŘÁBEK, J.; VRBA, K.; DOSTÁL, T.; JAIKLA, W.; METIN, B. Novel first-order all-pass filter applications of z- copy voltage differencing current conveyor. *INDIAN JOURNAL OF PURE & APPLIED PHYSICS,* 2015, vol. 53, no. 8, p. 537-545. ISSN: 0019- 5596.

BOTTA, M.; ŠIMEK, M.; KRAJSA, O.; ČERVENKA, V.; PÁL, T. On Location Estimation Technique Based of the Time of Flight in Low- power Wireless Systems. *Measurement Science Review,* 2015, vol. 15, no. 2, p. 58-63. ISSN: 1335- 8871.

ČERVENÁK, R.; HOŠEK, J. On Measuring User Experience with Mobile Data Services. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, vol. 6, no. 4, p. 49-54. ISSN: 1213- 1539.

ZAKARIA SALEM, Y.; HOŠEK, J.; MIŠUREC, J. Path Loss Measurements for Wireless Communication in Urban and Rural Environments. *American Journal of Engineering and Applied Sciences,* 2015, vol. 8, no. 1, p. 94-99. ISSN: 1941- 7020.

KOMOSNÝ, D.; PANG, S.; PRUŽINSKÝ, J.; IĽKO, P.; POLÁŠEK, J. PlanetLab Europe as Geographically-Distributed Testbed for Software Development and Evaluation. *Advances in Electrical and Electronic Engineering,* 2015, vol. 13, no. 2, p. 137-146. ISSN: 1336- 1376.

POLÁK, J.; JEŘÁBEK, J.; LANGHAMMER, L.; ŠOTNER, R. Practical AC & DC measurements of new MCDU active element. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, vol. 6, no. 1, p. 25-29. ISSN: 1213- 1539.

KUBÁNEK, D.; KHATEB, F.; TSIRIMOKOU, G.; PSYCHALINOS, C. Practical Design and Evaluation of Fractional- Order Oscillator Using Differential Voltage Current Conveyors. *CIRCUITS SYSTEMS AND SIGNAL PROCESSING,* 2016, vol. 2016 (), no., IF: 1. 118, p. 1-10. ISSN: 0278- 081X.

MALINA, L.; HAJNÝ, J.; DZURENDA, P.; ZEMAN, V. Privacy- preserving security solution for cloud services. *J APPL RES TECHNOL,* 2015, vol. 13, no. 1, p. 20-31. ISSN: 1665- 6423.

GALÁŽ, Z.; MEKYSKA, J.; MŽOUREK, Z.; SMÉKAL, Z.; REKTOROVÁ, I.; ELIÁŠOVÁ, I.; KOŠŤÁLOVÁ, M.; MRAČKOVÁ, M.; BERANKOVA, D. Prosodic Analysis of Neutral, Stress-modified and Rhymed Speech in Patients with Parkinson' s Disease. *COMPUTER METHODS AND PROGRAMS IN BIOMEDICINE,* 2016, no. 1, p. 1-17. ISSN: 0169- 2607.

ŠOTNER, R.; PETRŽELA, J.; JEŘÁBEK, J.; DOSTÁL, T. Reconnection-less OTA- based Biquad Filter with Electronically Reconfigurable Transfers. *Elektronika Ir Elektrotechnika,* 2015, vol. 21, no. 3, p. 33-37. ISSN: 1392-1215.

MEKYSKA, J.; JANOUŠOVÁ, E.; GOMEZ-VILDA, P.; SMÉKAL, Z.; REKTOROVÁ, I.; ELIÁŠOVÁ, I.; KOŠŤÁLOVÁ, M.; MRAČKOVÁ, M.; ALONSO-HERNANDEZ, J.; FAÚNDEZ ZANUY, M.; LOPEZ-DE-IPINA, K. Robust and complex approach of pathological speech signal analysis. *NEUROCOMPUTING,* 2015, vol. 167, no. 1, p. 94-111. ISSN: 0925- 2312.

MARTINÁSEK, Z. Scalable DDoS Mitigation System for Data Centers. *Advances in Electrical and Electronic Engineering,* 2015, vol. 13, no. 3, p. 1-6. ISSN: 1336- 1376.

JEŘÁBEK, J.; ŠOTNER, R.; DOSTÁL, T.; VRBA, K. Simple Resistor-less Generator Utilizing Z- copy Controlled Gain Voltage Differencing Current Conveyor for PWM Generation. *Elektronika Ir Elektrotechnika,* 2015, vol. 21, no. 5, p. 28-34. ISSN: 1392- 1215.

RAJMIC, P.; HOŠEK, J.; FUSEK, M.; ANDREEV, S.; STECÍK, J. Simplified Probabilistic Modelling and Analysis of Enhanced Distributed Coordination Access in IEEE 802. 11. *Computer Journal,* 2015, vol. 58, no. 6, p. 1456-1468. ISSN: 1460- 2067.

LANGHAMMER, L.; JEŘÁBEK, J.; POLÁK, J.; ČÍKA, P. Single-Ended and Fully-Differential Current-Input Current- Output, Universal Frequency Filter with Transconductace and Transresistance, Amplifiers. *WSEAS Transactions on Circuits,* 2015, vol. 14, no. 2015, p. 56-67. ISSN: 1109- 2734.

KENYERES, M.; KENYERES, J.; ŠKORPIL, V. Split distributed computing in wireless sensor networks. *Radioengineering,* 2015, vol. 24, no. 3, p. 749-756. ISSN: 1210- 2512.

ŠOTNER, R.; JEŘÁBEK, J.; HERENCSÁR, N.; VRBA, K.; LAHIRI, A.; DOSTÁL, T. Study of Small- signal Model of Simple CMOS Amplifier with Instability Compensation of Positive Feedback Loop. *Measurement Science Review,* 2015, vol. 15, no. 3, p. 139-151. ISSN: 1335- 8871.

ČÍKA, P. Survey of frequency domain image watermarking technique. *International Journal of Circuits Systems and Signal Processing,* 2015, vol. 2015, no. 9, p. 270-274. ISSN: 1998- 4464.

KOČÍ, L.; MÜNSTER, P.; HORVÁTH, T.; ČUČKA, M.; FILKA, M. The influence of digital modulations on 320 Gbit/s OTDM. *Journal of Communications Software and Systems,* 2016, vol. 11, no. 3, p. 1-5. ISSN: 1845- 6421.

NOVOTNÝ, V.; SYSEL, P.; KRKOŠ, R.; MÜNSTER, P.; ŠIFTA, R.; ŠTEFL, J.; POSPÍCHAL, P.; MALÝ, Z. The Opto- Fiber Sensory System is used for Intrusion Detection Monitored Areas and to Prevent Demage. *Czech Defence Industry Review,* 2015, vol. 22, no. 1/ 2015, p. 22-23. ISSN: 1802- 4300.

HORVÁTH, T.; MÜNSTER, P.; JURČÍK, M.; KOČÍ, L.; FILKA, M. Timing measurement and simulation of activation process in GPON networks. *Optica Applicata,* 2016, vol. 45, no. 4, p. 459-470. ISSN: 0078- 5466.

KENYERES, M.; KENYERES, J. Trendy smerovania v bezdrôtových senzorových sieťach. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 17, č. 2, s. 49-59. ISSN: 1213- 1539.

LANGHAMMER, L.; JEŘÁBEK, J.; POLÁK, J. Tunable Fully-Differential Filters Designed Using Signal- Flow Graphs Method. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, vol. 6, no. 3, p. 38-48. ISSN: 1213- 1539.

LEŽÁK, P. Univerzální protokol anonymní asymetrické autentizace. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 2015, č. 4, s. 142-149. ISSN: 1213- 1539.

HERENCSÁR, N.; KOTON, J.; HORNG, J.-W.; VRBA, K.; VENCLOVSKÝ, M. Voltage-Mode CFTA-C Third-Order Elliptic Low- Pass Filter Design and Optimization Using Signal Flow Graph Approach. *Elektronika Ir Elektrotechnika,* 2015, vol. 21, no. 2, p. 24-29. ISSN: 1392- 1215.

PYATTAEV, A.; HOŠEK, J.; JOHNSSON, K.; KRKOŠ, R.; GERASIMENKO, M.; MAŠEK, P.; OMETOV, A.; ANDREEV, S.; ŠEDÝ, J.; NOVOTNÝ, V.; KOUCHERYAVY, Y. 3GPP LTE-Assisted Wi-Fi Direct: Trial Implementation of Live D2D Technology. *ETRI JOURNAL,* 2015, vol. 37, no. 5, p. 877-887. ISSN: 1225- 6463.

Bachelor Degree Programme Teleinformatics

Analogová technika
(prof. Ing. Kamil Vrba, CSc.)

Analýza signálů a soustav
(prof. Ing. Zdeněk Smékal, CSc.)

Architektura sítí
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CISCO akademie II, V
(Ing. Milan Šimek, Ph.D.)

CISCO akademie III
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CISCO akademie IV
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Číslicové filtry
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Počítače a programování 1
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Vysokorychlostní komunikační systémy
(doc. Ing. Vladislav Škorpil, CSc.)

Základy kryptografie
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Bachelor Degree Programme Audio Engineering

Analogová technika
(prof. Ing. Kamil Vrba, CSc.)

Analýza signálů a soustav
(prof. Ing. Zdeněk Smékal, CSc.)

Audio technika v angličtině
(prof. Ing. Zdeněk Smékal, CSc.)

Číslicové zpracování signálů
(doc. Ing. Jiří Mišurec, CSc.)

Dějiny hudby 20. stol.
(prof. PhDr. Miloš Schnierer, JAMU)

Dějiny jazzu
(MgA. Jan Dalecký, JAMU)

Dějiny populární hudby
(prof. PhDr. Miloš Schnierer, JAMU)

Elektroakustika
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Hudba v nových médiích
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Hudební teorie
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Počítače a programování 1
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(Ing. Jiří Přinosil, Ph.D.)

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(Ing. MgA. Mgr. Dan Dlouhý, Ph.D., JAMU)

Vybavení elektroakustického studia
(MgA. Mgr. Ondřej Jirásek, Ph.D., JAMU)

Základy hudební akustiky
(RNDr. Lubor Přikryl, JAMU)

Základy instrumentace
(MgA. Edgar Mojdl, JAMU)

Základy počítačové sazby a grafiky
(Mgr. Pavel Rajmic, Ph.D.)

Zvukové aspekty interpretace
(MgA. Mgr. Ondřej Jirásek, Ph.D., JAMU)

Bachelor Degree Programme Information Safety

Fyzika 1
(prof. Ing. Lubomír Grmela, CSc.)

Matematika 1
(RNDr. Edita Kolářová, Ph.D.)

Základy kryptografie
(Ing. Jan Hajný, Ph.D.)

Počítače a programování 1
(doc. Ing. Ivo Lattenberg, Ph.D.)

Právní nauka
(doc. JUDr. Radim Polčák, Ph.D., PrF MU)

Matematika 2
(prof. RNDr. Jan Chvalina, DrSc.)

Počítače a programování 2
(Ing. Jiří Přinosil, Ph.D.)

Diskrétní matematika
(doc. RNDr. Martin Kovár, Ph.D.)

Úvod do práva ICT 1
(doc. JUDr. Radim Polčák, Ph.D., PrF MU)

Aplikovaná kryptografie
(doc. Ing. Václav Zeman, Ph.D.)

Komunikační technologie
(Ing. Jan Jeřábek, Ph.D.)

Pravděpodobnost a statistika
(doc. RNDr. Jaromír Baštinec, CSc.)

Úvod do práva ICT 2
(doc. JUDr. Radim Polčák, Ph.D., PrF MU)

Management
(doc. RNDr. Anna Putnová, Ph.D., FP VUT)

Mikroekonomie
(doc. Ing. et Ing. Stanislav Škapa, Ph.D., FP VUT)

Datová komunikace
(Ing. Pavel Šilhavý, Ph.D.)

Síťové operační systémy
(doc. Ing. Dan Komosný, Ph.D.)

Teoretická informatika
(Ing. Radim Burget, Ph.D.)

Bezpečnost ICT 1
(Ing. Jan Hajný, Ph.D.)

Makroekonomie
(doc. Ing. Marek Zinecker, Ph.D., FP VUT)

Semestrální projekt
(doc. Ing. Václav Zeman, Ph.D.)

Multimediální služby
(Ing. Petr Číka, Ph.D.)

Bezpečnost ICT 2
(doc. Ing. Jiří Mišurec, CSc.)

Softwarové právo
(doc. JUDr. Radim Polčák, Ph.D., PrF MU)

Odborná praxe
(doc. Ing. Vladislav Škorpil, CSc.)

Bakalářská práce
(doc. Ing. Václav Zeman, Ph.D.)

Kyberkriminalita a kybernetická bezpečnost
(doc. JUDr. Radim Polčák, Ph.D., PrF MU)

CryptologicProtocolTheory
(Ing. Jan Hajný, Ph.D.)

Elektrotechnika 1
(doc. Ing. Jiří Sedláček, CSc.)

Základy počítačové sazby a grafiky
(Mgr. Pavel Rajmic, Ph.D.)

Zabezpečovací systémy
(doc. Ing. Karel Burda, CSc.)

Přístupové a transportní sítě
(doc. Ing. Vladislav Škorpil, CSc.)

Architektura sítí
(doc. Ing. Vít Novotný, Ph.D.)

Objektově orientované programování
(doc. Ing. Ivo Lattenberg, Ph.D.)

Seminář C++
(doc. Ing. Pavel Fiala, Ph.D.)

Přenosová média
(prof. Ing. Miloslav Filka, CSc.)

Hardware počítačových sítí
(doc. Ing. Jaroslav Koton, Ph.D.)

Vysokorychlostní komunikační systémy
(doc. Ing. Vladislav Škorpil, CSc.)

Rádiové a mobilní komunikace
(prof. Ing. Stanislav Hanus, CSc.)

Praktikum z informačních sítí
(Ing. Petr Číka, Ph.D.)

Matematický seminář
(RNDr. Petr Fuchs, Ph.D.)

Fyzikální seminář
(Ing. Jitka Brüstlová, CSc.)

CISCO akademie 1 – CCNA
(doc. Ing. Dan Komosný, Ph.D.)

CISCO akademie 5 – CCNP
(Ing. Milan Šimek, Ph.D.)

CISCO akademie 3 – CCNP
(Ing. Jan Jeřábek, Ph.D.)

Daňový systém ČR
(Ing. Martin Jílek)

CISCO akademie 4 – CCNP
(Ing. Radim Burget, Ph.D.)

CISCO akademie 2 – CCNA
(Ing. Anna Kubánková, Ph.D.)

Angličtina pro bakaláře - středně pokročilí 1
(Mgr. Agata Walek)

Angličtina pro bakaláře - středně pokročilí 2
(Mgr. Pavel Sedláček)

Angličtina pro IT
(Mgr. Magdalena Šedrlová)

Master Degree Programme Telecommunication and Information Technology

Bezpečnost informačních systémů
(doc. Ing. Karel Burda, CSc.)

CISCO akademie I
(doc. Ing. Dan Komosný, Ph.D.)

CISCO akademie II, V
(Ing. Milan Šimek, Ph.D.)

CISCO akademie III
(Ing. Jan Jeřábek, Ph.D.)

CISCO akademie IV
(doc. Ing. Radim Burget, Ph.D.)

Číslicové zpracování akustických signálů
(Ing. Miroslav Balík, Ph.D.)

Číslicové zpracování signálů
(prof. Ing. Zdeněk Smékal, CSc.)

Moderní počítačová grafika
(doc. Mgr. Pavel Rajmic, Ph.D.)

Komunikační prostředky mobilních sítí
(doc. Ing. Vít Novotný, Ph.D.)

Kryptografie v informatice
(doc. Ing. Václav Zeman, Ph.D.)

Moderní síťové technologie
(Ing. Jaroslav Koton, Ph.D.)

Multimédia
(Ing. Petr Číka, Ph.D.)

Návrh, správa a bezpečnost počítačových sítí
(doc. Ing. Karel Burda, CSc.)

Optické sítě
(prof. Ing. Miloslav Filka, CSc.)

Počítače a jejich periferie
(Ing. Miroslav Balík, Ph.D.)

Počítačem podporovaná řešení inženýrských problémů (doc. Ing. Jiří Mišurec, CSc.)

Pokročilé komunikační techniky
(Ing. Jan Jeřábek, Ph.D.)

Pokročilé techniky zpracování obrazu
(doc. Ing. Kamil Říha, Ph.D.)

Bezdrátové senzorové sítě
(Ing. Milan Šimek, Ph.D.)

Signálové procesory
(Ing. Petr Sysel, Ph.D.)

Služby telekomunikačních sítí
(doc. Ing. Vladislav Škorpil, CSc.)

Teoretická informatika
(doc. Ing. Radim Burget, Ph.D.)

Teorie sdělování
(Ing. Radim Číž, Ph.D.)

Vyšší techniky datových přenosů
(doc. Ing. Václav Zeman, Ph.D.)

Vzájemný převod A/D signálů
(prof. Ing. Kamil Vrba, CSc.)

Zabezpečovací systémy
(doc. Ing. Karel Burda, CSc.)

Zpracování řeči
(prof. Ing. Zdeněk Smékal, CSc.)

Telekomunikační a informační systémy
(Ing. Pavel Šilhavý, Ph.D.)

Doctoral Degree Programme

Aplikovaná kryptografie
(doc. Ing. Karel Burda, CSc.)

Moderní síťové technologie
(doc. Ing. Vít Novotný, Ph.D.)

Laboratories

Laboratory of Circuit Technology (research of analog current-mode circuits, Kamil Vrba)

Laboratory of Converged Networks (research and instruction in modern data communication networks and services, 2G - 4G mobile telecommunication networks and systems for data network provision of voice and multimedia services, Vít Novotný, Pavel Šilhavý)

Laboratory of Digital Music Studio (instruction and research in real-time multichannel audio signal processing on PCs and embedded systems, Jiří Schimmel)

Laboratory of Electroacoustics and Studio Technology (anechoic chamber, instruction and research in measurement of electroacoustic converters, identification and analysis of sound sources, space acoustics, analysis and synthesis of sound fields, Jiří Schimmel)

Acoustic Laboratory (research in sound effects, multichannel sound systems, 3D audio, conference audio systems, Jiří Schimmel)

Laboratory of Network Technologies (instruction in network technologies, research of switch and indicator management, analysis of stationary and wireless local computer networks operation, modelling of algorithms used in modern data networks, Jaroslav Koton)

Laboratory of Multimedia Services (research in design and multimedia communication services including multimedia data digital processing, Petr Číka)

Laboratory of Data Transmission (instruction in data communication and research in data transmission, modulation methods and error-protection codes, esp. for xDSL and PLC systems, modelling of access network and end device characteristics, Pavel Šilhavý)

Laboratory of Design Systems (instruction of programming languages, modelling of communication systems, telecommunication networks and electronic circuits, research on modern communication technologies, design of electronic devices, Radim Číž)

Laboratory of Sensor Systems and Signals (instruction and research in sensor networks based on the IEEE 802.15.4 standard, analysis of Zigbee and 6lowPAN protocols, sensor units configuration, data transmission and wireless network management, microcontrollers Atmel AVR, Milan Šimek)

Laboratory of Telecommunication Systems (instruction in Telecommunication Systems, research of error-free transmission of messages, modelling of anti-error code systems, Václav Zeman)

Laboratory of Analog Circuits and Analog-Digital Conversion (instruction and research of analogue circuits and mutual analogue-digital converters, David Kubánek)

Laboratory of Communication Systems (instruction and research in access and transportation networks, transportation and connection systems, converged telecommunication and computer networks, high-speed systems and telecommunication network services, Vladislav Škorpil)

Laboratory of Transmission Networks (research in FPGA and high-rate multimedia data transmission up to 100 Gb/s, Vladislav Škorpil)

Laboratory of Acoustic Signal Processing (design, optimization and implementation of algorithms for speech and acoustic signal processing, optimization of algorithms for multi-core computing systems, instruction in Digital Acoustic Signal Processing, computers and their peripherals, Miroslav Balík)

Laboratory of Multimedia Signals (research and development of multimedia embedded devices with ARM, Harvard architecture and VLIW architecture digital signal processors, optimization of algorithms for real-time digital signal processing, instruction in Signal Processors, Digital Filters and Digital Signal Processing, Petr Sysel)

Research and Instruction Laboratory of Safety Systems (research and development of cryptographic methods for communication and information systems, research and development of electronic protection systems, Karel Burda)

Telepresence Studio (research and development in videoconferencing and telepresenting services, Petr Číka)

Department of Theoretical and Experimental Electrical Engineering

Prof. Ing. Pavel Fiala, Ph.D.

Head

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Professors Emeriti

Prof. Ing. Libor Dědek, CSc.

Professors

Prof. Ing. Karel Bartušek, DrSc.
Prof. Ing. Jarmila Dědková, CSc.
Prof. Ing. Pavel Fiala, Ph.D.
Prof. Ing. Eva Gescheidtová, CSc.
Prof. dr hab. inż. Jan Sikora

Associate Professors

Doc. Ing. Petr Drexler, Ph.D.
Doc. Ing. Radek Kubásek, Ph.D.
Doc. Ing. Jiří Sedláček, CSc.
Doc. Ing. Miloslav Steinbauer, Ph.D.

Lecturers

Ing. Tibor Bachorec, Ph.D., Mgr. Přemysl Dohnal, Ing. Martin Friedl, Ph.D., Ing. Radim Kadlec, Ph.D., Ing. Radim Kořínek, Ph.D., Ing. Tomáš Kříž, Ing. Petr Marcoň, Ph.D., Ing. Dušan Nešpor, Ph.D., Ing. Zdeněk Roubal, Ing. Zoltán Szabó, Ph.D., Ing. Robert Urban, Ph.D.

Ph.D. Students

Ing. Martin Čáp, Ing. Michal Hanzelka, MBA, Ing. Jiří Chytil, Ing. Ksenia Kořínková, Ing. Pavel Křepelka, Ing. Roman Matloch, Ing. Rastislav Motúz, Ing. Jiří Sliž, Ing. Martin Valla, Ing. Eliška Vlachová Hutová

Administrative and Technical Staff

Ing. Ivo Běhunek, Ph.D., Eva Cupáková, Alena Javůrková, doc. Ing. Petr Koňas, Ph.D., Ing. Taťána Krajčírovičová

Main Interests

The department provides instruction in all undergraduate and postgraduate programmes targeted at education in the major areas of electrical engineering through understanding of the basic principles of electrical engineering, safety issues, measurement of electrical and non-electrical characteristics with focus on special applications and modelling of electromagnetic fields. Bachelor, Master and Ph.D. theses deal with topics of the current and long-term research interests of the department. Instruction is provided in up-to-date laboratories, computer laboratories and a research laboratory for students' work on their diploma theses.

Research is conducted in laboratories with top equipment for magnetic measurements, light technology and low-level measurements. There are laboratories of pulse sources and microwave devices and a laboratory of electro-optics and laser technology. In recent years the department' s research activities have been centred on wideband signal processing, noise spectroscopy and special applications of metamaterial structures for nuclear magnetic resonance and electron microscopy. The department was involved in long-term research on analysis of numerical models of NANOstructures and technologies. In cooperation with IMI International, s. r. o. - Norgren CZ research is currently underway on graphene-based NANOstructures for applications in NANOsensors. Research is also centred on processing of images of magnetic resonance and electric impedance tomography. Generally, we are focused on research and design of special measuring methods, signal processing and evaluation, with support from grant projects and contract cooperation with the industrial sector.

The department offers an innovative approach to education, giving the students opportunities to participate in real industrial projects. The students work in teams including research workers, university and secondary school students. Every year the department organizes professional competitions, e.g. 'Microcontrollers are in'.

Major Achievements

Basic research was focused on wideband signal processing, noise spectroscopy, special applications of metamaterial structures for NMR and electron microscopy. Applied research was focused on evaluation of NMR images.
In 2015 the department was awarded a patent – 'Vibration Generator for Electric Energy Generation', which describes the concept and construction of a vibration generator for independent power supply. Cooperation continues in contract research with TES, s.r.o. on detection and localization of partial charges in electrical power converters with liquid dielectric. The system MOSAD®-MST-PD developed at UTEE in cooperation with TES, s. r. o. was awarded in competition 'Zlatý Amper 2015' as the most innovative exhibit at the trade fair 'Amper 2015'.
Another achievement was a numerical model for analysis of magnetic, thermal and mechanical deformation fields for innovation of the magnetic circuit of an actuator for IMI International, s.r.o. - Norgren CZ. A model of an induction flowmeter was designed for Badger Meter Czech Republic, s.r.o.
The long-term cooperation programme with PROTOTYPA, a.s. dealt with research on special methods for measurement of single processes. The department continued research cooperation with Technische Universität Wien, and participated in the centres SIX and CVVOZE. On FEEC level, UTEE was involved in two international projects 'Interdisciplinary Research of Wireless Technologies' (INWITE) and 'Advanced Wireless Technologies for Clever Engineering' (ADWICE) and one national project 'Complex Innovation of Study Programmes and Increasing the Quality of Instruction at Faculty of Electrical Engineering and Communication, Brno University of Technology' (KISP).
UTEE largely contributed to preparation of the university interactive playroom 'Elektrikárium', which was designed to explain electrical and electronic issues to the public through entertainment.

Major Research Projects

Devices for Neurocontrol and Neurorehabilitation DeNeCoR - 7H13014

Investigators: Pavel Fiala and Martin Čáp

Development of Human Resources Potential for Science and Research in Electrical Engineering– MŠMT CZ.1.07/2.3.00/20.0175

Investigator: Miloslav Steinbauer

Long-Distance Identification of Small Reflectors by Electromagnetic Waves – GAČR 15-08803S

Investigator: Petr Drexler

Research of Artificial Electromagnetic Materials and Metamaterials Using Utility Numerical and Imaging Methods – GAČR 13-09086S

Investigator Pavel Fiala

Selected Publications

FRIEDL, M.; FIALA, P. Application of an electromagnetic numerical model in accurate measurement of high velocities. *Informatyka, Automatyka, Pomiary w Gospodarce i Ochronie Środowiska,* 2015, vol. 2015, no. 3, p. 3-10. ISSN: 2083- 0157.

VLACHOVÁ HUTOVÁ, E.; MARCOŇ, P.; BARTUŠEK, K. EFFECT OF HIGH VOLTAGE ON THE DEVELOPMENT OF THE PLANT TISSUE. *Informatyka, Automatyka, Pomiary w Gospodarce i Ochronie Środowiska,* 2015, vol. 4, no. 2015, p. 38-41. ISSN: 2083- 0157.

MIKULKA, J. GPU- Accelerated Reconstruction of T2 Maps in Magnetic Resonance Imaging. *Measurement Science Review,* 2015, vol. 2015, no. 4, p. 210-218. ISSN: 1335- 8871.

FIALA, P.; NASSWETTROVÁ, A.; KŘIVÁNKOVÁ, S.; SZABÓ, Z. INDIKÁTOR PRO LOKALIZACI PŘESNÉ POLOHY ZA ZDÍ. *TZB- info,* 2015, roč. 5, č. 2, s. 20-26. ISSN: 1801- 4399.

FIALA, P.; NEŠPOR, D.; DREXLER, P.; STEINBAUER, M. Numerical Model of a Nanoelectric Line from a Graphene Component. *Microsystem Technologies,* 2016, vol. 2016, no. 1, p. 1-18. ISSN: 0946- 7076.

FIALA, P.; SEGIŇÁK, J.; MIKULKA, J.; NEŠPOR, D.; SZABÓ, Z.; MARCOŇ, P.; DREXLER, P. Periodic Material Structures Tested by the Noise Spectroscopy Method. *Microsystem Technologies,* 2015, vol. 2016, no. 2, p. 1-23. ISSN: 0946- 7076.

ROUBAL, Z.; MARCOŇ, P.; SZABÓ, Z.; SAJDL, O.; VESELÝ, I.; ZEZULKA, F. Remote measurement and performance modeling for smart grid. *Journal of the Technical University at Plovdiv. Fundamental Sciences and Applications,* 2015, vol. 1, no. 21, p. 111-114. ISSN: 1310- 8271.

NASSWETTROVÁ, A.; KŘIVÁNKOVÁ, S. RTG DETEKCE MÍRY POŠKOZENÍ DŘEVĚNÝCH PRVKŮ STAVEB. *TZB- info,* 2015, roč. 5, č. 2, s. 2-12. ISSN: 1801- 4399.

ZEZULKA, F.; SZABÓ, Z.; VESELÝ, I.; MARCOŇ, P.; BRADÁČ, Z.; SAJDL, O. Smart Energo Model. *IFAC-PapersOnLine (ELSEVIER),* 2015, vol. 48, no. 4, p. 404-408. ISSN: 2405- 8963.

MARCOŇ, P.; VESELÝ, I.; ZEZULKA, F.; ROUBAL, Z.; SZABÓ, Z. The Energy Efficiency of a Hydrogen Circuit in a Smart Grid. *IFAC-PapersOnLine (ELSEVIER),* 2015, vol. 48, no. 4, p. 386-391. ISSN: 2405- 8963.

KADLEC, R.; FIALA, P. The Response of Layered Materials to EMG Waves from a Pulse Source. *Progress In Electromagnetics Research M,* 2015, vol. 42, no. 1, p. 179-187. ISSN: 1937- 8726.

ČÁP, M.; FIALA, P.; NEŠPOR, D.; DREXLER, P. A numerical model of the concept of graphene polymer- based sensor. InProceedings of 10th International Conference on Measurement. Bratislava, SK: Institute of Measurement Science, Slovak Academy of Science, 2015. s. 13-16. ISBN: 978-80-969672-9- 2.

DREXLER, P.; FIALA, P.; NEŠPOR, D.; STEINBAUER, M.; KŘÍŽ, T.; FRIEDL, M. Numerical Model and Analysis of a Graphene Periodic Structure. *In Draft Proceedings of Progress In Electromagnetics Research Symposium PIERS 2015 Prague.Progress In Electromagnetics. Cambridge, MA, USA: The Electromagnetics Academy*, 2015. s. 2453-2457. ISSN: 1559- 9450.

NASSWETTROVÁ, A.; FIALA, P.; NEŠPOR, D.; DREXLER, P.; STEINBAUER, M. Numerical Model a Graphene Component for the Sensing of Weak Electromagnetic Signals. *In Proceedings of SPIE. Proceedings of SPIE. BELLINGHAM, WA 98227- 0010 USA: SPIE- INT SOC OPTICAL ENGINEERING*, 2015. s. 1-10. ISBN: 978-1-62841-639- 8. ISSN: 0277- 786X.

NASSWETTROVÁ, A.; DREXLER, P.; SEGIŇÁK, J.; NEŠPOR, D.; FRIEDL, M.; MARCOŇ, P.; FIALA, P. Noise Spectroscopy of Nano- and Microscopic Periodic Material Structures. *In Proceedings of SPIE. Proceedings of SPIE. BELLINGHAM, WA 98227- 0010 USA: SPIE- INT SOC OPTICAL ENGINEERING*, 2015. s. 1-10. ISBN: 978-1-62841-639- 8. ISSN: 0277- 786X.

Bachelor Degree Programme

Bezpečná elektrotechnika
(Ing. Radim Kadlec, Ph.D.)

Elektrotechnický seminář
(AELS, BELS – doc. Ing. Miloslav Steinbauer, Ph.D.)

Elektrotechnika
(Ing. Marcoň Petr, Ph.D.)

Elektrotechnika 1
(BEL1 – doc. Ing. Jiří Sedláček, CSc.,
KEL1 – prof. Ing. Jarmila Dědková, CSc.)

Elektrotechnika 2
(BEL2 – doc. Ing. Jiří Sedláček, CSc.,
KEL2 – doc. Ing. Miloslav Steinbauer, Ph.D.)

Elektrotechnika pro audio inženýrství
(doc. Ing. Petr Drexler, Ph.D.)

Měření v elektrotechnice
(BMVA – prof. Ing. Karel Bartušek, DrSc.,
HMVA – doc. Ing. Jan Mikulka, Ph.D.,
KMVA – prof. Ing. Eva Gescheidtová, CSc.)

Měření v elektrotechnice pro audio inženýrství
(prof. Ing. Karel Bartušek, DrSc.)

Seminář C++
(prof. Ing. Pavel Fiala, Ph.D.)

Počítačové modelování elektrotechnických zařízení a komponentů (prof. Ing. Pavel Fiala, PhD.)

Vybrané partie základů elektrotechniky v angličtině
(Ing. Petr Marcoň, Ph.D.)

Master Degree Programme

Bezpečná elektrotechnika
(Ing. Radim Kadlec, Ph.D.)

Bezpečnost zařízení
(doc. Ing. Miloslav Steinbauer, Ph.D.)

Elektrické instalace
(Ing. Radim Kadlec, Ph.D.)

Modelování elektromagnetických polí
(Ing. Tibor Bachorec, Ph.D.)

Doctoral Degree Programme

Numerické úlohy s parciálními diferenciálními rovnicemi (prof. Ing. Pavel Fiala, Ph.D.)

Speciální měřicí metody
(prof. Ing. Karel Bartušek, DrSc.)

Laboratories

Laboratory of Electrical Measurements (instruction in Measurements in Electrical Engineering and Measurements in Electrical Engineering for Audio Engineering, Zoltán Szabó)

Laboratory of Electrical Engineering (instruction in Electrical Engineering 1 and 2, Martin Friedl)

Laboratory of Electrical Engineering and Electrical Installations (instruction laboratory for Electrical Installations, Electrotechnical Seminar and Electrical Engineering, Radim Kadlec)

IET Laboratory (instruction laboratory, Miloslav Steinbauer)

Computer Laboratory of Electrical Engineering (instruction in Electrical Engineering 1 and 2, Miloslav Steinbauer)

Computer Laboratory (instruction in Electrotechnical Seminar, Modelling of Electromagnetic Fields, Computer Modelling of Electrical Devices and Components and Seminar C++, Miloslav Steinbauer)

Seminar Laboratory (Miloslav Steinbauer)

Research Laboratory of Magnetic Measurement (research laboratory of magnetic measurement, Zdeněk Roubal)

Research Laboratory of Light Technology (measurement of the parameters of light sources, Zdeněk Roubal)

Restricted Access Laboratory (basic and applied research of numerical methods, Pavel Fiala)

Laboratory of Low-Level Measurement (Zdeněk Roubal)

Research Laboratory for Student Theses (research laboratory for students, Martin Friedl)

Research Laboratory of Printed Circuit Boards (development of printed circuit boards, Zoltán Szabó)

Research Laboratory for Prototype Development (research laboratory for doctoral students, Martin Friedl)

Research Laboratory of Pulse Sources and Microwave Devices (basic research of pulse sources, low-noise measurements, shielded laboratory, semi-anechoic laboratory, Pavel Fiala)

Research Laboratory of Electro-Optics and Laser Technology (optoelectronic measuring methods, Petr Drexler)

Department of Power Electrical and Electronic Engineering

Ing. Ondřej Vítek, Ph.D.
Head

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Professors

Prof. RNDr. Vladimír Aubrecht, CSc.
Prof. Ing. Vítězslav Hájek, CSc.
Prof. Ing. Jiří Skalický, CSc.

Associate Professors

Doc. Ing. Bohuslav Bušov, CSc.
Doc. Ing. Bohumil Klíma, Ph.D.
Doc. Ing. Čestmír Ondrůšek, CSc.
Doc. Dr. Ing. Miroslav Patočka,
Doc. Ing. František Veselka, CSc.
Doc. Ing. Pavel Vorel, Ph.D.

Lecturers

Ing. Radoslav Cipín, Ph.D., Ing. Dalibor Červinka, Ph.D., Ing. Petr Dohnal, Ph.D., Ing. Petr Huták, Ph.D., Ing. Rostislav Huzlík, Ph.D., Ing. Marcel Janda, Ph.D., Mgr. Petr Kloc, Ph.D., Ing. Ivo Pazdera, Ph.D. Ing. Petr Procházka, Ph.D., Ing. Jiří Valenta, Ph.D., Ing. Ondřej Vítek, Ph.D.

Ph.D. Students

Ing. Jan Bárta, Ing. Radim Běloušek, Ing. Jan Bulín, Ing. Lukáš Dostál, Ing. Petr Chorovský, Ielyzaveta Ishkova, Ing. Josef Kadlec, Ing. Jiří Klíma, Ing. Jan Knobloch, Ing. Martin Kroupa, Ing. Martin Mach, Ing. Zbyněk Makki, Ing. Jan Martiš, Ing. Tomáš Mejzlík, Ing. Aleš Mikulčík, Ing. Lukáš Mišinger, Ziad Nouman, Ing. Veronika Novotná, Ing. Vladimír Ondřejček, Ing. Martin Prudík, Ing. David Šimek, Ing. Petr Španěl, Ing. Jiří Štaffa, Ing. Marek Toman, Ing. Adam Vašíček, Ing. Vojtěch Vetiška, Ing. Eva Vítková, BA., Ing. Michal Zelenka

Administrative and Technical Staff

Ing. Zdeněk Feiler, Ph.D., Zdeněk Liška, Josef Němec, Alena Šmídková

Main Interests

The department provides instruction in the study area Power Electrical and Electronic Engineering in the Bachelor and Ph.D. programmes and in the study areas Power Electrical Engineering and Power Electronics in the Master degree programme. Instruction is focused on the theory and construction of electrical machines and devices, CAD systems including solutions for electromagnetic and thermal fields and optimization methods for construction designs. The design, size, control and dynamics of electromechanical systems are the subject of instruction in electrical drives. Another area of interest is power electronics including DC/DC pulse converters (switching sources), DC/AC alternators, rectifiers etc. Attention is paid to the theory of regulation and digital control.

In basic research, the department deals with theoretical modelling of radiation energy transport in thermal plasma. Currently we are involved in basic research for medical purposes, in the development of special high voltage pulse source for electroporation of cancer cells.

In applied research, electrical machines, power electronics, electrical drives and devices are in the focus of interest. Research is centered on low-voltage machines used in automotive industry, synchronous machines with permanent magnets, asynchronous and DC machines. The department staff are experienced in development of special machines such as starter generators, controlled magnetic bearings and levitation systems. Activities centered on power exploitation for electric arc extinction in low- and high-voltage devices, power converters of extreme parameters, optimal regulation of electrical drives aimed at loss minimization in traction drives, implementation of ultracapacitors, accumulators and fuel cells in the system of traction drives.

The department cooperates with a number of universities, e.g., SPGU St Petersburg, TU Pskov, TU Omsk, TU Gliwice, TU Delft, TU Žilina, MU Brno, and industrial companies and institutions, e.g. JSC Electrocontact (Kineshma-RF), Siemens Elektromotory Drásov, OEZ Letohrad, APS Světlá nad Sázavou, ATAS Náchod, EMP Slavkov u Brna, JULI Motorenwerk Moravany, VUES Brno a.s., IVEP Brno, ŠLP Křtiny a.s., Tesla Blatná, Ingersoll Rand etc.

Major Achievements

A significant achievement is the design of a special device for electroporation of cancer cells, which was verified in several operations by a team from Faculty University Brno and Veterinary and Pharmaceutical University Brno. The device was presented at 'International Engineering Fair Brno 2015' and was very well accepted by the professional community.

We implemented an operating sample of high-revolution two-pole asynchronous motor 12 kW with unique construction of full rotor with a copper surface layer. This special construction was designed for high rotor revolutions 45000 min-1.

In cooperation with VUES we continued work on the electromagnetic design of electromotor 6kW and 120000 min-1.

The result of our cooperation with Tesla A high output of blocking sources can be attained. The implemented source 1200W utilizes the latest semiconductor transistors SiC and operates on the switching frequency 160kHz. It should be of good use in fast chargers for hand tools and electrobikes.

The development and manufacture of an universal converter for Juli Motorenwerk was completed. It is designed for all types of DC low-voltage motors produced by the company and all types of revolution and position sensors used in electrical traction, 80 V and 1000 A.

With Beta Control, the department developed and tested a recuperation unit for lift drives.

An achievement of contract research is the operation of short circuit laboratory, also on international level (Eton - Austria, Techna International – Great Britain).

Members of the staff were awarded a patent on vibration generators for electrical energy generation.

In cooperation with Department of Physics and 'Centre for Research and Utilization of Renewable Sources' we organized the XIX. International Symposium 'Physics of Switching Arc'.

The department acquired equipment for instruction and research in the amount of cca 6 million CZK.

Major Research Projects

Energy in Conditions of Sustainable Development (EN-PUR) - LO1210

Investigator: Vladimír Aubrecht

Study of Thermodynamic and Electromagnetic Processes in Low-Voltage Switching Devices - GA15-14829S

Investigator: Vladimír Aubrecht

New Directions in Research of Electrical Machines, Devices, Electrical Drives and Power Electronics - FEKT-S-14-2342

Ivestigator: Vítězslav Hájek

Research Centre of Special Rotating Machines - TE02000232

Investigator: Čestmír Ondrůšek

Research and Development of an Insulation System of Small Electrical Machines - FR-TI4/104

Investigator: Vítězslav Hájek

Selected Publications

VOREL, P.; ČERVINKA, D.; MARTIŠ, J. Asynchronní motor – duel generací. *Electro,* 2015, roč. 25, č. 6, s. 11-13. ISSN: 1210- 0889.

ELIÁŠ, M.; KLOC, P.; JAŠEK, O.; MAZÁNKOVÁ, V.; TRUNEC, D.; HRDÝ, R.; ZAJÍČKOVÁ, L. Atmospheric pressure barrier discharge at high temperature: Diagnostics and carbon, nanotubes deposition. *Journal of Aplied Physics,* 2015, vol. 117, no. 10, p. 103301- 1 (103301-10 p.) ISSN: 0021- 8979.

MARTIŠ, J.; VOREL, P.; PROCHÁZKA, P.; CIPÍN, R.; PAZDERA, I.; ČERVINKA, D. Fast-discharging apparatus 0 - 400 A / 2 - 4. 2 V for testing of lithium cells. *ECS Transactions,* 2015, vol. 70, no. 1, p. 47-51. ISSN: 1938-5862.

DOSTÁL, L.; DOHNAL, P.; VALENTA, J. Change of the thermal profile in the modern MCCB by the different electrical contact resistance. *Plasma Physics and Technology,* 2015, vol. 2, no. 3, p. 77-81. ISSN: 2336- 2626.

HUZLÍK, R.; ONDRŮŠEK, Č. Návrh generátoru pro malou vodní elektrárnu. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz),* 2015, roč. 2015, č. 4, s. 150-161. ISSN: 1213- 1539.

VOREL, P.; PROCHÁZKA, P.; ČERVINKA, D.; PAZDERA, I. Neuvěřitelná životnost nikl- ocelového akumulátoru. *Electro,* 2015, roč. 25, č. 4, s. 43-45. ISSN: 1210- 0889.

HADAŠ, Z.; ONDRŮŠEK, Č. Nonlinear spring- less electromagnetic vibration energy harvesting system. *European Physical Journal- Special Topics,* 2015, vol. 224, no. 14- 15, p. 2881-2896. ISSN: 1951- 6355.

KOZÁK, J.; RUDOLF, P.; SEDLÁŘ, M.; HABÁN, V.; HUDEC, M.; HUZLÍK, R. Numerical simulation and experimental visualization of the separated cavitating boundary layer over NACA2412. *EPJ Web of Conferences,* 2015, vol. 2015, no. 92, p. 1-8. ISSN: 2100- 014X.

VESELKA, F.; ZABOIN, V. Ocenka efektivnosti primenenija teflona v sistemach tokosjema električeskich mašin. *Almanach mirovoj nauki,* 2015, roč. 02, č. 01, s. 114-115. ISSN: 2412- 8597.

KLOC, P.; AUBRECHT, V.; BARTLOVÁ, M.; COUFAL, O.; RÜMPLER, C. On the Selection of Integration Intervals for the Calculation of Mean Absorption Coefficients. *Plasma Chemistry and Plasma Processing,* 2015, vol. 35, no. 6, p. 1097-1110. ISSN: 0272- 4324.

PROCHÁZKA, P.; PAZDERA, I.; CIPÍN, R.; HADAŠ, Z. Optimal Design Techniques for Small Electric Car Operating in Common Urban Traffic. *Przeglad Elektrotechniczny,* 2015, vol. 2015, no. 5, p. 1-8. ISSN: 0033- 2097.

VOREL, P.; PROCHÁZKA, P.; PAZDERA, I.; ČERVINKA, D.; MARTIŠ, J.; CIPÍN, R. Possibilities of trolleybus transportation energy demand reduction. *ECS Transactions,* 2015, vol. 70, no. 1, p. 301-304. ISSN: 1938- 5862.

KLOC, P.; AUBRECHT, V.; BARTLOVÁ, M.; COUFAL, O. Radiation transfer in air and air- Cu plasmas for two temperature profiles. *Journal of Physics D: Applied Physics,* 2015, vol. 48, no. 5, p. 1-13. ISSN: 0022- 3727.

BÁRTA, J.; ONDRŮŠEK, Č. Rotor Design and Optimization of Synchronous Reluctance Machine. *MM Science Journal,* 2015, vol. 2015, no. march 2015, p. 555-559. ISSN: 1803- 1269.

RUDOLF, P.; ŠTEFAN, D.; SEDLÁŘ, M.; KOZÁK, J.; HABÁN, V.; HUZLÍK, R. Spatio- temporal description of the cavitating flow behavior around NACA 2412 hydrofoil. *Journal of Physics: Conference Series,* 2015, vol. 656, no. 012168, p. 1-5. ISSN: 1742- 6596.

Bachelor Degree Programme

Počítače a programování 1
(prof. RNDr. Vladimír Aubrecht, CSc.)

Informatika v silnoproudé elektrotechnice
(Ing. Marcel Janda, Ph.D.)

Výkonová elektronika
(doc. Dr. Ing. Miroslav Patočka)

Elektrické přístroje
(doc. Ing. Bohuslav Bušov, CSc.)

Elektrické stroje
(doc. Ing. Čestmír Ondrůšek, CSc.)

Teorie řízení
(Ing. Petr Huták, Ph.D.)

Elektrické pohony
(Ing. Dalibor Červinka, Ph.D.)

Automobilová elektrotechnika
(prof. Ing. Vítězslav Hájek, CSc.)

Řídicí elektronika
(doc. Dr. Ing. Miroslav Patočka)

Elektrické stroje 2
(Ing. Ondřej Vítek, Ph.D.)

Inspekční a revizní činnost
(doc. Ing. František Veselka, CSc.)

Mikroprocesorová technika v pohonech
(Ing. Ivo Pazdera, Ph.D.)

Počítačová podpora konstruování
(Ing. Marcel Janda, Ph.D.)

Master Degree Programme

Dynamika elektromechanických soustav
(doc. Ing. Čestmír Ondrůšek, CSc.)

Technika výkonových měničů
(doc. Dr. Ing. Miroslav Patočka)

Počítačové modelování v silnoproudé elektrotechnice
(Ing. Marcel Janda, Ph.D.)

Řízení dynamických soustav
(Ing. Petr Huták, Ph.D.)

Laboratoře elektrických strojů a přístrojů
(Ing. Marcel Janda, Ph.D.)

Průmyslová elektronika
(doc. Ing. Pavel Vorel, Ph.D.)

Střídavé pohony
(Ing. Ivo Pazdera, Ph.D.)

Elektrické mikropohony
(Ing. Ondřej Vítek, Ph.D.)

Elektrické regulované pohony
(Ing. Dalibor Červinka, PhD.)

Navrhování výkonových měničů
(doc. Dr. Ing. Miroslav Patočka)

Adaptivní a optimální řízení pohonů
(Ing. Petr Huták, PhD.)

Diagnostika a jištění elektrických zařízení
(Ing. Jiří Valenta, Ph.D.)

Projektové řízení inovací
(doc. Ing. Bohuslav Bušov, CSc.)

Řídicí členy v elektrických pohonech
(doc. Ing. Pavel Vorel, Ph.D.)

Stavba a výroba elektrických přístrojů
(doc. Ing. Bohuslav Bušov, CSc.)

Mikropočítačové řízení elektrických pohonů
(Ing. Ivo Pazdera, Ph.D.)

Doctoral Degree Programme

Vybrané statě z elektrických strojů a přístrojů
(doc. Ing. Čestmír Ondrůšek, CSc.)

Vybrané statě z výkonové elektroniky a elektrických pohonů (prof. Ing. Jiří Skalický, CSc.)

Laboratories

Laboratory of Electrical Machines (research on commutation of electrical machines, measurement of medium-power output, magnetic bearings, automated measurements, Ondřej Vítek)

Laboratory of Mechatronics (Ondřej Vítek)

Laboratory of Electrical Devices (switching devices, Bohuslav Bušov)

Laboratory of Holographic Interferometry (optical stand for holographic interferometry, e.g. diagnostics of rotating machine vibrations, Marcel Janda)

Laboratory of Electrical Drives (electrical drives with focus on independent traction, Dalibor Červinka)

Laboratory of Power Electronics (research in pulse converters of different outputs, Petr Procházka)

Laboratory of High-Current Electronics (research on DC/DC converters, alternators and low-voltage brushless drives, Dalibor Červinka)

Laboratory of Dynamic Properties of Electrical Machines (experimental analysis of transient performances in electrical machines, Ondřej Vítek)

Laboratory of Control Electronics (Pavel Vorel)

Laboratory of Microprocessor Technology (Bohumil Klíma)

Laboratory of Microelectromechanical Systems (Rostislav Huzlík)

Laboratory of Power Electronics 2 (Pavel Vorel)

Research and Development Laboratory (Petr Procházka)