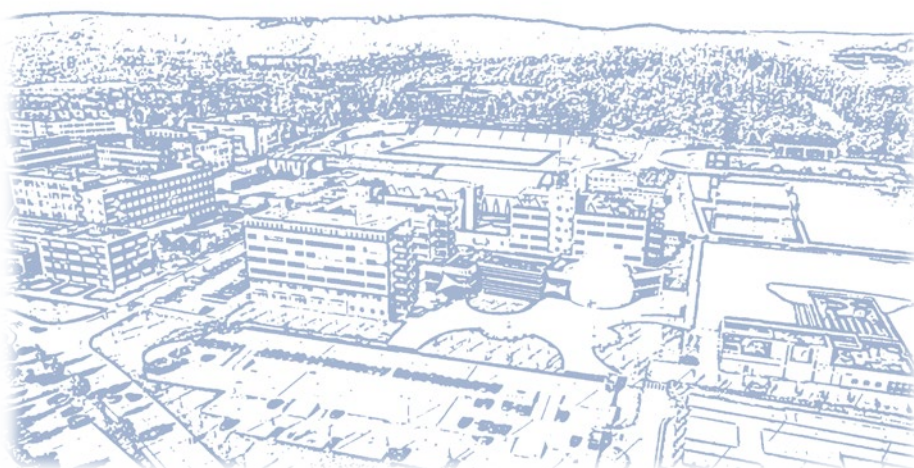
ANNUAL REPORT 2013

FACULTY OF ELECTRICAL ENGINEERING AND COMMUNICATION

BRNO UNIVERSITY OF TECHNOLOGY



Contents

Introduction 3
Faculty of Electrical Engineering and Communication 7
Accredited study programmes and specializations 9
Study Programmes 11
Science, Research and Doctoral Study 17
External Relations and International Cooperation 21
Academic Senate 27
Campus Development 29
Other 31
Department of Control, Instrumentation and Measurement 33
Department of Biomedical Engineering 39
Department of Power Electrical Engineering 47
Department of Electrical and Electronic Technology 53
Department of Physics 61
Department of Languages 67
Department of Mathematics 71
Department of Microelectronics 77
Department of Radioelectronics 89
Department of Telecommunications 99
Department of Theoretical and Experimental Electrical Engineering 109
Department of Power Electrical and Electronic Engineering 115

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 tuition were Czech and German. In consequence of political and national disputes Czech gradually ceased to be used as a language of tuition 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 became parts of 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). The faculty was the third largest among the then existing seven faculties of BUT 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 at FEECS 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) on 1 January 2002.

The year 2013 when new premises were completed is an important milestone in the history of the faculty. After more than 50 years of its existence the whole faculty is now located in one campus Pod Palackého vrchem.

The Faculty in 2013

Professor Karel Rais was the Rector of Brno University of Technology. One of the leading personalities of the Faculty of Electrical Engineering and Communication Professor Pavel Jura from the Department of Control, Measurement and Instrumentation was Vice-Rector for Information and Communication Technologies.

The Dean of the faculty in 2013 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). Miloslav Morda was faculty bursar.

At the end of 2013 there were 224 academics at the faculty (professors, associate professors, lecturers and other pedagogical and research staff) and 3,817 students in all forms of government supported programmes. Moreover, instruction was provided for 263 students of the Faculty of Information Technology, 40 students of the Faculty of Mechanical Engineering and 32 students of the Faculty of Management. On the other hand the Faculty purchased tuition for 14 students from the Faculty of Management. Then

the number of students educated at the Faculty totalled 4,152. In 2013 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). The study programmes at FEEC are now fully compatible with the educational systems applied in the European Union, mobility has been facilitated. Among the FEEC graduates in 2013 there were 449 students who completed the Bachelor degree programme, 416 follow-up Master programme graduates and 33 doctoral students completed the Ph.D. programme. There were 1, 245 students who started their Bachelor studies, 607 started the follow-up Master programme and 82 students the Ph.D. programme. Instruction in English was provided to 2 international students paying their fees. Five academics habilitated and were appointed associate professors with the title Docent. The Scientific Board dealt with 2 applications for the appointment to professorship.

Events and Activities

- Moving of seven faculty departments - UAMT, UBMI, UEEN, UREL, UTEE, UTKO and UVEE in-to the new premises at Technická 12 in the BUT campus Pod Palackého vrchem
- completion and opening of Professor List Technology Park
- meeting of the deans of the Faculty of Electrical Engineering and Faculty of Information Technology with members of the club Elektron
- commencement of tuition in the new Bachelor programme Audio Engineering
- commencement of tuition in the new Ph.D. programme BTBIO-F Biomedical Engineering and Bioinformatics
- courses for secondary school students interested in study at FEEC organized by Department of Mathematics to help them prepare for entrance examination at FEEC
- Open Door Days (November, December 2013), visits by students to secondary schools, secondary school advisors visiting FEEC
- presentation of new study programmes at 20th European trade fair of higher and lifelong education Gaudeamus 2013, 5-8 November 2013, to promote FEEC and arise interest of secondary school students in study at FEEC, participation in trade fairs in Bratislava and Prague
- meeting of the leaderships of Czech and Slovak faculties of electrical engineering and associated faculties in Pardubice, 21-23 May 2012
- publication of the faculty yearbook 2012/13
- development of programmes leading to habilitation and appointment procedures
- STUDENT EEICT 2013 Conference and Competition organized in cooperation with the Faculty of Information Technology, sponsored by Honeywell, ABB, ON Semiconductor and others, with 45 Bachelor, 91 Master, 104 Ph.D. papers and 12 papers by secondary-school students
- Lifelong Learning Programme-Erasmus and other European programmes
- full use of the central BUT information system
- completion of two European projects funded by the operational Programme ´Research and Development for Innovations´, Priority Axis 2 - Regional Research and Development Centres ‘SIX – Centre for Sensoric, Information and Communication Systems’ and CVVOZE – ‘Centre for Renewable Electric Energy Sources’, investigators Zbyněk Raida and Vladimír Aubrecht
- preparation of projects of regional centres funded from NPU I,

- establishment of the mininursery Edisonka funded by the Human Resources and Employment Operational Programme, key investigator Professor Ivo Provazník
- activities of Academic Senate member Vlasta Krupková in her capacity as a member of the Higher Education Council
- activities of Academic Senate members, mainly the chairman Miloslav Steinbauer, focused on the development 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-seventh faculty ball at the Voroněž hotel

Achievements

Economic situation of the faculty in 2013 was satisfactory. Income for educational activity increased to the level of 2011 and therefore the funds distribution mechanism could be applied. The trend in salaries and material supply was favourable also due to outstanding pedagogical and research achievements of academic staff and faculty expenditure minimization.

Economic stability of departments was mainly due to involvement in research projects of the Czech Science Foundation, Foundation of the Czech Academy of Sciences, Ministry of Trade and Industry, European Commission (FP6 and FP7) and Higher Education Development Fund, and efforts of those who under the leadership of chief investigators participated in OP VK projects, the OP PI project for Professor List Technology Park and two OP VaVpI projects for regional research centres SIX and CVVOZE.

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

Jarmila Dědková
Dean

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. Tomáš Mejzlík

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. Pavel Jura, CSc.
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. Radimír Vrba, CSc.
Doc. Ing. Jaroslav Zendulka, CSc.

External members

Doc. Ing. Ladislav Dušek, CSc.
Ing. Leoš Dvořák
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
Ing. Robert Vích, DrSc.

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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: Automation 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

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

Study areas: Biomedical and Ecological Engineering
Power Electrical 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
Power Electrical and Electronic Engineering
Teleinformatics

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

Accredited Areas for Habilitation Procedures and Procedures for Appointment to Professorship

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

Study Programmes

Bachelor Degree Programme English in Electrical Engineering and Information Technology

In academic year 2012/13 a new Bachelor programme English in Electrical Enginering and Information Technology (AJEI-H) with one study area 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 subjects focused on management skills, cultural studies, and fundamentals of electrical engineering and economics. The graduates will be equipped for work in industrial companies, in government administration, research institutions, management and technical translations. The graduates 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 were 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 the 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 the mathematics test.

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 88 applicants for academic year 2013/14, 64 appicants were admitted and 54 of them 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 has been offered at FEEC. This 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. This programme was prepared and implemented in cooperation with Janáček Academy of Music and Performing Arts in Brno, 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 the above entrance examination. Decisive for admission is the number of points achieved at the aptitude test, and in the entrance examination the applicant is required to achieve the given minimum number of points. The aptitude test cannot be exempt. Exempt from the 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 119 applicants, 82 were admitted and 59 students enrolled.

Bachelor Degree Programme Biomedical Technology and Bioinformatics

In academic year 2007/08 a new 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 at Masaryk University in Brno.

The study area Biomedical Technology and Bioinformatics is mainly focused on practice, but it also prepares graduates for further studies in the 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, but also for communication with doctors and medical staff. They get acquainted with operation principles and use of medical technology and informatics, and gain ability to communicate 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 in academic year 2013/14 was 150. The written examination contained tests in mathematics and biology. Applicants with secondary-school grade average of 1.25 were exempt from the 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 the examination and those who passed the examination with excellent results were admitted. In 2013 there were 183 paid applications for study in the programme BTBIO-A, 129 applicants were admitted and 122 enrolled. And there were 311 full-time students in the BTBIO-A programme.

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 1,817 full-time students enrolled in the Bachelor programme EECR-B in 2013. The programme was completed by 340 students, 81 of them in the study area Automation and Measurement Technology (B-AMT), 69 in Electronics and Communications (B-EST), 32 in Microelectronics and Technology (B-MET), 66 in Power Electrical and Electronic Engineering (B-SEE) and 92 in Teleinformatics (B-TLI).

In the part-time Bachelor programme EECR-BK there were 255 students in 2013. The part-time study programme was completed by 25 students, 6 of them in study area Automation and Measurement Technology (BK-AMT), 7 in Electronics and Communications (BK-EST), 3 in Microelectronics and Technology (BK-MET), 8 in Power Electrical and Electronic Engineering (BK-SEE) and 1 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 three assessed parts completed National Comparative Examinations with a minimum of 60% 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.

In 2013 there were 1,384 applicants, 1,166 for full-time study and 218 for part-time form of study. Finally, 1,032 students were admitted, 852 in full-time study and 180 in part-time study. As the number of admitted students did not reach full capacity, a second term was announced. There were 57 applications for full-time study and 25 applications for part-time study. The total number of students enrolled was 963, 808 full-time students and 155 part-time students. It can be said that the part-time form of study remains in the focus of interest.

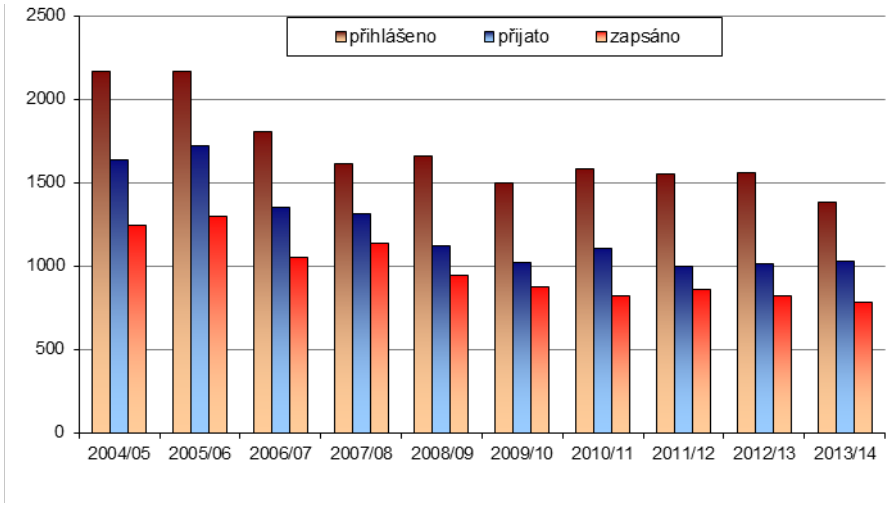
Table 1: Interest of full-time students in Bachelor programme study areas – Automation and Measurement Technology (B-AMT), Electronics and Communications (B-EST), Microelectronics and Technology (B-MET), Power Electrical and Electronic Engineering (B-SEE), Teleinformatics (B-TLI)

Acad. year		*B-AMT*	*B-EST*	*B-MET*	*B-SEE*	*B-TLI*	*Not given*	*Total*
	Number	98	127	50	90	153		
2008/09	%	18,9	24,5	9,7	17,4	29,5	47	565
	Number	94	101	48	77	101		
2009/10	%	22,3	24	11,4	18,3	24	0	421
	Number	144	151	47	146	214		
2010/11	%	20,5	21,5	6,7	20,8	30,5	-	702
	Number	138	109	100	160	189		
2011/12	%	19,8	15,7	14,4	23	27,2	-	696
	Number	140	97	71	159	182		
2012/13	%	21,6	14,9	10,9	24,5	28,0	-	649
	Number	113	105	67	146	189		
2013/14	%	21,5	14,9	10,9	24,4	28,0	-	620

Graph 1 shows the numbers of applicants, admitted and enrolled full-time students since 2004. The decreasing trend in applications is apparent, due to the demographic trend and students' interest in newly accredited Bachelor programmes at other universities. For the first time in academic year 2010/11 applicants were admitted directly to a selected specialization, while in previous years they had selected their specializations during their studies. Statistics for the period 2004/05 - 2013/14 based on students´ interest in individual study areas after the first semester are in Table 1.

Preparatory courses were offered by 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, at visits by teachers and students to secondary schools, and at the GAUDEAMUS fair. All above activities are focused on promotion of FEEC and increasing interest in studies at the faculty.



Graph 1: Applicants, admitted and enrolled in full-time and part-time form of study in EECR-B in academic years 2004/05 - 2013/14

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 2013 there were 790 full-time students in the follow-up Master programme EECR-M, 369 in the first year of study and 421 in the second year of study. There were 185 part-time students in EECR-ML, 96 first-year students and 89 second-year students. In 2013, 312 students completed their studies, 17 in Biomedical and Ecological Engineering (M-BEI), 35 in Power Electrical Engineering (M-EEN), 69 in Electronics and Communications (M-EST), 34 in Electrotechnical Manufacturing and Management (M-EVM), 43 in Cybernetics, Automation and Measurement (M-KAM), 26 in Microelektronics (M-MEL), 18 in Power Electrical and Electronic Engineering (M-SVE) and 70 in Telecommunications and Informatics (M-TIT). Part-time study was completed by 45 students, 1 in Biomedical and Ecological Engineering (ML-BEI), 4 in Electronics and Communications (ML-EST), 10 in Electrotechnical Manufacturing and Management (ML-EVM), 5 in Cybernetics, Automation and Measurement (ML-KAM), 1 in Microelectronics (ML-MEL), 5 in Power Electrical and Electronic Engineering (ML-SVE) and 19 in Telecommunications and Informatics (ML-TIT).

The total number of applicants for study in the EECR programme (with paid application) was 691, 551 applicants for full-time programme (EECR-M) and 140 for part-time programme (EEKR-ML). For academic year 2013/14 the

maximum numbers of admissions approved by Academic Senate were 750 (full-time study) and 250 (part-time study). The written entrance examination contained 10 tasks approved by the Council of Study Programmes, two for each of the subjects Electrotechnical Engineering 1, Electrotechnical Engineering 2, Electronic Components, Signals, Structures, Systems and Measurement in Electrical Engineering. The time limit was 75 minutes, the candidates were divided into 5 groups with subgroups A and B. Every correct result yielded 10 points. The total was 100 points. 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 of them. On the announced date of entrance examination 27 June 2013 nearly all applicants enrolled. The second term of entrance examination 9 July 2013 and Committee meeting scheduled for 22 August 2013 were cancelled. The total number of admitted was 532, 426 in full-time study and 106 in part-time study, 498 of them enrolled, 397 in full-time study and 101 in part-time study.

All admitted were registered for the study areas they had selected. Numbers of applicants and admitted by study areas are in Table 2.

Table 2: Numbers of applicants and admitted in study areas of follow-up Master programmes EECR-M and EECR-ML in 2013: 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, Automation and Measurement (M-KAM, ML-KAM), Microelectronics (M-MEL, ML-MEL), Power Electrical and Electronic Engineering (M-SVE, ML-SVE), Telecommunications and Informatics (M-TIT, ML-TIT)

Study area	*Applicants*	*Admissions*	*Study area*	*Applicants*	*Admissions*
M-BEI	51	32	ML-BEI	21	17
M-EEN	62	51	ML-EEN	10	9
M-EST	78	63	ML-EST	11	7
M-EVM	54	44	ML-EVM	23	14
M-KAM	97	77	ML-KAM	16	11
M-MEL	39	32	ML-MEL	4	3
M-SVE	46	34	ML-SVE	13	9
M-TIT	124	93	ML-TIT	42	36

Bachelor Degree Programme Biomedical Technology and Bioinformatics

Since academic year 2010/11 the faculty provides education in the follow-up Master programme Biomedical Engineering and Bioinformatics BTBIO-F in full-time form of study. In 2013 there were 118 students enrolled in this programme, 64 in the first year of study and 54 second-year students.

Fifty-nine students completed their studies in the programme BTBIO-F in 2013. The total number of applicants for admissions in this programme was 98. The top limit approved by Academic Senate for admission to full-time study in the programme BTBIO-A in academic year 2013/14 was 250. The written examination contained 10 problems selected from 2 topic areas published on faculty websites. The timing was 75 minutes. Every correct result yielded 10 points. The total was 100 points. 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 of them. The second term of entrance examination 9 July 2013 and the Committee meeting scheduled for 22 August 2013 were cancelled. Seventy applicants were admitted and 70 students enrolled.

Lifelong Education and Self-Paid Study

The faculty participates in the system of lifelong 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 2013 there were 9 students in the lifelong education programme.

There was one international student paying his fees in the follow-up Master programme EECR-MN.

Support of tuition

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 2013, 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 tuition in full-time and part-time Bachelor and follow-up Master programmes new or innovated electronic texts (ET) and multimedia aids (MP) were created and are accessible on faculty websites.

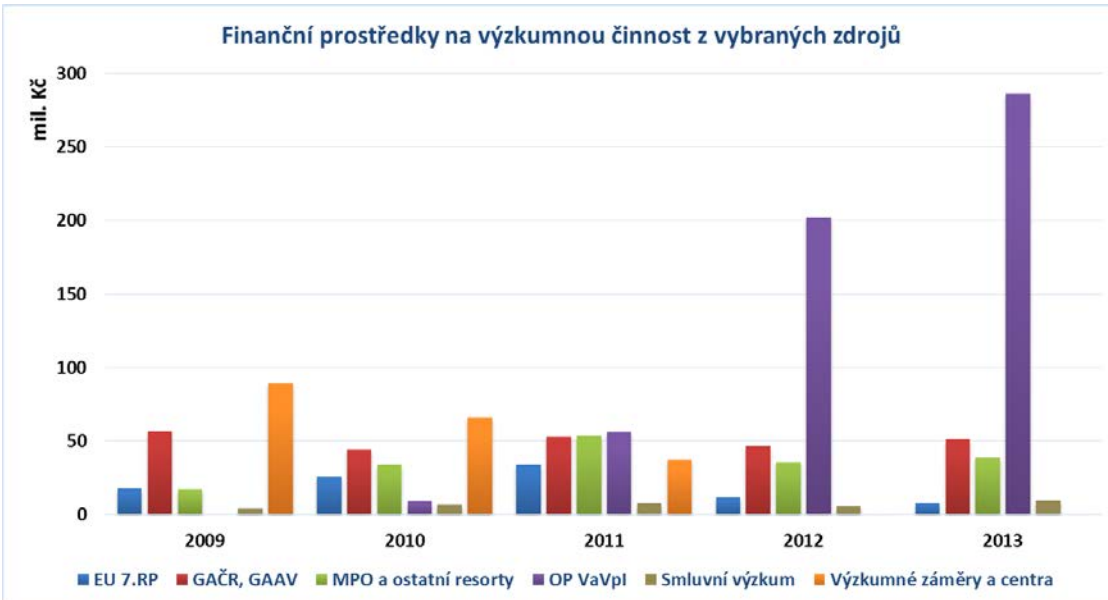
Science, Research and Doctoral Study

Creative Activities, Science and Research

The major source of mainly investment funds in 2013 was the Operational Programme 'Research and Development for Innovations' (OP VaVpI) for completion of two regional research centres.

Other major sources were projects of the Czech Science Foundation and projects conducted in cooperation with industrial companies.

Original scientific and research results were published in 2 international monographs and in 149 articles in impact journals. FEEC was granted 17 national patents.



Graph 4: Research and development funds in mil.CZK, 2009 - 2013

Regional Research Centres

The project of two regional centres was completed in 2013. The centres will be financed by the Operational Programme 'Research and Development for Innovations' (OP VaVpI).

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

The Centre is targeted at concentration and coordination of capacities focused on research, development and innovation of renewable energy sources. The research team members are involved in research of chemical and photovoltaic sources of electrical energy, electrochemistry, electromechanics, electrotechnology, power electrical engineering, electrical drives, mobile robots and industrial electronics.

The research centre CVVOZE deals with three programmes:

1. Electromechanical energy conversion,

2. Chemical and photovoltaic energy sources
3. Generation, transmission, distribution and exploitation of electrical energy

The project is focused on research and cooperation of a higher education institution with the industrial sector and acceleration of the transfer of new technologies into industrial use.

The most significant outcome of the implementacion stage are 2 strategic laboratories: Laboratory of Switching Devices and Ultra High Voltage Laboratory. Both laboratories were set in operation in September 2013. The equipment provides opportunities for research and development in diagnostics and testing of electrical devices. Accreditation of these two laboaratories is now being prepared.

Another major achievement is accreditation of Laboratory of Measurement and Photovoltaic Laboratory in accordance with the standard ČSN EN ISO/IEC 17025:2005. These laboratories have been designed for research on climate and mechanical resistance of electrotechnical devices and special diagnostics of photovoltaic panels.

All CVVOZE laboratories form a unique infrastructure that will certainly attract industrial partners whose production activities are closely connected with the centre's research work. For more information on CVVOZE visit www.cvvoze.cz.

Centre of Sensoric, Information and Communication Systems (SIX)

(investigator Zbyněk Raida)

The research centre SIX was established to support the innovation potential of companies making use of communication, information and sensoric technologies in various applications. As an example support of the quality of life of ageing generation can be mentioned (scans of life functions and wireless transfer of information), prevention of terrorist (scans of traces of hazardous substances and wireless transmission of warnings), road transport management (intelligent highway is based on communication between vehicles and stationary units) or early diagnosis of neurological disorders through analysis of speech signals.

The structure of Centre SIX follows the structure of a common communication system:

The cornerstone of a communication system is its physical layer (hardware – electronic circuits, antennas and lines). Frequencies - perspective systems move from currently used bands to millimeter bands. In the millimeter band it is possible to create communication channels of sufficient transmission capacity. Research of the physical layer is in the focus of Program of Microwave Technologies.

To achieve an accord of hardware components of the communication system, an approriate system layer must be designed. Research of the system layer is dealt with in the Program of Wireless Technologies.

Buses transferring data packages can be seen as blood circulation in the communication system. To secure safe blood circulation it is necessary to design appropriate communication protocols and find ways how to optimize data traffic. Responsible for this part of research is the Program of converged systems (communication and information systems converge toward union digital data transfer). An interface must be added to the communication system that would tranform data to physical characteristics such as sound or image. The Program of multimedia systems is focused on this research.

Information obtained from chemical, biological and physical characteristics constitutes the bulk of data transferred by sensoric systems. Scanning processing and transfer of sensoric data are objectives of the Program of sensoric systems.

Centre SIX consists of five research departments. Each of them is responsible for one of above programs, though all of them contribute to research conducted by other departments.

For more information visit

http://www.six.feec.vutbr.cz.

Habilitations and Appointments to Professorship

In 2013 five new associate professors habilitated:

Doc. Ing. Radek Kubásek, Ph.D.

Theoretical Electrical Engineering

Doc. Ing. Jaroslav Láčík, Ph.D.

Electronics and Communications

Doc. Ing. Radek Škoda, Ph.D.

Power Electrical Engineering

Doc. Ing. Petr Sedlák, Ph.D.

Electrical and Electronic Technology

Doc. Ing. Jaroslav Koton, Ph.D.

Teleinformatics

There were two appointments to professorship:

Prof. Ing. Pavel Václavek, Ph.D.

Technical Cybernetis

Prof. Ing. Pavel Fiala, Ph.D.

Theoretical Electrical Engineering

Doctoral Programme

In academic year 2013/14 there are 444 students in the doctoral degree programme. Two of them enrolled in the study programme in English. Numbers of Ph.D. students in individual years of study over the last five years are in Table 4

Table 5 shows numbers of doctoral programme graduates over the last five years. The list of 2013 doctoral programme graduates can be found on FEEC websites, links *Study, Doctoral study programmes, Doctoral programme graduates.*

Table 4: Numbers of Ph.D. students from 2009 to 2013

year	***2009***	***2010***	***2011***	***2012***	***2013***
1.	88	118	**85**	**77**	**79**
2.	80	76	96	82	62
3.	80	75	69	85	70
4.	60	64	71	64	77
5.	8	47	48	58	49
6.	18	7	43	37	46
7.	23	18	7	41	51
total	**357**	**406**	**419**	**444**	**434**

Table 5: Numbers of Ph.D. graduates by departments from 2009 to 2013

	2009	*2010*	*2011*	*2012*	*2013*	*Total*
UAMT	8	1	0	3	2	**14**
UBMI	6	0	2	1	4	**13**
UEEN	4	0	4	0	1	**9**
UETE	4	1	2	0	1	**8**
UMAT	0	0	2	2	1	**5**
UFYZ	3	0	0	4	2	**9**
UMEL	11	0	3	3	4	**21**
UREL	12	7	8	7	8	**42**
UTEE	1	1	1	1	1	**5**
UTKO	10	3	4	7	4	**28**
UVEE	6	4	1	3	5	**19**
Total	**65**	**17**	**27**	**31**	**33**	**173**

Student Creative Activities

The 19th FEEC STUDENT EEICT conference 2013 was jointly organized with the Faculty of Information Technology on 25 April 2013. The abbreviation stands for the English words Electrical Engineering, Information and Communication Technology indicating the priority areas of research and education at the two faculties. In the finals of the competition there were 240 papers - 45 Bachelor, 91 Master, 104 Ph.D. papers and 12 papers presented by 7 secondary schools. The major sponsors were Honeywell, ABB and ON Semiconductor .

The papers were evaluated by 27 expert committees including representatives of the sponsoring companies, academics and representatives of the club Students for Students. Sixty nine top or outstanding papers were awarded at the closing ceremony. For more information visit FEEC websites, links *Research, Conference, Student EEICT.*

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 participation in international research and education projects, placements of FEEC students at partner universities abroad, and offering tuition 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 faculties of Brno University of Technology. There has been good cooperation with the BUT Department of International Relations responsible for organization and economic support of mobility programmes and the Lifelong Learning Programme (LLP)/Erasmus. FEEC is one of the most active faculties of Brno University of Technology. There has been good cooperation with the BUT Department of International Relations responsible for organization and economic support of mobility programmes and the Lifelong Learning Programme (LLP)/Erasmus. As a result, 49 students were at placements of 201 months, and 19 teachers were on lecture stays of 22 weeks and a two-week training of two members of the staff (Table 6). The extent of student and teacher mobility is stabilized. Reciprocally, the interest of international students in placements at FEEC has been increasing. Within the LPP programme, 99 students came for placements of 433 months, Mobility figures for incoming and outgoing students in individual programmes in 2013 are in Table 7. The programme ended in 2013 and is being followed by programme Erasmus +. Fifty-eight existing agreements in the Lifelong Learning Programme-Erasmus were renewed. The list of universities cooperating with the Faculty on the basis of Lifelong Learning Programme-Erasmus in academic year 2013/14 is in Table 9.

In 2013 we succeeded in obtaining funds for long-term international placements of students of all study programmes within the mobility Development Programme of the Ministry of Education in the amount of 421.5 thous. CZK. There were 9 students in placements of 19 months in total.

Table 8 shows mobility figures for incoming and outgoing students for all mobility programmes over the past 5 years. The trend in incoming students is steadily increasing, the number of outgoing students for 2013 is comparable with the previous year. The duration of placements of FEEC students is 223 months. On the other hand, placements of international students at FEEC reached 462.5.

The faculty supports cooperation of departments and academics with international institutions based on interfaculty and LLP-Erasmus as well as newly made contacts. In 2013, the amount of 65 thous. CZK was provided in support of such activities. Targeted international relations were financed by departments from projects of operational programmes. The funds were used to cover travel expenses of internationally recognised academics coming to short lecture stays at FEEC.

The Faculty of Electrical Engineering and Communication invites renowned international experts to lectures, short-term lecture stays or short-term stays connected with research projects. Such visits help to increase the professional level of tuition and contribute to the general education of students and atmosphere of international environment in work on research projects.

Funding in the amount of 260 thous. CZK for these activities was obtained from the Development Programme of Ministry of Education 2.5. The funds were provided to 7 experts of the faculty and used to pay the costs connected with the lecture stay of prof. Leonid Berezansky from Ben-Gurion University of Negev

in Israel and Prof. Cicekoglu Ogushana from Bogazici University in Turkey.

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

Table 6: Student and teacher placements at universities abroad in the Socrates-Erasmus and Longlife Socrates-Erasmus and Longlife Learning Programme-Erasmus from 2009 to 2013

Socrates (LLP)-Erasmus	***2009***	***2010***	***2011***	***2012***	***2013***
Students	45	51	54	46	49
Months	167	167,5	224	215	201
Lecture stays	28	25	27	27	19
Lecture weeks	34	29	32	33	22
Training				1	2
Training weeks				2	2

Table 7: Student placements at FEEC and abroad by programmes, 2013 - summary

Activity	***Arrivals***		***Departures***	
	Students	***Months***	***Students***	***Months***
Socrates(LLP)-Erasmus	99	433	49	201
Inter-university contracts	10	29,5	-	-
Development Programme of Ministry of Education	-	-	9	19
Other mobility	0	0	2	3

Table 8: Student placements at FEEC and abroad in all mobility programmes from 2009 to 2013

		2009	***2010***	***2011***	***2012***	***2013***
Arrivals	Students	68	74	86	100	109
	Months	235	285	298	432,5	462,5
Departures	Students	62	67	71	65	60
	Months	238	230	276	261	223

External Relations

External relations are focused on promotion of faculty activities and providing updated and specific information on the 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 the generation of 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 new competition of four-person secondary-school teams Merkur perFEKT Challenge. The competition offered five topics which the teams selected at registration. For capacity reasons only the first 30 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 120 students, including 5 girls, for the competition. 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 2014, the winners competed in the superfinals, where the winner was the team *Maxwell silver hammer* representing Gymnázium Vídeňská Brno. This year they are the owners of the challenge cup for the overall winner.

Increased attention was paid to the media, to presenting information on 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 in Czech and in English.

As every year, the management attended the annual meeting of the Czech and Slovak faculties of electrical engineering and associated faculties held in Pardubice 21-23 May 2013. 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.

In 2013 forty-five years passed since the tragic event on Kubínská hola where an avalanche killed six students of the then Electrotechnical Faculty in Brno, who were on a ski course. Representatives of FEEC together with participants of the course honoured the memory of the victims at the monument on Kubínská hola.

Close 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 tasks, expert's reports and consultancy. The major cooperating companies are E. ON Česká republika, a.s., ABB s.r.o., Veletrhy Brno, a.s., 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 research centres CVVOZE – Centre for Research and Exploitation of Renewable Energy Sources and SIX – Centre of Sensoric, Information and Communication Systems. Cooperation was also intensified during the preparation and start of the project of the 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 thesis 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 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 9: Universities having Erasmus programme agreements with FEEC for academic year 2013/14

University	Country
Katholieke Hogeschool Limburg	Belgium
Технически университет-София	Bulgaria
Технически университет-София – Пловдив	Bulgaria
Aalborg Universitet	Denmark
Danmarks Tekniske Universitet Lyngby	Denmark
Aalto University	Finland
Tampereen teknillinen yliopisto	Finland
University of Eastern Finland	Finland
EPITA Paris	France
ESIGELEC Rouen	France
Groupe ESIEE Paris	France
Institut Catholique de Paris	France
Institut Polytechnique de Grenoble	France
Université Joseph Fourier – Polytechnique de l´Université Grenoble	France
Italy	Italy
Vilniaus Gedimino Technikos Universitetas	Lithuania
Duale Hochschule Baden-Württemberg Lörrach	Germany
Fachhochschule Wiesbaden	Germany
Friedrich-Alexander-Universitat Erlangen	Germany
Hochschule für Technik, Wirtschaft und Kultur Leipzig	Germany
Hochschule Furtwangen – Furtwangen University of Applied Science	Germany
Hochschule Pforzheim – University of Applied Sciences Pforzheim	Germany
Technische Universität Dresden	Germany
Universität Ulm	Germany
Universitat I Bergen	Norway

Politechnika Wroclawska	Poland
Instituto Politécnico de Lisboa – ISEL	Portugal
Instituto Politécnico do Porto	Portugal
Universidade Católica Portuguesa – Escole Superior de Biotecnologia	Portugal
Universidade do Porto	Portugal
University of Coimbra	Portugal
Fachhochschule Oberösterreich	Austria
Technische Universität Graz	Austria
Technische Universität Wien	Austria
Universität für Gesundheitswissenschaften, Medizinische Informatik und Technik	Austria
TEI Κρήτης - Παράρτημα Χανίων	Greece
Technická univerzita v Košiciach, Fakulta elektrotechniky a informatiky	Slovakia
Žilinská univerzita, Elektrotechnická fakulta	Slovakia
Žilinská univerzita, Fakulta prírodných vied	Slovakia
Modragon Unibertsitatea	Spain
Universidad de Cantabria	Spain
Universidad de Malaga	Spain
Universidad de Zaragoza	Spain
Universidad Politécnica de Valencia	Spain
Universitat de Valéncia	Spain
Universitat Politécnica de Catalunya	Spain
Universitat Rovira i Virgili Tarragona	Spain
Högskolan I Halmstad	Sweden
Malmö högskola	Sweden
Bogazici University	Turkey
Karadeniz Technical University	Turkey
Namik Kemal University	Turkey
Suleyman Demirel Universitesi	Turkey

T.C. Ankara Üniversitesi	Turkey
T.C. Dogus Universitesi	Turkey
Yeditepe University	Turkey
Zonguldak Karaelmas University	Turkey
University of Huddersfield	Great Britain



Academic Senate

In 2013 the members of Academic Senate were (membership in legislative committee – LK, pedagogical committee – PK, economic committee – EK, 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. Petr Baxant, Ph.D., EK, UEEN
RNDr. Petr Fuchs, Ph.D., EK, UMAT
Ing Petr Honzík, Ph.D., EK, UAMT
Doc. Ing. Jiří Mišurec, CSc., EK, UTKO
PhDr. Ludmila Neuwirthová, Ph.D., PK, UJAZ
Ing. Radovan Novotný, Ph.D., EK, LK, UMEL
Ing. Helena Polsterová, CSc., EK, PK, UETE
Doc. Ing. Miloslav Steinbauer, Ph.D., EK, LK, UTEE
RNDr. Naděžda Uhdeová, Ph.D., EK, LK, UFYZ
Ing. Martin Vítek, Ph.D., EK, UBMI
Doc. Ing. Pavel Vorel, Ph.D., EK, PK, UVEE

Student Chamber

Bc. Tomáš Mejzlík, LK, PK, chair
Bc. Rastislav Červenák, PK
Bc. Juraj Jakubík, PK
Bc. Petr Jarchovský, EK, PK
Ing. Marián Klampár (since October), EK
Bc. Zuzana Moldříková, PK
Bc. Vojtěch Svatoš, EK
Ing. Martin Zukal (until October), EK

Academic Senate held 11 regular meetings, with an average attendance of 79%. Discussions were always constructive, proposals were sent to members prior to the meeting for study and comments using the central electronic storage system also used for archiving of documents.

During the year one member of Student chamber resigned on the membership in Academic Senate and his position was taken by a substitute elected in regular elections 2011.

On 10 December 2013 Academic Senate elected Professor Jarmila Dědková for candidate for the position of Dean in the period February 2014 – January 2018.

Academic Senate discussed novels of internal guidelines and standards. FEKT. Updating of the

Longterm Intent of FEEC BUT for 2011-2015 for was dealt with and approved for 2013. The Dean's guideline amending the Study and Examination Regulations of BUT was approved as well as the Dean´s guideline amending the Scholarship Regulations of BUT. The Senate approved of the draft of amendment to Regulations for Admissions to Study and requirements for admission to doctoral programme EKT-P, connected with accreditation of the new Ph.D. programme 'Biomedical Technology and Bioinformatics' concerned with the possibility to announce a second round of admission procedure. The economic issues discussed and approved included economic report for 2012, proposal on the distribution of financial means in 2013 and proposal on the distribution of funds earned by teaching.

Legislative committee prepared a draft of the new version of Election Regulations and Rules of Procedure that will be discussed in 2914 by the Senate.

At its November meeting, Academic Senate approved of the regulations for distribution of financial means at FEEC for 2014. The regulations were worked out in cooperation of the faculty management and the economic committee of the senate.

Campus Development

In the first half of 2013 all faculty departments located at premises Kolejní 4, Purkyňova 118 and Technická 2 were moved to the newly completed premises Technická 12. Construction of strategic laboratories - part of the project Professor List Technology Park was completed in 2013. The park adjoins the premises Technická 12 in the north, and was opened on 18 September 2013. Since then, all faculty educational and research units have been located at premises in the university campus Pod Palackého vrchem.

At the beginning of 2013, Ministry of Education approved of the project Reconstruction of Technická 8 and issued Decision on Providing Funds on18 April 2013. The project will receive funds from the 4th priority axis of the Operational Programme VaVpI. By implementation of this project, all premises used by the faculty will be at the same technological level and it will be possible to control them within a single control system. Also instruction technical support will be comparable. The reconstruction preparation process was completed, a suitable supplier chosen and contract concluded in the second half of December 2013. Completion of reconstruction is scheduled for the second half of January 2015.

Computer Networks and Information Systems

Priority was given to:

- upgrading of servers and adaptation of facilities
- centralization of network administration services in connection with opening of Technická 12 and Professor List Technology Park
- network backup
- commencement of preparation and implementation of transition of file and directory services until now 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
- faculty information system

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 the setting of the information system in operation are in progress. The process will continue in 2014.


VUT


VUT V BRNĚ FEKT
VĚDECKO-TECHNICKÝ PARK PROFESORA LISTA

Other

Equal Opportunities

The consultancy centre for support of equal education opportunities continued its activities in 2013.

The centre, managed by the Department of Physics, provided professional and personal consultancy to female students, and organized information events for the public aimed at removing the barriers female students face when choosing careers in technical fields.

The centre concentrated on integration of handicapped students in full-time and part-time study programmes, promotion of study opportunities and their specific needs in terms of financial and other support.

The Centre cooperated with the Department of Physics, the club Students for Students and some 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 2013 - 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.

The project IET1 is targeted at increasing the interest of secondary school students in electrical engineering and improving conditions for teaching electrical engineering and physics, including exploitation of ICT in instruction. In 2013, the Institute organized informal popularization motivation lectures at elementary and secondary schools. The staff also conducted projects for gifted secondary-school students and organized lectures for teachers. In laboratories students can carry out experiments and tasks supporting their basic knowledge.

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

IET is seeking breakthrough solutions to some extremely difficult research tasks together with elementary, secondary and tertiary education students preparing them for research careers. Close contact with authorities in science and technology fields educates young researchers and creates innovative potential of coming generation. Most IET team students enter a Ph.D. programme. The project Elektro-výzkumník (CZ.1.07/2.3.00/20.0175) contributes to research potential development.

In 2013 IET organized the competition *Mikrokontroléry letí* for individuals and teams from secondary schools and universities.

Management:

Director – doc. Ing. Pavel Fiala, Ph.D.

Coordinator IET1 – Ing. Jan Mikulka, Ph.D.

Coordinator IET2 – doc. Ing. Pavel Fiala, Ph.D.

Members – UTEE staff, representatives of industrial partners IET1 (Siemens s.r.o), IET2 (SVS FEM s.r.o., Prototypa a.s., ABB s.r.o., Eaton Moeller s.r.o.).

Address:
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Student Activities

Active at FEEC are two student organizations: Student Chamber of Academic Senate (SK AS) and the voluntary club Students for Students (SPS).

The Student Chamber is part of the Academic Senate of FEEC and has seven voted members. The Student Chamber acts as an intermediary between faculty management and students, contributes to exchange of information covering the whole spectrum of study and faculty life, solutions of students' problems and instruction quality assessment by students. Activities of the club Students for Students are focused on leisure time. Its role is to enrich student life.The club issues the student magazine e-fekt (1500 copies every other month), assists first-year students in adaptation at the Faculty and organizes cultural, sports and entertainment events. The membership is voluntary, every student can apply, not only FEEC students, but all those interested in student activities at FEEC and BUT. In 2013 students co-organized the ball of FEKT and FIT. They also co-organized the EEICT Student Conference and helped with FEEC presentation at trade fairs and Roadshow, visits to secondary schools.

On 25 September 2013, the club organized the 6th festival of amateur groups *Music from FEEC*. The band The Substitation was the winner and received an invitation to BUT Majáles. The main guest of the event Vypsaná fiXa drew 4500 music fans. In the summer semester, sport-loving students took part in the fun race *Run to 53*. The task was to run the distance from Kolejní 4 to the nearby no 53 bus stop and back in the shortest possible time. There were several student categories, a VIP faculty management relay and student relays. Approximately 50 runners and several hundreds of spectators took part. The project *perFEKT assistance* was prepared for first-year Bachelor students to help them cope with study affairs and getting round the city of Brno, and many other activities were organized.

Department of Control, Instrumentation and Measurement

Doc. Ing. Václav Jirsík, CSc.

Head

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Professors

Prof. Ing. Pavel Jura, CSc.
Prof. Ing. Petr Pivoňka, CSc.
Prof. Ing. František Šolc, CSc.
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. Pavel Václavek, Ph.D.
Doc. Ing. Luděk Žalud, Ph.D.

Lecturers

Ing. Miloslav Čejka, CSc., 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. Pavel Kučera, Ph.D., Ing. Tomáš Macho, Ph.D., 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. Abdulrahman Wassem, Ing. Tomáš Babinec, Mgr. Radek Baránek, Ing. Luděk Buchta, Ing. Vladimír Burlak, Ing. Pavel Číp, Ing. Michal Dobias, Ing. Jiří Fialka, Ing. Tomáš Florián, Ing. Lešek Franek, Ing. Petr Gábrlík, Ing. Miroslav Graf, Ing. Daniel Haupt, Ing. Tomáš Hynčica, Ing. Adam Chromý, Ing. Aleš Jelínek, Ing. Tomáš Jílek, Ing. Miroslav Jirgl, Ing. Jan Klusáček, Ing. Vlastimil Kříž, Ing. Michal Kupčík, Ing. Aleš Lebeda, Ing. Lukáš Otava, Ing. Milan Papež, Ing. Karel Pavlata, Ing. Stanislav Pikula, Ing. Daniel Píši, Ing. Lukáš Pohl, Ing. Peter Rášo, Ing. Michal Šír, Ing. Ladislav Šťastný, Mgr. Martin Tůma, Ing. Miroslav Uher, Ing. Martin Vágner, Ing. Ivo Veselý, Ing. Jan Vomočil, Ing. Dušan Zámečník

External: Ing. František Burian, Ing. Miloš Čábel, Ing. Luděk Červinka, Ing. Petr Feilhauer, Ing. Petr Fidler, Ing. František Gogol, Ing. Ondřej Hynčica, Ing. Luděk Chomát, Ing. Miroslav Juhas, Ing. Václav Kaczmarczyk, Ing. Zdeněk Kaňa, Ing. Roman Koňarik, Ing. Ondřej Kotaba, Ing. Jolana Krištůfková - Dvorská, Ing. Marek Kváš, Ing. Jaroslav Lepka, Ing. Vlastimil Lorenc, Ing. Petr Malounek, Ing. Vojtěch Mikšánek, Ing. Věra Nováková - Zachovalová, Ing. Petr Petyovský, Ing. Jan Pohl, Ing. Václav Sáblík, Ing. David Skula, Mgr. Karel Stibor, Ing. Jaroslav Šembera, Ing. Miroslav Uher, Ing. Michal Vašina, Ing. Libor Veselý, Ing. Miloš Veselý. I Ing. Miroslav Vomela, Ing. Pavel Zbranek, Ing. Viktor Žáček.

Administrative and Technical Staff

Ing. Luděk Anděra, Ing. František Burian, Ing. Tomáš Florián, Ing. Ondřej Hynčica, Bc. Jan Klečka, Ing. Marek Kváš, Lenka Petrová, Ing. Petr Petyovský, Ing. Soběslav Valach, Jan Vodička.

Centre of Applied Cybernetics

Ing. Luděk Anděra, Ing. Tomáš Babinec, Ing. Pavel Číp, Ing. Peter Honec, Ph.D., Ing. Karel Horák, Ph.D., Ing. Soběslav Valach.

Main Interests

The department provides tuition in the Bachelor degree programme Automation and Measurement Technology and the follow-up Master degree programme Cybernetics, Automation and Measurement. Tuition 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 international ENIAC project MotorBrain in cooperation with international industrial partners. Intensive research was carried out in theoretical probability filtration of dynamical systems. Work concentrated mainly on automatic setting algorithms of filter parameters with possible suppression of system model vagueness. The group continued long-term cooperation with the company Freescale Semiconductor in design of robust and predictive algorithms for AC drives control.

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, GMC-měřicí technika, s.r.o., IMA s.r.o., Speltronic s.r.o. 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 inside buildings, design of highly reliable robotic systems for work under extreme conditions, with automatic self-localization and map-making, and flying surveying equipment multicopter. Currently, the group is dealing with 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 prime interest of the group dealing with computer vision is applied research and development. The group coop erates with a number of commercial companies and university departments. Academics are involved in research projects and provide instruction in image processing and analysis, object recognition, modelling and recognition of 3D objects and specialized hardware design for real-time processing of extensive data files.

Apart from research, the department is also centred on innovation of instruction (European project Multimedia Interactive Didactic System) and equipment upgrading or systematic upgrading of laboratories for computer vision and image processing.

Research teams are involved in an OP VaVpI project of CEITEC (Central European Institute of Technology). group Cybernetics for Materials Sciences is involved in the project CEITEC. The group is 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 test laboratories for safety control systems.

Major achievements

The automatic control group achieved very good results in applied research of advanced control systems for electric drives. A conception of a system for multiphase synchronous motor control for new-generation electrical vehicles was developed. A significant publishing achievement by young researchers is a publication dealing with state observability of AC drives in the journal IEEE Transactions on Industrial Electronics, the most frequently cited journal in this field.

The group of measurement technology involved in projects VaVPI made major investment in the development of laboratories for measurement of noise, vibrations and temperature. A new course was launched, dealing with analog processing of sensor signals.

The group of industrial automation was involved in several significant projects, mainly investigation of a filter-ventilation unit for protection of people from chemicals, validation of trigger code for industrial automation systems and recuperation of elevator loss energy for standby consumption.

The group of artificial intelligence and robotics continued work on the visual telepresence system with high resolution and possibility to combine data from TOF proximity scanners, CCD sensors and thermovision cameras. The reconnaissance robotic system Orpheus designed for operation in hazardous environments was further developed, and development of new modifications Orpheus-HOPE and Orpheus-X3 started.

The group of computer vision continued work on the prestigious project 'Applied Cybernetics Centre' which has already been operating under the Technology Agency ČR in the programme 'Centre of Competence'. The group regularly contributes to the Centre with publications, results of applied reserach such as prototypes or patents. Research focused on sophisticated computer vision problems in traffic applications, driving assistance systems and industrial camera inspection systems. The group also deals with methods and devices for processing of large volumes of data on the basis of FPGA/DSP platforms.

Major Research Projects

Centre of Applied Cybernetics – Technology Agency ČR – CK TE01020197

Investigator: Vladimír Kučera, investigator at ÚAMT Karel Horák

Intelligent Algorithms for Predictive and Robust Control of AC Drives – GA ČR - P103-10-0647

Investigator: Pavel Václavek

MotorBrain - Nanoelectronics for Electric Vehicles Intelligent Failsafe PowerTrain - ENIAC 2010-1 270693

Investigator: Pavel Václavek

Development, Implementation and Verification of the Prototype of a Diagnostic System for Early Detection of Risk Factors in the Cardiovascular System – MPO FR-TI3/703

Investigator: Soběslav Valach

Internet of Energy for Electric Mobility - 7H11098

Investigator: Petr Fiedler

REVYT - Recuperation of Elevator Loss Energy for Standby Consumption - TA03020907

Investigator: Zdeněk Bradáč

Selected Publications

FIALKA, J.; BENEŠ, P. Comparison of Methods for the Measurement of Piezoelectric Coefficients. *IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT.* 2013. 62(5). p. 1047 - 1057. ISSN 0018-9456. (IF(2012)=1,357).

VÁCLAVEK, P.; BLAHA, P.; HERMAN, I. AC Drive Observability Analysis. *IEEE Transactions on Industrial Electronics.* 2013. 60(8). p. 3047 - 3059. ISSN 0278-0046. (IF(2012)=5,165).

JIRGL, M.; HAVLÍKOVÁ, M.; BRADÁČ, Z. Vliv prostředí na spolehlivost systémů 1/2. *Journal of Safety Research and Applications (JOSRA).* 2013. 6(1). p. 1 - 8. ISSN 1803-3687.

LEBEDA, A.; PIVOŇKA, P. Estimace a linearizace modelů založených na principu Volterrových řad. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz).* 2013. 15(4). p. 260 - 265. ISSN 1213-1539.

RÁŠO, P. Príklad, porovnanie a využitie vysoko zrýchlených skúšok životnosti. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz).* 2013. 15(3). p. 162 - 180. ISSN 1213-1539.

TŮMA, M. The choice of the optimal parameter in the data compression task using generalized Laguerre functions. *GRANT Journal.* 2013. 2(1). p. 67 - 148. ISSN 1805-0638.

KOCMANOVÁ, P.; ŽALUD, L. Kalibrace dálkoměrné kamery SwissRanger SR4000. *GEODETICKÝ A KARTOGRAFICKÝ OBZOR.* 2013. 59/101(6). p. 123 - 128. ISSN 1805-7446.

JIRGL, M.; HAVLÍKOVÁ, M.; BRADÁČ, Z. Vliv prostředí na poslehlivost systémů 2/2. *Journal of Safety Research and Applications (JOSRA).* 2013. 6(2). p. 1 - 8. ISSN 1803-3687.

HORÁK, K.; ČERVINKA, L. Visual Measurement of Material Segregation in Steel Wires. *Procedia Engineering.* 2013. 2013(X). p. 1 - 8. ISSN 1877-7058.

BRADÁČ, Z.; ZEZULKA, F.; SZABÓ, Z.; ROUBAL, Z.; MARCOŇ, P. Design and functional description of experimental smart grid. *TechSys 2009 Internationa Conference Engieering, Technologies and Systems.* 2013. 2013(19). p. 313 - 317. ISSN 1310-8271.

BRADÁČ, Z.; ZEZULKA, F.; SAJDL, O.; VESELÝ, I.; ŠÍR, M. Smart Grid - Smart Metering System. *TechSys 2009 Internationa Conference Engieering, Technologies and Systems.* 2013. 2013(19). p. 329 - 333. ISSN 1310-8271.

BARÁNEK, R.; ŠOLC, F. TUNING OF COMPLEMENTARY FILTER ATTITUDE ESTIMATOR USING PRECISE MODEL OF MULTICOPTER. *ElectroScope - http://www.electroscope.zcu.cz.* 2013. 2013(5). p. 1 - 6. ISSN 1802-4564.

TŮMA, M. Application of Laguerre functions to data compression. *GRANT Journal.* 2013. 1(2). p. 54 - 133. ISSN 1805-0638.

Bachelor Degree Programme

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

Databázové systémy
(Ing. Radovan Holek, CSc.)

Elektronické měřicí systémy
(Ing. Miloslav Čejka, CSc.)

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
(doc. 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. Miloslav Čejka, CSc.)

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
(Doc. 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.)

Zpracován 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. Miloslav Čejka, CSc.)

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.)

Operační systémy reálného času
(Ing. Pavel Kučera, 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
(doc. 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, Miloslav Čejka, Marie Havlíková)

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

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 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)

Laboratory of Computer Vision (instruction, research and development of devices for image recording and methods of image processing and analysis for industrial and traffic applications, 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)

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

Laboratory of Image Processing (instruction and research of image signal processing methods, common and multispectral data, image analysis, recognition and classification of objects, Karel Horák)

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. Radovan Jiřík, Ph.D., Ing. Vratislav Harabiš, Ing. Jiří Sekora, Ing. Martin Vítek, Ph.D.

Ph.D. Students

Ing. Layal Abo Khayal, Ing. Larisa Baiazitova, Ing. Jaroslav Balogh, Ing. Michal Bartoš, Ing. Miloš Bělehrad, Ing. Karel Bubník, Ing. Mgr. Jan Cimbálník, Ing. Petr Čech, Ing. Vratislav Čmiel, Ing. Jiří Dlouhý, Ing. Alena Drkošová, Ing. Jiří Dvořák, Ing. Jiří Gazárek, Ing. Lucie Grossová, Ing. Vratislav Harabiš, Ing. Jakub Hejč, Ing. Jiří Chmelík, Ing. Martin Chrobák, Ing. Roman Jakubíček, Ing. Jiří Janeček, Ing. Jan Kašpárek, Ing. Oto Janoušek, Ing. Martin Klimek, Ing. Petr Klimeš, Ing. Markéta Koťová, Ing. Jiří Kratochvíla, Ing. Vladimíra Kubicová, Ing. Zdeněk Kuna, Ing. René Labounek, Ing. Martin Lamoš, Mgr. Peter Langer, Ing. Pavel Leinveber, Ing. Ondřej Macíček, Ing. Pavlína Macková, Ing. Denisa Maděránková, Ing. Miloš Malínský, Ing. Martin Mézl, Ing. Jiří Nedvěd, Ing. Jan Odstrčilík, Ing. Pawan Kumar Pathak, Ing. Roman Peter, Ing. Petra Podlipná, Ing. Tomáš Potočňák, Ing. Jiří Roleček, Ing. Pavla Ronková, Ing. Marina Ronzhina, Ing. Karel Sedlář, Ing. Jiří Sekora, Ing. Tomáš Slavíček, Ing. Vladimír Slávik, Ing. Lukáš Smital, Ing. Ladislav Soukup, Ing. Ondřej Svoboda, Ing. Tomáš Šikner, Ing. Helena Škutková, Ing. Marie Tobolová, Ing. Martin Valla, Ing. Petr Veselý, Ing. Petr Walek, RNDr. Bohuslav Zmek

Administrative and Technical Staff

Doc. PharmDr. Petr Babula, Ph.D., Ing. Gabriela Petrovičová, Miroslava Prášilová, Hana Rýznarová, MUDr. Šárka Sekorová

Main Interests

The department provides tuition in processing of signals and images, ecology, biomedical and ecological engineering, biomedical technology and bioinformatics in Bachelor, Master and doctoral programmes.

The department is involved in basic and applied research of engineering principles in neuroscience, physiology, electrochemistry, botanics, genetics, molecular biology and ecology. The main areas of interest are digital processing and analysis of especially cardiologic signals, digital processing and analysis of medical images, mainly of opthalmological and ultrasonographic data using contrasting substances, phylogenetic, evolution and similarity analysis of genomic and proteomic data, mainly metallothionein protein and mitochondrial DNA.

The department closely cooperates with the Opthalmological Clinic of Friedrich-Alexander-University Erlangen, Germany, University of Bergen, Norway, company Philips Česká republika, BLOCK, a.s., MIKRO s.r.o., Knitting Technology Research Institute a.s., 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.

The department is involved in 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 technologies. The department is also involved in the international project European regional cooperation AT – ČR (development of artificial lungs), national grant research projects GAČR (research of electrophysiology of the heart, research of nanotechnological and electrochemical tools for biochemical and molecular-biological studies, analysis of EEG and NMR imaging data in patients suffering from epilepsy, application of contrast magnetic resonance and ultrasonography imaging techniques in medical diagnostics), TAČR ALFA projects (development of artificial arteries with antibacterial effect). The department cooperates with the company Philips in the development of automated CT subtraction angiography of lower limbs. In cooperation with the Faculty of Information Technology and the Department of Technology Transfer the department is also involved in an OP VaVpI project 'BUT Safety and Protection' centred on biometric technology for the retina and iris.

Major Achievements

In 2013 members of the department published numerous articles in scientific journals and presented papers at international conferences, with favourable response within the scientific community. One of the most significant achievements is the publishing of an article in the journal BMC Bioinformatics with IF 3,024. Members of the department were awarded a national patent in technology for analysis of human cells contractility, 4 industrial samples were registered (unique optical constructions for simultaneous fluorescence meausurement of contractility and dynamics of calciferous transients in human cells. A certified methodology of preparation of nanotechnological materials for artificial arteries was registered, and a number of products such as authorized software and operating samples were created. An application for a national patent was submitted.

The department continued extensive cooperation with University Hospital U sv. Anny in a project of ICRC (International Clinical Research Center Brno) in section 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 cooperated with Technikum Wien and prepared a new double-degree programme, which was approved by both universities, and now first students are working on their diploma theses.

A new Ph.D. programme Biomedical Technology and Bioinformatics was accredited by the Accreditation Commission of ČR and instruction was commenced in 2013. It follows the Bachelor and Master programmes provided by UBMI, accredited by Ministry and Education and Ministry of Healthcare for training of specialists in biomedical engineering in compliance with the law on non-medical healthcare.

Major Research Projects

Advanced Lung Research for Veterinary Medicine of Particles for Inhalation – A Program of European Regional Cooperation Austria – Czech Republic M00250

Investigator: Ivo Provazník

Analysis of the Relation 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 Studies of Eucaryotic Cells (NanoBioTECell) – GAČR P102/11/1068

Investigator: Ivo Provazník.

Optimization of the Methodolody for Analysis and Assessment of Simultaneous EEG-fMRI in Pacients with Pharmacoresistant Epilepsy – GAČR P304/11/1318

Investigator: Jiří Jan

Development and Innovation of Nanomaterials for Targeted Modification of Arterial Implants – TAČR TA01010088

Investigator: Ivo Provazník

Selected Publications

ABO KHAYAL, L.; PROVAZNÍK, I.; TKACZ, E. Differential Analysis of Neurodegenerative Aging-Related Mitochondrial Genes of Long-Lived Naked Mole-Rat. *International Journal of Bioscience, Biochemistry and Bioinformatics*. 2013. 3(2). p. 75 - 79. ISSN 2010-3638.

BABULA, P.; MASAŘÍK, M.; ADAM, V.; PROVAZNÍK, I.; KIZEK, R. From Na+/K+-ATPase and Cardiac Glycosides to Cytotoxicity and Cancer Treatment. *Anti-Cancer Agents in Medicinal Chemistry*. 2013. 13(7). p. 1069 - 1086. ISSN 1871-5206. (IF(2012)=2,61).

BRÁZDIL, M.; JANEČEK, J.; KLIMEŠ, P.; MAREČEK, R.; ROMAN, R.; JURÁK, P.; CHLÁDEK, J.; DANIEL, P.; REKTOR, I.; HALÁMEK, J.; PLEŠINGER, F.; JIRSA, V. On the Time Course of Synchronization Patterns of Neuronal Discharges in the Human Brain during Cognitive Tasks. *PLOS ONE*. 2013. 8(5). p. 1 - 10. ISSN 1932-6203. (IF(2012)=3,73).

DOBEŠ, J.; ZÍTKA, O.; SOCHOR, J.; RUTTKAY-NEDECKÝ, B.; BABULA, P.; BEKLOVÁ, M.; KYNICKÝ, J.; HUBÁLEK, J.; KLEJDUS, B.; KIZEK, R.; ADAM, V. Electrochemical Tools for Determination of Phenolic Compounds in Plants. A Review. *International Journal of Electrochemical Science*. 2013. 8(4). p. 4520 - 4542. ISSN 1452-3981.

GUMULEC, J.; RAUDENSKÁ, M.; HLAVNA, M.; STRAČINA, T.; SZTALMACHOVÁ, M.; TANHÄUSEROVÁ, V.; PÁCAL, L.; RUTTKAY-NEDECKÝ, B.; SOCHOR, J.; ZÍTKA, O.; BABULA, P.; ADAM, V.; KIZEK, R.; NOVÁKOVÁ, M.; MASAŘÍK, M. Determination of oxidative stress and activities of antioxidant enzymes in guinea pigs treated with haloperidol. *Experimental and Therapeutic Medicine*. 2013. 5(2). p. 479 - 484. ISSN 1792-0981. (IF(2012)=0,344).

HARABIŠ, V.; KOLÁŘ, R.; MÉZL, M.; JIŘÍK, R. Comparison and evaluation of indicator dilution models for bolus of ultrasound contrast agents. *Physiological Measurement*. 2013. 34(2). p. 151 - 162. ISSN 0967-3334. (IF(2012)=1,496).

CHUDOBOVÁ, D.; NEJDL, L.; GUMULEC, J.; KRYŠTOFOVÁ, O.; MERLOS RODRIGO, M.; KYNICKÝ, J.; RUTTKAY-NEDECKÝ, B.; KOPEL, P.; BABULA, P.; ADAM, V.; KIZEK, R. Complexes of silver(I) ions and silver phosphate nanoparticles with hyaluronic acid and/or chitosan as promising antimicrobial agents for vascular grafts. *International Journal of Molecular Sciences*. 2013. 14(7). p. 13592 - 13614. ISSN 1422-0067. (IF(2012)=2,464).

JANOUŠEK, O.; KOLÁŘOVÁ, J.; RONZHINA, M.; NOVÁKOVÁ, M.; PROVAZNÍK, I. Motion artefact in voltage-sensitive fluorescent dye emission during repeated ischemia of isolated heart. *Physiological Research*. 2013. 62(4). p. 371 - 378. ISSN 0862-8408. (IF(2012)=1,531).

JIŘÍK, R.; NYLUND, K.; GILJA, O.; MÉZL, M.; HARABIŠ, V.; KOLÁŘ, R.; STANDARA, M.; TAXT, T. Ultrasound perfusion analysis combining bolus-tracking and burst-replenishment. *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*. 2013. 60(2). p. 310 - 319. ISSN 0885-3010. (IF(2012)=1,822).

KOLÁŘ, R.; HARABIŠ, V.; ODSTRČILÍK, J. Hybrid retinal image registration using phase correlation. *Imaging Science Journal*. 2013. 61(4). p. 269 - 284. ISSN 1368-2199. (IF(2012)=0,506).

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KRAJCAROVÁ, L.; NOVOTNÝ, K.; BABULA, P.; PROVAZNÍK, I.; PROCHAZKOVÁ, P.; ADAM, V.; MARTIN, M.; KIZEK, R.; KAISER, J. Copper Transport and Accumulation in Spruce Stems (Picea abies (L.) Karsten) Revealed by Laser-Induced Breakdown Spectroscopy. *International Journal of Electrochemical Science*. 2013. 8(4). p. 4485 - 4504. ISSN 1452-3981.

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KRYŠTOFOVÁ, O.; SOCHOR, J.; ZÍTKA, O.; BABULA, P.; KUDRLE, V.; ADAM, V.; KIZEK, R. Effect of Magnetic Nanoparticles on Tobacco BY-2 Cell Suspension Culture. *International Journal of Environmental Research and Public Health*. 2013. 10(1). p. 47 - 71. ISSN 1660-4601. (IF(2012)=1,998).

NEJDL, L.; SOCHOR, J.; ZÍTKA, O.; CERNEI, N.; RUTTKAY-NEDECKÝ, B.; KOPEL, P.; BABULA, P.; ADAM, V.; HUBÁLEK, J.; KIZEK, R. Spectrometric and chromatographic study of reactive oxidants hypochlorous and hypobromous acids and their interactions with taurine. *Chromatographia*. 2013. 76(7-8). p. 363 - 373. ISSN 0009-5893. (IF(2012)=1,437).

NYLUND, K.; JIŘÍK, R.; MÉZL, M.; LEH, S.; HAUSKEN, T.; PFEFFER, F.; ODEGAARD, S.; TAXT, T.; GILJA, O. Quantitative Contrast-Enhanced Ultrasound Comparison Between Inflammatory and Fibrotic Lesions in Patients with Crohn's Disease. *Ultrasound In Medicine And Biology*. 2013. 39(7). p. 1197 - 1206. ISSN 0301-5629. (IF(2012)=2,455).

ODSTRČILÍK, J.; KOLÁŘ, R.; BUDAI, A.; HORNEGGER, J.; JAN, J.; GAZÁREK, J.; KUBĚNA, T.; ČERNOŠEK, P.; SVOBODA, O.; ANGELOPOULOU, E. Retinal Vessel Segmentation by Improved Matched Filtering: Evaluation on a New High–Resolution Fundus Image Database. *IET Image Processing*. 2013. 7(4). p. 373 - 382. ISSN 1751-9659. (IF(2012)=0,895).

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RONZHINA, M.; ČMIEL, V.; JANOUŠEK, O.; KOLÁŘOVÁ, J.; NOVÁKOVÁ, M.; BABULA, P.; PROVAZNÍK, I. Application of the optical method in experimental cardiology: action potential and intracellular calcium concentration measurement. *Physiological Research*. 2013. 62(2). p. 125 - 137. ISSN 0862-8408. (IF(2012)=1,531).

SKOPALÍK, J.; POLÁKOVÁ, K.; ČMIEL, V.; HAVRDOVÁ, M.; HRUŠKOVÁ, D. Nanočástice v současné biologii a medicíně. *Zpravodaj České biologické společnosti*. 2013. 23(2). p. 2 - 9. ISSN 1805-9619.

SMITAL, L.; VÍTEK, M.; KOZUMPLÍK, J.; PROVAZNÍK, I. Adaptive Wavelet Wiener Filtering of ECG Signals. *IEEE Transactions on Biomedical Engineering*. 2013. 60(2). p. 437 - 445. ISSN 0018-9294. (IF(2012)=2,348).

ŠKUTKOVÁ, H.; VÍTEK, M.; BABULA, P.; KIZEK, R.; PROVAZNÍK, I. Classification of genomic signals using dynamic time warping. *BMC Bioinformatics*. 2013. 14(10). p. 1 - 7. ISSN 1471-2105. (IF(2012)=3,024).

ŠKUTKOVÁ, H.; VÍTEK, M.; KŘÍŽKOVÁ, S.; KIZEK, R.; PROVAZNÍK, I. Preprocessing and Classification of Electrophoresis Gel Images Using Dynamic Time Warping. *International Journal of Electrochemical Science*. 2013. 2013(8)(2). p. 1609 - 1619. ISSN 1452-3981.

ŠMERKOVÁ, K.; DOSTÁLOVÁ, S.; VACULOVIČOVÁ, M.; KYNICKÝ, J.; TRNKOVÁ, L.; KRÁLÍK, M.; ADAM, V.; HUBÁLEK, J.; PROVAZNÍK, I.; KIZEK, R. Investigation of interaction between magnetic silica particles andlambda phage DNA fragment. *Journal of Pharmaceutical And Biomedical Analysis*. 2013. 86(1). p. 65 - 77. ISSN 0731-7085. (IF(2012)=2,947).

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ZÍTKA, O.; ŠOBROVÁ, P.; ADAM, V.; HUBÁLEK, J.; PROVAZNÍK, I.; ŽIŽKOVÁ, V.; KIZEK, R. Nanotechnologie pro efektivnější cévní náhrady. *Chemické listy*. 2013. 107(1). p. 24 - 29. ISSN 0009-2770. (IF(2012)=0,453).

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.)

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. Milan Chmelař, CSc.)

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.)

Multitaktní systémy
(doc. Ing. Jiří Kozumplík, CSc.)

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
(Prof. RNDr. Hana Librová, CSc)

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

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

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

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

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, experiment 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, Ivo Provazník)

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, Ivo Provazník)

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

Doc. Ing. Petr Toman, Ph.D.

Head

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Associate Professors

Doc. Ing. Vladimír Blažek, CSc.
Doc. Ing. Petr Baxant, Ph.D.
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. Antonín Matoušek, CSc.
Doc. Ing. Jaroslava Orságová, Ph.D.
Doc. Ing. Jiří Raček, CSc.
Doc. Ing. Radek Škoda, Ph.D.
Doc. Ing. Petr Toman, Ph.D.

Lecturers

Ing. Bohumír Garlík, CSc., Ing. Jan Gregor, CSc., Ing. Karel Katovský, Ph.D., Ing. Jan Macháček, Ph.D., Ing. Martin Paar, Ph.D., Ing. Stanislav Sumec, Ph.D., Ing. Josef Šenk, CSc., Ing. Jan Škoda, Ph.D., Ing. Lukáš Radil, Ph.D., Ing. David Topolánek, Ph.D.

Ph.D. Students

Ing. Almabrok Abdoalhade, Ing. Tomáš Bartošík, Ing. Branislav Bátora, Ing. Martin Belatka, Ing. František Bernáth, Ing. Mayada Daboul, Ing. Jiří Dočkal, Ing. Štěpán Foral, Ing. Miroslav Haluza, Ing. Nail Khisamutdinov, Ing. Tomáš Klouček, Ing. Marek Kopička, Ing. Michal Krbal, Ing. Jakub Mašek, Ing. Jan Morávek, Ing. Jan Novotný, Ing. Luděk Ondroušek, Ing. Tomáš Pavelka, Ing. Jiří Pěcha, Ing. Václav Prokop, Ing. Michal Ptáček, Ing. Jan Šlezingr, Ing. Jaroslav Špaček, Ing. Martin Štefanka, Ing. René Vápeník, Ing. Jan Varmuža, Ing. Josef Vávra

Administrative and Technical Staff

Ing. Filip Koval, Jitka Langerová

Main Interests

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

Research is focused on generation of electrical power in conditions of sustainable development, that is 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 electric energy, technical and technological limits of inter-state power distribution, analysis of major system failures and appropriate measures, connection of wind-powered stations and design of outdoor and indoor illumination protection 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, ČEZ, MEgA - Měřící Energetické Aparáty, a.s., ČEPS, a.s., ABB, s.r.o., EGÚ Brno, a.s., Teplárny Brno, a.s., Siemens, s.r.o., etc. There has also been cooperation with departments of power electrical engineering at all Czech and Slovak technical universities.

Members of the department have been active in the Technology platform 'Sustainable Energy Engineering Czech Republic' and in international associations CIRED, CIGRE and IEEE.

In 2013 the department moved to new premises Technická 12 and a number of its laboratories were included in the regional research centre CVVOZE where new Ultra-high Voltage Laboratories were established.

Major Achievements

In 2013 the department was involved in research conducted by the Centre for Research and Exploitation of Renewable Energy (CVVOZE). Members of the department participated in 1 MPO TIP project, 3 TAČR projects, 2 FRVŠ and 3 OP VK projects, an international project on cooperation with Texas A&M University Kontakt II, 1 Leonardo da Vinci programme and 26 projects on cooperation with industrial companies.

The major results published in reputable journals and presented at national and international conferences concerned complex methodology of measuring voltage fluctuations, modern illumination control in intelligent electroinstallations, analysis of light sources resistance to short-term voltage drops and cut-offs, flickermetre implementation in the LabView environment. The third generation of LDA brightness analyzer was developed for assessment of street illumination.

The department continued cooperation with E.ON Česká republika, s.r.o. in dealing with issues of the safety of electric lines in the case of failures, and failure localization. Cooperation with Unicontrols-Tramex s.r.o. focused on development of railway signal lamps. 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 was also involved in the project 'ePower – Innovation of Instruction in Power Engineering and Power Electrical Engineering Based on E-learning and Practical Training' and the project 'CENE-NET - Partnership in New Generation Nuclear Power Engineering'. Work on a joint university project 'KISP – Complex Innovation of Study Programmes and Improvement of Instruction at FEEC BUT' Brno was commenced.

Major Research Projects

Centre for Advanced Nuclear Technologies - TE01020455 (CANUT)

Investigator: Karel Katovský

A Dynamic Model of Distribution Network - TA03020523

Investigator: Petr Toman

A System for HV Network Protection Using Standardized Digital Output Current and Voltage Sensors IEC 61850-9-2 - TA03010444

Investigator: Jaroslava Orságová

Research and Development of a Modular System of Phytotron Low Power Consumption Chambers - FR-TI3/383

Investigator: Petr Baxant

Research and Characteristics of Materials for Heat Accumulation in Containment Systems of Light Water Nuclear Reactors at an Effective Reduction of Internal Pressure in Accidents - LH12063

Investigator: Karel Katovský

Selected Publications

RADIL, L. Netradiční metoda akumulace elektrické energie. *Energetika.* 2013. 63(2). p. 76 - 78. ISSN 0375-8842.

JAKUBOVÁ, I.; ŠENK, J.; LÁZNIČKOVÁ, I. The Influence of Nitrogen in Ar+N2 Mixture on Parameters of High-temperature Device with Electric Arc. *Acta Polytechnica.* 2013. 53(2). p. 179 - 184. ISSN 1210-2709.

PTÁČEK, M. The definition of input parameters for modelling of energetic subsystems. *EPJ Web of Conferences.* 2013. 2013(54). p. 02002.1 (8 p.). ISSN 2100-014X.

ŠKODA, J.; BAXANT, P.; KRBAL, M.; SUMEC, S.; PAVELKA, T. Photometry of LED sources. *Przeglad Elektrotechniczny.* 2013. 89(6/2013). p. 341 - 344. ISSN 0033-2097.

ONDROUŠEK, L. Inovativní možnosti provozu spalovacích turbín. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz).* 2013. 15(6). p. 380 - 385. ISSN 1213-1539.

ADZMAN, M.; TOPOLÁNEK, D.; LEHTONEN, M.; TOMAN, P. An Earth Fault Location Scheme For Isolated and Compensated Neutral Distribution Systems. *International Review of Electrical Engineering (IREE).* 2013. 8(5). p. 1520 - 1531. ISSN 1827-6660.

COUFAL, O. On Resistance and Inductance of Solid Conductors. *Journal of Engineering.* 2013. 2013(526072). p. 1 - 14. ISSN 2314-4904.

Coufal Oldřich. A method for the accurate and smooth approximation of standard thermodynamicfunctions (new version). *COMPUTER PHYSICS COMMUNICATIONS.* 2013. 184(7). p. 1810 - 1811. ISSN 0010-4655. (IF(2012)=3,078).

BÁTORA, B.; TOMAN, P. Using of PSCAD Software for Simulation Ferrorezonance phenomenon in the Power System with the Three-phase Power Transformer. *TRANSACTIONS ON ELECTRICAL ENGINEERING.* 2013. 2013 Vol.2(4). p. 102 - 105. ISSN 1805-3386.

VÁPENÍK, R. Svodový proud homogenního vedení s rozprostřenými parametry. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz).* 2013. 15(1). p. 52 - 59. ISSN 1213-1539.

Bachelor Degree Programme

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

Ekonomika a ekologie elektroenergetiky
(Ing. Jan Macháček, Ph.D.)

Jaderně energetická zařízení
(doc. Ing. Jiří Raček, CSc.)

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

Počítačové modelování a simulace
(doc. Ing. Petr Baxant, Ph.D.)

Projektování silových a datových rozvodů
(Ing. Jan Macháček, Ph.D.)

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

Strojní zařízení elektráren
(doc. Ing. Jiří Raček, CSc.)

Technická mechanika
(doc. Ing. Jiří Raček, CSc.)

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

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

Master Degree Programme

Aplikace elektrického oblouku
(Ing. Jan Gregor, CSc.)

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

Distribuční a průmyslové sítě
(doc. Ing. Jaroslava Orságová, Ph.D.)

Ekonomika elektroenergetiky
(Ing. Jan Macháček, 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.)

Energetická zařízení
(doc. Ing. Jiří Raček, CSc.)

Informační a řídicí systémy v elektroenergetice
(doc. Ing. Petr Baxant, Ph.D.)

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

Jaderné elektrárny
(doc. Ing. Jiří Raček, CSc.)

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

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

Nekonvenční přeměny
(doc. Ing. Antonín Matoušek, CSc.)

Osvětlovací soustavy
(doc. Ing. Petr Baxant, Ph.D.)

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

Projektování silových a datových rozvodů
(Ing. Jan Macháček, 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
(doc. Ing. Vladimír Blažek, CSc.)

Doctoral Degree Programme

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

Vybrané problémy z výroby elektrické energie
(doc. Ing. Antonín Matoušek, CSc.)

Laboratories

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

Laboratory of Electrical Protection (instruction in Protection and Security of Facilities, Integrated Protection Systems, measurement in real network, research, Jaroslava Orságová)

Laboratory of Electrical Networks (instruction in Electric Power Distribution, Transmission Networks, Electrical Stations and Line Networks, Distribution and Industrial Networks, research projects, Petr Toman)

Laboratory of Heating Technology (instruction in Electric Power Exploitation and Electric Heating Technology, Ilona Lázničková)

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

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

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

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

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

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

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

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

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)

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

Department of Electrical and Electronic Technology

Doc. Ing. Petr Bača, Ph.D.

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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.

Lecturers

Ing. Ondřej Čech, Ing. Petr Dvořák, RNDr. Andrea Fedorková, Ph.D., Ing. Martin Frk, Ph.D., Ing. Petr Křívík, Ph.D., Ing. Helena Polsterová, CSc., Ing. Zdenka Rozsívalová, Ing. Jiří Starý, Ph.D., Ing. Jiří Špinka

Ph.D. Students

Ing. Ondřej Čech, Ing. Pavel Čudek, Ing. Petr Dvořák, Ing. Daniel Frýda, Ing. Roman Gvritishvili, Ing. Jiří Hudec, Ing. Chladil Ladislav, Ing. Ivan Jakubis, Ing. Michl Kadlec, Ing. Ondřej Kaválek, Ing. Tomáš Kazda, Ing. Miroslav Kunovjánek, Ing. Jiří Libich, Ing. Josef Máca, Ing. Michal Musil, Ing. Jiří Neoral, Ing. David Pléha, Ing. Marek Solčanský, Ing. Radek Stojan, Ing. Lucie Šimonová, Ing. Jiří Šubarda, Ing. Jiří Tichý, Ing. Pavel Tošer, Ing. Sebastian Vaculík, Ing. Jiří Vrbický, 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 electric 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. The subject Materials and Technical Documentation is provided to all first-year full-time and part-time students in the Bachelor programme Electrical, Electronic, Control and Communication Technology.

In the Bachelor programme Biomedical Technology and Bioinformatics (BTBIO) the department provides instruction in the subject Materials and Components for Biomedicine.

Research activities are centred on basic and applied research oo electrochemical power sources (with focus on improving the characteristics of lead and alkaline accumulators for use in electric and hybrid vehicles), gel electrolytes and lithium-ion batteries, electrocatalysts and ion-exchange membranes for fuel cells, thin-layer electrodes for electrochromic systems, low combustibility materials for lithium-ion accumulators, photovoltaic systems, non-destructive diagnostics of defects and quality, 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.

Another area of interest is mathematical-physical modelling of blood flow in arteries, in cooperation with the team engaged in Magnetic Resonance and Bioinformatics (Institute of Scientific Instruments AVČR).

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, the company Graphite AG Kropfmühl AG, Institute of Scientific Instruments AVČR, Institute of Inorganic Chemistry AVČR, Institute of Physical Chemistry AVČR, Institute of Macromolecular Chemistry AVČR, the companies 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.

In 2014 research in all above mentioned areas is expected to continue, with focus on European research programmes and centres, GAČR, GAAV and FRVŠ projects.

The department focuses on continuing innovation of subjects in the study areas Microelectronics and Technology in the Bachelor programme and Electrotechnical Manufacturing and Management in the Master programme as well as upgrading of laboratories and computer rooms.

The department will co-organize the 35th conference 'Non-conventional Electric Energy Sources' in Blansko, 21-23 May 2014, and the 15th international conference 'Advanced Batteries, Accumulators and Fuel Cells' (ABAF- 15th) in Brno.

Major Achievements

The department coorganized the 34rd international conference 'Nonconventional Sources of Electric Energy' in Hrotovice, 29 – 31 May 2013. The conference was organized in cooperation with the Czech Electrotechnical Society, group for chemical sources of electric energy (Petr Bača, Pavel Tošer). The department also organized the 14th international conference 'Advanced Batteries, Accumulators and Fuel Cells', 1-5 September 2013, under the auspices of American electrochemical group the Electrochemical Society ECS and BUT Brno (Marie Sedlaříková and Jiří Vondrák).

Members of the department also participated in the meeting of Czech and Slovak colleagues, the 40th international conference 'Electrotechnology 2013', organized by the Institure of Power and Applied Electrical Engineering FEI STU, Bratislava (Jiří Kazelle).

In 2013 the department obtained funds for the bilateral project MŠMT ČR – Argentina (identification code 7AMB13AR008) 'Development of new lithium-ions bateries for storage of electric energy'. The project included exchange stays of two BUT and two Argetinian researchers.

The department was investigator or co-investigator of the project 'Specific tertiary education research' at BUT (Materials and Technologies in Electrical Engineering) and the FRVŠ project 236/2013 (Upgrading and Extension of Laboratory Assignments in Materials and Technical Documentation).

A member of the department staff visited the Institute of Physical Chemistry in Moscow.

Four members of the staff took part in the 18th conference organized by the Portuguese Electrotechnical Society in Porto (Portugal).

Andrea Fedorková went for a one-month internship with INIFTA La Plata and Atomic centro Bariloche Argentina and a two-month internship at Institute ICN2 (CSIC), Barcelona, Spain.

In September we had discussions with Dr. Marek Slavík of LITHIO s.r.o., Bratislava, and a Horizon project 'Post-lithium ion batteries for eletric automotive applications' is being prepared.

In cooperation with Institute of Scientific Instruments AVČR Brno the department is working on the European project 'Support of Human Resources and Knowledge Transfer in Conditions of International Cooperation of Research Teams', Operational Programme, Priority Axis 7.2 'Tertiary Education, Research and Development'.

The department was visited by two researchers of Žilina University during the conference '34 NZEEEV Non-conventional sources of electric energy'. May 29-31. Doc. Ing. Dušan Kudelas, Ph.D. presented the paper 'Simulation of wind farm parameters' and doc. Ing. Zdeněk Dostál, CSc. presented the paper 'Closed biosystem and energy cycles affected by civilization'.

Professor Vladimir Kulish of Nanyang Technological University, Singapore visited our department in July (13-19 July). He took part in the workshop „Ultra-Fast Energy Transport and High-Temperature Superfluidity'.

In September, the department invited four international guests for the conference 'ABAF-14th – Modern Batteries, Accumulators and Fuel Cells' - Manab Kundu, M.Sc., Ph.D. from Portugal, International Iberian Nanotechnology Laboratory, doc. RNDr. Renáta Oriňáková, of the Faculty of Science, P.J.Šafárik University in Košice, prof. Pedro Gomez-Romero from Spain, Ing. Francis Amalraj Susai, Ph.D. from Bar-Ilan University in Israel. They presented the following individual or joint papers: Amalraj, F. S. „Studies on High Energetic Li Rich Lix[MnNiCo]O2 Electrodes at 60°C for Li-ion Batteries', Fedorková, A., Oriňáková, R., Sedlaříková, M., Gómez-Romero, P. 'S-LiFePO4-PPy Cathode Materials for Li/S Batteries Prepared by Solid-states Synthesis', Gómez-Romero, P. 'From hybrid Devices to Hybrid Materials', Kundu, M., Liu, L. 'Nanostructured Metal Oxide Electrodes for Electrochemical Energy Storage', Oriňáková, R., Škantárová, L., Filkusová, M., Oriňák, A. 'Electrocatalysis at Nanoparticles and Nanostructured Surfaces'.

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

The department staff are also involved in the European project of OP VaVpI, Priorirty Axis 2 - Regional Research and Development Centres, 'Centre for Research and Utilization of Renewable Energy' (CVVOZE), in research programme 2 – 'Chemical and Photovoltaic Energy Sources'.

The test laborary of CVVOZE was accredited within this operational programme in 2013 and the department also obtained accreditation for testing of VA characteristics of photovoltaic panels.

Major Research Projects

In 2013 the department won a bilateral project **MŠMT ČR – Argentina (7AMB13AR008) Development of New Lithium-Ion Batteries for Storage of Electric Energy**.

Support for Human Resources and Knowledge Transfer in Conditions of International Research Teams Cooperation – CZ.1.07/2.3.00/20.0103

Investigator: Josef Jirák

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

Investigator: Petr Bača

FRVŠ - Upgrading and Extension of Laboratory Assignments in the Subject Materials and Technical Documentation (236/2013)

Investigator: Josef Jirák

Selected Publications

KOŘÍNEK, R.; VONDRÁK, J.; BARTUŠEK, K.; SEDLAŘÍKOVÁ, M. Experimental investigations of relaxation times of gel electrolytes during polymerization by MR methods. *Journal of Solid State Electrochemistry.* 2013. 17(8). p. 2109 - 2114. ISSN 1432-8488. (IF(2012)=2,279).

KŘIVÍK, P. Studium pulzního nabíjení olověných akumulátorů. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz).* 2013. 15(6). p. 364 - 367. ISSN 1213-1539.

PLÉHA, D.; MUSIL, M.; KUNOVJÁNEK, M. Vanadové redoxní Vanadové redoxní baterie. *Energetika.* 2013. 2013(2). p. 79 - 80. ISSN 0375-8842.

ŠUBARDA, J.; NOVÁK, V.; MUSIL, M.; KUNOVJÁNEK, M. Membrány pro nízkoteplotní PEMFC palivové články. *Energetika.* 2013. 63(2). p. 95 - 97. ISSN 0375-8842.

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MÁCA, J. Typy větrných elektráren. *Energetika.* 2013. 63(3). p. 168 - 170. ISSN 0375-8842.

SOLČANSKÝ, M.; VANĚK, J.; PORUBA, A. Fast New Method for Temporary Chemical Passivation. *Acta Montanistica Slovaca.* 2013. 17(4). p. 263 - 267. ISSN 1335-1788. (IF(2012)=0,094).

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TOŠER, P.; BAČA, P.; ABRAHAM, P. PROPERTIES OF THE HYBRID PHOTOVOLTAIC SYSTEM. *Acta Montanistica Slovaca.* 2013. 17(4). p. 247 - 250. ISSN 1335-1788. (IF(2012)=0,094).

TIHLAŘÍKOVÁ, E.; NEDĚLA, V.; SHIOJIRI, M. In Situ Study of Live Specimens in an Environmental Scanning Electron Microscope. *MICROSCOPY AND MICROANALYSIS.* 2013. volume 20(04). p. 1 - 5. ISSN 1431-9276. (IF(2012)=2,495).

FILKUSOVÁ, M.; FEDORKOVÁ, A.; ORIŇÁKOVÁ, R.; ORIŇÁK, A.; NOVÁKOVÁ, Z.; ŠKANTÁROVÁ, L. Effect of multi-walled carbon nanotubes on the thermal stability and surface morphology of LiFePO4 cathode material. *NEW CARBON MATERIALS.* 2013. 28(1). p. 1 - 7. ISSN 1007-8827. (IF(2012)=0,981).

FEDORKOVÁ, A.; ORIŇÁKOVÁ, R.; ČECH, O.; SEDLAŘÍKOVÁ, M. New Composite Cathode Materials for Li/S Batteries: A Review. *INTERNATIONAL JOURNAL OF ELECTROCHEMICAL SCIENCE.* 2013. 8(8). p. 10308 - 10318. ISSN 1452-3981.

STOJAN, R.; VANĚK, J.; ŠIMONOVÁ, L.; VESELÝ, A.; FRANTÍK, O.; BAURA, T. Detekce defektů fotovoltaických článků pomocí luminiscenčních metod. *Energetika.* 2013. 63(7). p. 431 - 434. ISSN 0375-8842.

MÁCA, J.; SEDLAŘÍKOVÁ, M.; VONDRÁK, J. Stanovení potenciálových oken a kapacity dvojvrstvy elektrolytů. *ElectroScope - http://www.electroscope.zcu.cz.* 2013. 2013(4). p. 4 - 7. ISSN 1802-4564.

SEDLAŘÍKOVÁ, M.; VONDRÁK, J.; MÁCA, J.; BARTUŠEK, K. Sulfolane as Solvent for Lithium Battery Electrolytes. *New Materials for Electrochemical Systems.* 2013. 16(2). p. 065 - 70. ISSN 1480-2422. (IF(2012)=0,532).

TOŠER, P.; BAČA, P.; VACULÍK, S. Náklady na akumulaci ELEKTRICKÉ ENERGIE V SEKUNDÁRNÍCH článcích. *TZB-info.* 2013. 2013(39). p. 1 - 9. ISSN 1801-4399.

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VYROUBAL, P.; MAXA, J.; NEDĚLA, V.; JIRÁK, J.; HLADKÁ, K. Apertures with Laval nozzle and circular orifice in secondary electron detector for environmental scanning electron microscope. *Advances in Military Technology.* 2013. 8(1). p. 59 - 69. ISSN 1802-2308.

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DVOŘÁK, P.; MUSIL, M.; PLÉHA, D. Gelové polymerní elektrolyty pro Li-Ion akumulátory a superkondenzátory. *Elektrorevue - Internetový časopis (http://www.elektrorevue.cz).* 2013. 2013(12). p. 415 - 418. ISSN 1213-1539.

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MAXA, J.; VYROUBAL, P.; VANĚK, J.; HLADKÁ, K. Aplikace CAE systémů při návrhu vzduchem chlazeného koncentrátorového solárního panelu. *Electrorevue.* 2013. 2013(4). p. 1 - 5. ISSN 1336-8559.

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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.)

Elektroizolační systémy
(Ing. Helena Polsterová, CSc.)

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 on 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 semestral 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 Electrical Measurement (diagnostic analysis of properties of dielectric materials, material specimen from commercial suppliers are measured by commonly used instruments, Helena Polsterová)

Laboratory of Electrotechnical Materials 1 (analysis of electrotechnical materials, instruction in Materials and Technical Documentation and Electrotechnology for Faculty of Mechanical Engineering, Petr Křivík)

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.

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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., RNDr. Naděžda Uhdeová, Ph.D.

Research Staff

Ing. Pavel Škarvada, Ph.D.

Ph.D. Students

Ing. Faisel Inas Abuetwirat, Mgr. Naděžda Bogatyreva, Ing. Gabriel Cséfalvay, Mgr. Dinara Dallaeva, Ing. Miloš Chvátal, Ing. Michal Jurčík, Ing. Pavel Kaspar, Ing. Michal Kašparec, Ing. Marián Klampár, Ing. Martin Kopecký, Ing. Ondřej Krčál, Ing. Tomáš Kuparowitz, Ing Martin Kuparowitz, Ing. Lukáš Palko, Ing. Petr Paračka, Alexander Podshivalov, Ing. Elena Prokopyeva, RNDr. Zdeněk Sita, Ing. Milan Spohner, Ing. Jiří Šicner, Ing. Ondřej Šik, Ing. Tomáš Trčka, Ing. Marek Vondra

Administrative and Technical Staff

Mgr. Naděžda Bogatyreva, Ing. Gabriel Cséfalvay, Mgr. Dinara Dallaeva, Ing. Miloš Chvátal, Ing. Marián Klampár, Ing. Alexandr Knápek, Ing. Jiří Majzner, Ph.D., Ing. Tomáš Palai-Dany, Ph.D., Ing. Elena Prokopyeva, Miroslav Sadovský, Ing. Petr Sadovský, Ph.D., Ing. Milan Spohner, Ing. Jiří Šicner, Ing. Ondřej Šik, Ing. Pavel Škarvada, Ph.D., Ing. Pavel Tofel, Ph.D., Ing. Tomáš Trčka, Ing. Alena Václavíková, Ing. Marek Vondra, Radimír Vrba

Main Interests

In 2013 the department provided tuition in basic courses of the Bachelor degree programme Physics 1 and Physics 2 (full-time and part-time study), Physics for the study programme English in Electrical Engineering and Information Technology (H-AEI), Physics for the study programme Audio Engineering (J-AUD) and Physics 1 and Physics 2 for the programme Biomedical

Technology and Physics for Information Technology for students of the Faculty of Information Technology. The subjects in the Master programme included Nanotechnology, Modern Physics, Solid Phase Physics and Non-Destructive Diagnostics, Physics of Dielectrics for FEEC, and Physical Optics for Faculty of Information Technology. The subjects Junctions of Nanostructures and Spectroscopic Methods for Non-Destructive Diagnostics were offered in the doctoral study programme, and Optics for FIT Ph.D. students.

Assignments for Physical Practice and multimedia study materials were being updated for instruction in the computer room and for student self-study. Laboratory instruction for Master students was innovated and upgraded within the framework of a FRVŠ project.

The department activities were centred on basic and applied research of the physical parameters of semiconductor and dielectric materials and components, and recently nanosensors. The main area of interest was noise spectroscopy, local characterization with nanodistinction, measurement of nonlinearities, design of quality and reliability indicators for non-destructive assessment of a given technological step and dielectric spectroscopy. Significant results were achieved in research of the characteristics of acoustic and electromagnetic emission sensors.

Research was also focused on local spectroscopy, topography, photoluminescence of semiconductor and photonic structures. The department cooperated with European and Japanese laboratories in the field of noise spectroscopy and nanotechnology, extended cooperation with Augsburg University, Germany in research of dielectrics, with American universities in Orlando and Rapid City in nanometrology and started cooperation with San Sebastian University. The department cooperated with leading Czech laboratories in the development and enhancement of the parameters of CdTe radiation detectors, mainly their contacts.

Contract research was expanded on the basis of 6 economic contracts. Our major partners included the world leaders On Semiconductor, AVX Kyocera and NEE, a.s.

Research laboratories were equipped with a number of modern devices. A workplace for experimental study of semiconductor and dielectric samples at low temperatures (up to 10 K) was set up. Optical spectroscopy using SNOM, spectral analyzers of signals for the entire technical frequency spectrum, the automatic meter Keithley 4200 and a vacuum system for research of autoemission cathodes in electron microscopy, electron microscope LYRA with 1 nm resolution, alfa analyzer Novocontrol for measurement of dielectric spectra over 12 frequencies and infrared spectrometer-Nicolet were purchased.

Major Achievements

The regional centre VaV CZ.1.05/2.1.00/03.0072 'Centre for Sensoric, Information and Communication Systems' (SIX) continued its operations. The department's two laboratories involved in the project were equipped with up-to-date apparatus – Laboratory of Noise, Dielectric Spectroscopy and Electromagnetic Emissons (Lubomír Grmela) and Laboratory of Nanometrology (Vladimír Holcman).

The department participated in a start-up project of excellence CZ.1.05/1.1.00/02.0068 STI CEITEC, groups 1-7 'Optoelectronic Characterisation of Nanostructures', with the leader of the team Lubomír Grmela. The project outcomes in 2013 were 5 publications in impact journals, 1 patent, 4 prototypes and 1 utility software.

The department was involved in 2 GAČR, 1 TAČR, 1 FRVŠ, 2 MPO, 1 INGO, 1 OPVK project and1 project of specific research, and 6 economic contracts with industrial companies. The GAČR projects focused on stochastic processes in semiconductor structures and in CdTe emission detectors, service time of autoemission and Schottky cathodes based on analysis of noise and transport spectroscopy, electromagnetic and acoustic emission in advanced composite materials and diagnostics of defects in materials by advanced defectoscopy.

The FRVŠ project dealt with upgrading of laboratories for Bachelor and Master study.

In MPO TIP projects the department cooperated with Solartec s.r.o. on applications of laser technology in production of quartz crystal solar

cells, and with Třinec Iron and Steel Works on research and development of progressive tools for enhanced quality of billet, wires and bars.

The project for specific research involves methodology of enhancing the quality of optoelectronic materials and components.

The commercial contracts dealt with DC-AC solar converters, characteristics of biophysical sensors and methods of non-destructive detection of technology defects in ceramic, tantalum and niobium condensers, and physical processes in supercapacitors.

In connection with the development of nanotechnologies the department received 2 projects for innovation and upgrading of instruction in physics from the Operational Programme Education for Competitiveness 2.3 CZ.1.07/2.3.00/09.0214 - IVEFEN 'Research Team Incubator for Physical Electronics and Nanotechnology' and 2.2 CZ.1.07/2.2.00/15.0147 'Nanotechnology for Electrical Engineering', jointly financed by the European Social Fund and Czech Republic budget. As a result the department can extend its offer of courses on nanoscience, nanometrology, nanomaterials and nanosensors.

Awareness of the doctoral study programme Physical Electronics and Nanotechnology has been raised and the number of new Ph.D. students has increased.

Major Research Projects

Application of Laser Technology in Production of Quartz Crystal Solar – MPO FR-TI1/305

Investigator at UFYZ: Pavel Koktavý

Utilization of Electromagnetic and Acoustic Emission in Research on Modern Composite Materials for Construction Applications – GA P104/11/0734

Investigator: Pavel Koktavý

Prompts for Engineers - Innovation of Study Programmes – MŠMT 1.07/2.2.00/15.0147

Investigator: Pavel Dobis

Low-temperature Fuel Cell for Stationary Applications with Output 5kW – TA02020998

Investigator for BUT FEEC: Lubomír Grmela

Center of Sensoric, 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

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PROKOPYEVA, E.; TOMÁNEK, P.; KOCOVÁ, L.; PALAI-DANY, T.; BALÍK, Z.; ŠKARVADA, P.; GRMELA, L. Comparison of optical and electrical investigations of meat ageing. *Proceedings of SPIE.* 2013. 8774(8774). p. 84471L1 (8 p.). ISSN 0277-786X.

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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 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, 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 optical scanning nearfield 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 new advanced technologies, nanosensorics, development of non-destructive diagnostics and modern methods of electronic components and structures lifetime estimation, Lubomír Grmela)

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Lecturers

PaedDr. Alena Baumgartnerová, Mgr. Petra Fiĺová, Ph.D., PhDr. Marcela Borecká, Kenneth Froehling, M.A., Mgr. Terezie Filipenská, Ph.D., Mgr. Filip Hanzelka, Ing. Martin Jílek, Mgr. Miroslav Kotásek, Ph.D., Mgr. Petra Langerová, PhDr. Dagmar Malíková, Mgr. Jana Kopecká, PhDr. Ludmila Neuwirthová, Ph.D., Mgr. Šárka Rujbrová, Mgr. Pavel Sedláček, PhDr. Milan Smutný, Ph.D., Mgr. Agata Walek, Mgr. Marie Žouželková Bartošová

Administrative and Technical Staff

Miroslava Purová

Main Interests

In 2013 the first year of the new Bachelor degree programme ‘English in Electrical Engineering and Informatics’ continued. It equips graduates with knowledge of linguistic theory of professional English together with language skills specific for the professional language of various disciplines of electrical engineering and information technology. The programme, which is quite unique in the Czech Republic, started in the academic year 2012/13 and aroused considerable interest. It equips graduates with interdisciplinary knowledge and skills that the current job market desires. New subjects such as Introduction to Linguistics, Professional Styles in Czech and English, Practical English 1, Grammar Structures, Language as Discourse in Science and Technology, Practical English 2, and English for Information Technology were introduced and new materials were created.

In 2013 the department continued working on the OPVK project ‘Internationalisation of Faculty of Physical Culture, Palacký University in v Olomouc’, providing methodical counselling and consultations.

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 national or foreign language. The department’s research results and teaching observations were presented in the book ‘English Studies’. The economic section offered a number of economic and psychological courses focused on practice, and in the lifelong education programme the section offered the course of Supplementary Pedagogical Study.

Major Achievements

In 2013 the department's activities centred mainly on the new Bachelor degree programme English in Electrical Engineering and Informatics which started in the academic year 2012/13. New subjects in the programme are based on long-term research of English as a professional language of electrical engineering and information technology. The research outcomes are implemented both in the courses and in highly specific methodology. From now on the research will also focus on compounds in English for medicine and producer strategies in professional communication and explicitness and implicitness in professional discourse.

A new course 'English for Engineering' was opened for students in the Bachelor degree programmes EEKR-B and BTBIO-A. It focuses on English as the language of different engineering disciplines. The course 'English for Life' for students in the Master degree programme is now a two-semester course specialising in the cultural and professional aspects of English in electrical engineering disciplines.

A new language software DynEd was purchased as part of the project 'Complex Innovation of Study Programmes and Lecture Quality Improvement at FEEC BUT'. Students in the Bachelor degree programme used the software in an intensive course and their home study. This enabled to bring the students competences to an equal level which is a prerequisite for the compulsory language courses.

Selected Publications

BAUMGARTNEROVÁ, A. The Experience of Teaching a Specialized Grammar Course. In English Studies, Department of Foreign Languages. B. Brno: Vutium, Brno, 2013. s. 1-5. ISBN: 978-80-214-4837- 7.

BORECKÁ, M. Teaching Reading Skills to Engineering Students. In *English Studies, Department of Foreign Languages.* B. Vutium, Brno, 2013. s. 1-11. ISBN: 978-80-214-4837- 7.

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JÍLEK, M. Challenges in teaching non-technical subjects in a technical environment. In *English Studies, Department of Foreign Languages.* B. Brno: Vutium, Brno, 2013. s. 1-5. ISBN: 978-80-214-4837- 7.

KOPECKÁ, J. Generation Y in the Language Classroom. In *English Studies, Department of Foreign Languages.* B. Vutium, Brno, 2013. s. 1-5. ISBN: 978-80-214-4837- 7.

KOTÁSEK, M. Technologising Humanity, Humanising Technology. In *English Studies, Department of Foreign Languages.* B. Brno: Vutium, 2013. s. 1-10. ISBN: 978-80-214-4837- 7.

KRHUTOVÁ, M., SMUTNÝ, M. Explicitness and Implicitness in Professional Discourse. *Academic Journal of Science,* 2013, roč. 2013 (2), č. 2, s. 533-541. ISSN: 2165- 6282

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Bachelor Degree Programme

Praktická angličtina I
(Mgr. Pavel Sedláček)

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 diskurs ve vědě a technice
(doc. PhDr. Milena Krhutová, Ph.D.)

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

Kulturní studia I
(Mgr. Pavel Sedláček)

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
(PhDr. Dagmar Malíková)

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

Department of Mathematics

Doc. RNDr. Zdeněk Šmarda, CSc.

Head

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Professors Emeriti

Prof. RNDr. Václav Havel, DrSc.

Professors

Prof. RNDr. Josef Diblík, DrSc.
Prof. RNDr. Jan Chvalina, DrSc.

Associate Professors

Doc. RNDr. Jaromír Baštinec, CSc.
Doc. RNDr. Dana Hliněná, 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. Edita Kolářová, 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. Blanka Morávková, Ing. Petr Skorkovský, Mgr. Hana Halfarová, Alena Chernikava, Ganna Konstantinivna Piddubna, Mgr. Štěpán Křehlík, Ing. Marie Klimešová

Administrative and Technical Staff

Eva Šimečková

Main Interests

In 2013 the department was responsible for tuition in subjects in full-time and part-time Bachelor degree programme (Mathematics 1, Mathematics 2, Mathematics 3, Selected Chapters in Mathematics) in full-time and part-time Master degree programme (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 tuition in two Ph.D. courses (Discrete Processes in Electrical Engineering, Probability, Stochastic Processes, Operations Research) and in a number of mathematical courses for the Bachelor degree programme at the Faculty of Information Technology.

Research mainly in investigation of functional and stochastic differential equations was conducted on the basis of contracts with international partners – the team of Prof. D. Khusainov, Institute of Dynamical System Modelling, Faculty of Cybernetics, Kiev State University, the team of Prof. I. Dzalladova, Institute of Mathematics, Faculty of Information Systems and Technologies, Kiev State University.

The department also cooperates with Prof. Berezansky, University in Beer-Sheva, Israel, Prof. Schmeidel, University in Bialystok, Poland, Prof.

Stevic, Serbian Academy of Sciences in Belgrade, and Prof. Khan, University Zhejiang Hangzhou, China.

Research centred on the representation of solutions of discrete linear systems which are often applied for circuit modelling and signal processing. Discrete linear equations with two linear expressions, two delays and two commuting matrices were examined. Research of numerical solutions of functional differential equations focused on decomposition and perturbation methods including the differential transformation method.

Activities in fuzzy structures focused on fuzzy implications, their generation and possible application in fuzzy preference modelling. Research also centred on the construction and characteristics of uninorms, which are a general representation of triangular norms and conorms, and are therefore applicable in modelling of fuzzy logic connectives.

Research of topological structures centred on the approximation of general context structures by the limit of finite context structures (so called finite frameworks) and mutual relations between generated topologies. General metric characteristics of context and causal structures and the possibilities of generating universal metrics using measure were examined.

Major Achievements

The department was involved in 2 GAČR projects, 2 ESF OPVK projects 1.3 and 2.2, and 1 specific research project.

Discrete matrix delayed exponential for two matrices was defined and its major quality was derived (fundamental matrix relation).

Activities in discrete systems with weak feedback centred on explicit solutions for initial assignments. A criterion for detection of planar linear discrete equations with weak delay in case the system consists of two matrices and two delayed expressions was derived. By transformation to canonical form explicit solutions were found and certain solution characteristics were determined.

Transformation formulae for the solution to the initial assignments with non-linearities were derived. In causal structures motivated by quantum gravity the research demonstrated that the Lorentz variety topology is a de-Groot dual topology generated by the causal site. The existence of causal sites that generate topologies so as the existence of more general non-Lorentz space-times was proved.

In research of fuzzy structures a new way to generate fuzzy implications by using three monotonous functions was discovered.

In 2013, 21 articles were published in scientific journals Abstract and Applied Analysis, Applied Mathematics and Computation, Advances in Difference Equations, Boundary Value Problems, European Journal of Combinatorics, Discrete and Continuous Dynamical Systems, The Scientific World Journal. In connection with the investigation of qualitative characteristics of dynamical systems 10 software application modules were created.

The department staff co-organized international conferences:

International Conference on Delay Differential and Difference Equations and Applications, Balatonfüred, Hungary, 9th ISAAC Congress Krakow, Poland, Differential Equations, Functions Theory and Applications, Sevastopol, Ukraine. The department staff also gave a number of invited presentations.

In the OPVK project ‘Innovation of Mathematics Instruction within Study Programmes at FEEC and FIT, BUT’ a bank of exercises that enables students to generate tests and autotests in all mathematical subjects at FEEC and FIT, BUT was created.

Major Research Projects

Training of Secondary-School Teachers Focused on Increasing Student Motivation to Take up Higher Technical Education – OPVK 1.3 CZ.1.07/1.3.00/14.0001

Investigator: Michal Novák

Innovation of Mathematics Instruction within Study Programmes at FEEC and FIT, BUT Brno – OPVK 2.2 CZ.1.07/2.2.00/15.0156

Investigator: Zdeněk Šmarda

Difference Equations and Dynamic Equations on Time Scales II – GAČR 201/07/0145

Investigator: Josef Diblík

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

Investigator: Josef Diblík

Solution Characteristics of Functional Differential and Difference Equations – FEKT -S-11-2/921

Investigator: Zdeněk Šmarda

Selected Publications

NOVÁK, M. Some basic properties of EL-hyperstructures. *EUROPEAN JOURNAL OF COMBINATORICS.* 2013. 2013 (34)(2). p. 446 - 459. ISSN 0195-6698. (IF(2012)=0,658).

BAŠTINEC, J.; PIDDUBNA, G. Controllability for a certain class of linear matrix systems with delay. *Journal of Applied Mathematics.* 2013. V(2012)(II). p. 13 - 23. ISSN 1337-6365.

HLINĚNÁ, D.; KRÁĽ, P.; KALINA, M. Implication Functions Generated Using Functions of One Variable. In *Advances in Fuzzy Implication Functions.* 1. Berlin Heidelberg, Springer Berlin Heidelberg. 2013. p. 125 - 153. ISBN 978-3-642-35676-6.

HLINĚNÁ, D.; BIBA, V. A note on some classes of generated fuzzy implications II. *Journal of Applied Mathematics.* 2013. 2012(2). p. 243 - 252. ISSN 1337-6365.

KOLÁŘOVÁ, E.; BRANČÍK, L. Vector Stochastic Differential Equations Used to Electrical Networks with Random Parameters. *International Journal of Advances in Telecommunications, Electrotechnics, Signals and Systems.* 2013. 2(1). p. 1 - 8. ISSN 1805-5443.

ŠMARDA, Z.; HALFAROVÁ, H.; OLEKSANDRA, K. APPLICATION OF HOMOTOPY PERTURBATION METHOD TO SOLVING SINGULAR INITIAL VALUE PROBLEMS. *Journal of Applied Mathematics.* 2013. 5(2). p. 69 - 76. ISSN 1337-6365.

ŠMARDA, Z.; KHAN, Y. SINGULAR INITIAL VALUE PROBLEM FOR IMPLICIT VOLTERRA INTEGRO-DIFFERENTIAL EQUATIONS. *Journal of Applied Mathematics.* 2013. 5(2). p. 97 - 102. ISSN 1337-6365.

REBENDA, J.; ŠMARDA, Z. Stability and asymptotic properties of a system of functional differential equations with nonconstant delays. *APPLIED MATHEMATICS AND COMPUTATION.* 2013. 219(12). p. 6622 - 6632. ISSN 0096-3003. (IF(2012)=1,349).

BRANČÍK, L.; KOLÁŘOVÁ, E. Simulation of Higher-Order Electrical Circuits with Stochastic Parameters via SDEs. *ADV ELECTR COMPUT EN.* 2013. 13(1). p. 17 - 22. ISSN 1582-7445. (IF(2012)=0,552).

DIBLÍK, J.; HALFAROVÁ, H. Explicit general solution of planar linear discrete systems with constant coefficients and weak delays. *Advances in Difference Equations.* 2013. 2013(2013). p. 1 - 37. ISSN 1687-1847. (IF(2012)=0,76).

DIBLÍK, J.; IRIČANIN, B.; STEVIČ, S.; ŠMARDA, Z. On Some Symmetric Systems of Difference Equations. *Abstract and Applied Analysis.* 2013. 2013(Article ID 2467). p. 1 - 7. ISSN 1085-3375. (IF(2012)=1,102).

REBENDA, J.; ŠMARDA, Z. Stability of a Functional Differential System with a Finite Number of Delays. *Abstract and Applied Analysis.* 2013. 2013(Article ID 85313). p. 1 - 11. ISSN 1085-3375. (IF(2012)=1,102).

SVOBODA, Z. Asymptotic properties of one differential equation with unbounded delay. *Mathematica Bohemica.* 2013. 2012(2). p. 239 - 247. ISSN 0862-7959.

DIBLÍK, J.; MORÁVKOVÁ, B. Discrete matrix delayed exponential for two delays and its property. *Advances in Difference Equations.* 2013. 2013(1). p. 1 - 18. ISSN 1687-1847. (IF(2012)=0,76).

DIBLÍK, J.; KUDELČÍKOVÁ, M. Positive solutions of advanced differential systems. *The Scientific World Journal.* 2013. 2013(Article ID). p. 1 - 8. ISSN 1537-744X. (IF(2012)=1,73).

FUSEK, M.; MICHÁLEK, J. Statistical Methods for Analyzing Musk Compounds Concentration based on Doubly Left-Censored Samples. *INTERNATIONAL JOURNAL of MATHEMATICAL MODELS AND METHODS IN APPLIED SCIENCES.* 2013. 7(8). p. 755 - 763. ISSN 1998-0140.

DIBLÍK, J.; FEČKAN, M.; POSPÍŠIL, M. Forced Fermi-Pasta-Ulam lattice maps. *Miskolc Mathematical Notes.* 2013. 14(1). p. 63 - 78. ISSN 1787-2405. (IF(2012)=0,304).

FEČKAN, M.; POSPÍŠIL, M. Discretization of dynamical systems with first integrals. *DISCRETE AND CONTINUOUS DYNAMICAL SYSTEMS.* 2013. 33(8). p. 3543 - 3554. ISSN 1078-0947. (IF(2012)=1,005).

FEČKAN, M.; POSPÍŠIL, M.; ROTHOS, V.; SUSANTO, H. Periodic travelling waves of forced FPU lattices. *Journal of Dynamics and Differential Equations.* 2013. 25(3). p. 795 - 820. ISSN 1040-7294. (IF(2012)=0,863).

DIBLÍK, J.; FEČKAN, M.; POSPÍŠIL, M. Representation of a solution of the Cauchy problem for an oscillating system with two delays and permutable matrices. *Ukrainian Mathematical .* 2013. 65(1). p. 64 - 76. ISSN 0041-5995. (IF(2012)=0,154).

DIBLÍK, J.; FEČKAN, M.; POSPÍŠIL, M. Representation of a solution of the Cauchy problem for an oscillating system with multiple delays and pairwise permutable matrices. *Abstract and Applied Analysis.* 2013. 2013(ArticleID 931493). p. 1 - 10. ISSN 1085-3375. (IF(2012)=1,102).

DIBLÍK, J.; REBENDA, J.; ŠMARDA, Z. Singular Initial Value Problem for Certain Classes of Systems of Ordinary Differential Equations. *Abstract and Applied Analysis.* 2013. 2013(Article ID 20735). p. 1 - 12. ISSN 1085-3375. (IF(2012)=1,102).

CHVALINA, J.; MAYEROVÁ, Š. General Omega-hyperstructures and certain applications of those. *Ratio Mathematica.* 2013. 2012(23). p. 3 - 20. ISSN 1592-7415.

CHVALINA, J.; MAYEROVÁ, Š.; NEZHAD, D. General actions of hyperstructures and some applications. *Analele Stiintifice Ale Universitatii Ovidius Constanta, Seria Matematica.* 2013. 2012(21(1)). p. 59 - 82. ISSN 1224-1784. (IF(2012)=0,221).

DIBLÍK, J.; DZHALLADOVA, I.; MICHALKOVÁ, M.; RŮŽIČKOVÁ, M. Modeling of applied problems by stochastic systems and their analysis using the moment equations. *Advances in Difference Equations.* 2013. 2013(2013). p. 1 - 12. ISSN 1687-1847. (IF(2012)=0,76).

DIBLÍK, J.; DZHALLADOVA, I.; MICHALKOVÁ, M.; RŮŽIČKOVÁ, M. Moment equations in modeling a stable foreign currency exchange market in conditions of uncertainty. *Abstract and Applied Analysis.* 2013. 2013(1). p. 1 - 12. ISSN 1085-3375. (IF(2012)=1,102).

DIBLÍK, J.; VÍTOVEC, J. Lower and upper estimates of solutions to systems of delay dynamic equations on time scales. *Boundary Value Problems.* 2013. 2013(216). p. 1 - 14. ISSN 1687-2770. (IF(2012)=0,922).

ŠMARDA, Z.; KHAN, Y. Heat Transfer Analysis on the Hiemenz Flow of a Non-Newtonian Fluid: A Homotopy Method Solution. *Abstract and Applied Analysis.* 2013. 2013(Article ID 34269). p. 1 - 5. ISSN 1085-3375. (IF(2012)=1,102).

LIN, R.; ZHAO, Y.; ŠMARDA, Z.; WU, Q.; KHAN, Y. Newton-Kantorovich convergence theorem of a new modified Halleys method family in a Banach space. *Advances in Difference Equations.* 2013. 2013(325(1)). p. 1 - 11. ISSN 1687-1847. (IF(2012)=0,76).

DIBLÍK, J.; RŮŽIČKOVÁ, M.; CHUPÁČ, R. Unbounded solutions of the equation $\dot y(t)=\sum_{i=1}^{n}\beta_{i}$ (t)\left[y(t-\delta_{i})-y(t-\tau_{i})\right]$. *APPLIED MATHEMATICS AND COMPUTATION.* 2013. 2013(221). p. 610 - 619. ISSN 0096-3003. (IF(2012)=1,349).

ŠMARDA, Z.; KHAN, Y. Singular initial value problem for a system of integro-differential equations unsolved with respect to the derivative. *APPLIED MATHEMATICS AND COMPUTATION.* 2013. 2013(222). p. 290 - 296. ISSN 0096-3003. (IF(2012)=1,349).

VÍTOVEC, J. Some generalizations in theory of rapid variation on time scales and its applications in dynamic equations. *Journal of Applied Mathematics.* 2013. 5 (2012)(2). p. 139 - 146. ISSN 1337-6365.

Bachelor Degree Programme

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

Matematika 1
(RNDr. Edita Kolářová, CSc.)

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

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

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

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

Prof. Ing. Vladislav Musil, CSc.

Head

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Professors

Prof. Ing. Dalibor Biolek, CSc.
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. 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. Ing. František Urban, CSc.
Doc. Ing. Radek Vlach, Ph.D.

Lecturers

Ing. Martin Adámek, Ph.D., Ing. Ondřej Hégr, Ph.D., Ing. Edita Hejátková, Ing. Radovan Novotný, Ph.D., Ing. Jan Prášek, Ph.D., Ing. Roman Prokop, Ph.D., Ing. Ondřej Sajdl, Ph.D., Ing. Jiří Stehlík, Ph.D., Ing. Cyril Vaško, Ing. Michal Pavlík, Ph.D.

Ph.D. Students

Ing. Marek Bohrn, Ing. Martin Buršík, Ing. Ondřej Frantík, Ing. Jiří Hladík, Ing. Radim Hrdý, Ing. David Jaroš, Ing. Nabhan Khatib, Ing. Vilém Kledrowetz, Ing. Petr Kosina, Ing. Martin Magát, Ing. Ladislav Macháň, Ing. Milan Matějka, Ing. Michal Nicák, Ing. Alexandr Otáhal, Ing. Jan Pekárek, Ing. Marián Pristach, Ing. Boleslav Psota, Ing. Jiří Pulec, Ing. Zdeněk Pytlíček, Ing. Michal Řezníček, Ing. Jiří Sedláček, Ing. Ayad Khazal Shehab, Ing. Jiří Vávra, Ing. Doaa Yahya, Ing. Jaromír Žák, Ing. Martin Holain, Ing. Milan Holík, Ing. Martin Klíma, Ing. Vladimír Levek, Ing. Petr Schnederle, Ing. Dina Younes, Ing. Ondřej Čožík, Ing. Barbora Mojrová, Ing. Jan Valíček, Ing. Jakub Somer, Ing. Ondřej Chmela, Ing. Tomáš Vejmola, Ing. Marek Bedlek, Mgr. Mykhailo Lutso

Administrative and Technical Staff

Jarmila Fučíková, Petra Jedličková, PhDr. Jarmila Jurášová, Mgr. Eva Martincová, Ph.D., RNDr. Michal Masařík, Ph.D., Ing. Břetislav Mikel, Ph.D., Bc. David Nejezchleb, Mgr. Michaela Pekarová, Ph.D., Mgr. Markéta Ryvolová, Ph.D., Ing. Jiří Sochor, Mgr. Ondřej Zítka

Main Interests

In 2013 the department provided tuition 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 the investigation of integrated circuits, sensors and microelectronic technologies. Main areas of interest included:

- design of voltage, current and switching 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 chemosensors, optosensors and biosensors, mainly of gases and toxic substances,
- advanced components, surface and sensor technology,
- microelectrodes modified by nanostructures (nanotubes, nanocolumns) using advanced nanotechniques,
- simulation and evaluation of 3D linking systems reliability,
- new methods of thixotropic material non-vacuum depositions in 3D circuits,
- reliability of lead-free solders,
- advanced methods of semiconductor chips interconnection and packaging,
- simulation of electronic kits and packages in ANSYS,
- non-conventional application of thick films (sensors, attenuator, shielding, antennas etc).

The department closely cooperated (student exchanges) with Technical University in Sofia (Bulgaria), ISTU Izhevsk (Russia), and maintained research cooperation with the company Autoflug in Hamburg, with Catalonia University Rovira i Virgili in Tarragona, with the research laboratory IMEC-KHBO in Belgium, with IMEC research laboratory in Belguim, with UC Berkeley, UC San Diego, Politecnico Di Torino, and TU Dresden.

In cooperation 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.

Major Achievements

In 2013 members of the department were involved in 1 EUREKA project, 3 projects of the 7th EU framework OP VK, in 2 GAČR, 1 AV, 4 MPO (cooperation with industry), 2 FRVŠ projects.

In June 2013 the department co-organized the international conference ‘Electronic Devices and Systems EDS 2013’ with participation of Czech and international experts. There were 60 papers on microelectronics and technology.

The group involved in microelectronic technology headed by Doc. Szendiuch in cooperation with the company REHM (dr. Bell) focused on lead-free solders and the influence of the controlled atmosphere on the service life and long-term reliability of lead-free soldered connections. In cooperation with Pbt Rožnov and manufacturing subjects the TAČR project in cleaning methods continued in compliance with the requirements of environmental management. Research outcomes include transparent testing substrates designed to adjust and control the cleaning of electronic soldering kits. The results were presented at the international trade fair Productronica 2013 in Munich as part of a special exposition Cleaning and Contamination Center in which leading companies in the sector of electronic kit cleaning participated. At the end of the year a European patent application was submitted while the sale of manufacturing licence is being negotiated. 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 commercial subjects was also commenced in this field. A system for thixotropy material deposition was developed, and the letters patent called 'Dispensing Apparatus Arrangement for Selective Deposition of Pastes and Adhesives' was granted. Results were published at the Web of Science (ISI) conferences. The project Board on Board EU 10-101 (EUREKA, cluster Euripides) supervised by the French company Thales Security and Communication was commenced. It has been carried out in cooperation with Celestika (Spain), ATS (Austria), Cimulec (France) and University in Metz. Under innovation vouchers of the South Moravian Innovation Centre (JIC) industry agreement with MAGNETON a.s. Kroměříž in custom hybrid circuit was carried out centering on advanced alternator regulator. The cooperation will continue next year.

The team LabSensNano (Laboratory of Microsensors and Nanotechnology) led by Doc. Hubálek continued research and development of chemical sensors and biosensors for medical and environmental applications. The development of the 'Lab on a chip' technology continued so as the electrochemical deposition of on-chip quantum dots. The team was awarded one utility sample in nanotechnologies. Research results were published in several journals and presented at the Web of Science (ISI) conferences.

The team involved in custom integrated circuits led by Doc. Fujcik focused on the development of intelligent submicron structures and systems for modern microsensors and low-input and low-voltage applications. In the GAČR project P102/11/1379 a concept of small signal digitization was further elaborated. It was then applied to the previously developed integrated circuit used in vibration diagnostics of rotating machines. The structure was awarded a patent and results were published in scientific journals.

The department's research team in cooperation with CROSS Zlín and NETWORK GROUP, s.r.o. continued work on a new sensor for dynamic weighing of vehicles.

Cooperation with BD Sensors, s.r.o. on the development of a new low-pressure and vacuum pressure sensor continued. 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.

The team of Professor Boušek continued with research of sputter passivation and anti-reflective coating of crystalline solar segments and SiNx/SiO2/SiNx multilayer deposition and their optimization in terms of optical transmission in highly efficient coloured segments. In cooperation with ONSemiconductor parasite phenomena in high-voltage LDMOS structures were investigated.

The team of Professor Biolek focused on basic research of so called memsystems, particularly memristors. The memristor concept was generalized for other physical domains. Methods for memsystem modelling and computer simulation were developed and hardware emulators were constructed. Results were published in prestigious scientific journals. Cooperation of the research team with international partners was presented in a monograph cooauthored by Prof. Chua from UC Berkeley and Dr. Williamd from HP. In 2013 international response to the published results was received, as well as a number of citations on the Web of Science.

Major Research Projects

Development of New Type of Fibre-Optic Based Sensor for High Speed Weigh-in-Motion for Road and Highways Application – TA ČR TA01030859

Investigator: Radimír Vrba

Research of Sensors for Sensing Low Pressure and Pressure in Vaccum with Digital Interface for Configuration and Diagnostics – MPO ČR FR-TI3/017

Investigator: Radimír Vrba

New Nanostructured Sensing System for Infrared Detection (NanoIR) – GA AV ČR, GA13-19947S

Investigator: Jaromír Hubálek

Substrate on Substrate Bonding Technology (BOB) - MŠMT-10090/2013-311

Investigator: Ivan Szendiuch

Selected Publications

ALSIBAI, Z. Floating-Gate Operational Transconductance Amplifier. *International Journal of Information and Electronics Engineering .* 2013. 2013 (3)(4). p. 361 - 364. ISSN 2010-3719.

KHATEB, F.; KAÇAR, F.; KHATIB, N.; KUBÁNEK, D. High-precision Differential-Input Buffered and External Transconductance Amplifier for Low-voltage Low-power Applications. *CIRCUITS SYSTEMS AND SIGNAL PROCESSING.* 2013. 2013 (32)(2, IF: 0.982). p. 453 - 476. ISSN 0278-081X. (IF(2012)=0,982).

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Bachelor Degree Programme

Analogové elektronické obvody
(prof. Ing. Dalibor Biolek, CSc.)

Diagnostika a testování elektronických systémů
(prof. Ing. Vladislav Musil, CSc.)

Digitální obvody a mikroprocesory
(doc. Ing. Lukáš Fujcik, Ph.D.)

Elektronické součástky
(prof. Ing. Jaroslav Boušek, CSc.)

Elektrovakuové přístroje a technika nízkých teplot
(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
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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. Likáš Fujcik, Ph.D.)

Microelectronics in English
(prof. Ing. Jaromír Brzobohatý, CSc.)

Mikroelektronické obvody
(Ing. Daniel Bečvář, Ph.D.)

Mikroelektronické prvky a struktury
(Ing. Ondřej Hégr, Ph.D.)

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 (prof. Ing. Jaromír Brzobohatý, CSc.)

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
(doc. 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, Ondřej Hégr, Petr Kosina, Jaroslav Boušek)

Laboratory of Analogue Circuits and Microelectronic Practice (instruction in Analogue 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)

Laboratory of Integrated Circuit Design (instruction in Design of Analogue 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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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.

Professors

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.

Lecturers

Ing. Viera Biolková, Ing. Jiří Dřínovský, Ph.D., Ing. Zbyněk Fedra, Ph.D., Ing. Lucie Hudcová, Ph.D., Ing. Ivana Jakubová, Ing. Michal Kubíček, Ph.D., Ing. Zbyněk Lukeš, Ph.D., Ing. Martin Slanina, Ph.D., Dr. techn. Ivan Starkov, Ing. Martin Štumpf, Ph.D., Ing. Tomáš Urbanec, Ph.D., Ing. Petr Vágner, Ph.D.

Research Workers

Ing. Ondřej Baran, Ph.D., Ing. Jiří Blumenstein, Ph.D., Dr. Techn. Vojtěch Derbek, Ing. Petr Kadlec, Ph.D., Ing. Tomáš Mikulášek, Ph.D., Ing. Michal Pokorný, 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. Radek Balada, Ing. Peter Barcík, Ing. Libor Boleček, Ing. Jan Cigánek, Ing. Aleš Dobesch, Ing. Ivo Dufek, Ing. Martin Dušek, Ing. Tomáš Götthans, Ing. Vladimír Hebelka, Ing. Jan Hofman, Ing. Patrik Hubka, Ing. Ondřej Kaller, Ing. Edward Kasem, Ing. Zdeněk Kincl, Ing. Lukáš Klozar, Ing. David Krutílek, Ing. Vlastimil Koudelka, Ing. Zenon Kuder, MSc., Ing. Martin Kufa, Ing. Pavel Kukolev, Ing. Demian Lekomtcev, Ing. Tobiáš Malach, Ing. Roman Mego, Ing. Jiří Miloš, Ing. Marek Müller, Ing. Michal Mrnka, Ing. Petr Navrátil, Ing. Kamil Pítra, Ing. Juraj Poliak, Ing. Martin Pospíšil, Ing. Miroslav Staněk, Ing. Vladimír Šporik, Ing. Milan Štohanzl, Ing. Pavel Štraus, Ing. Lenka Tejmlová, Ing. Petr Vašina, Ing. Jan

Vélim, Ing. Petr Všetula, Ing. Josef Vychodil, Ing. David Wolanský, Ing. Ondřej Zach, Ing. Filip Záplata, Ing. Petr Zatloukal

Administrative and Technical Staff

Ing. Josef Báňa, Ing. Philip Bělohlávek, Dora Šebestová, Bohuslava Raidová, 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.

In 2013 research was financed by 2 research projects of the Operational Programme 'Education for Competitiveness' (OP VK) and 1 VaVpI project 'Research and Development for Innovations'. The staff participated in 3 GAČR (Grant Agency of the Czech Republic) projects and in 3 TAČR projects (Technology Agency of the Czech Republic), in 5 MPO projects and 3 internal BUT grants. The department was also involved in 1 FP7 project ENIAC JU and 5 projects of international cooperation (COST research). The staff cooperated in several contracts for international partners (Volkswagen AG, CISC Semiconductor GmbH) and nearly 10 contracts with Czech companies.

Research results are immediately incorporated in Bachelor, Master and doctoral degree programmes. Upgrading of the educational process was supported by 1 FRVŠ project (MŠMT).

The department cooperates with many organizations and societies. Staff members are engaged in the committee of the Czech and Slovak section of IEEE and the Society for Radioelectronic Engineering. The department supports activities of the Student Section of IEEE at Brno University of Technology and Radioclub OK2KOJ. There has been active cooperation with the Czech Electrotechnical Society.

The department is a collective member of the international organization AMSAT.

Major Achievements

The department continued, in cooperation with Departments of Telecommunications, Microelectronics and Physics, building the regional 'Centre of Applied Research SIX' (Centre of Sensor, Information and Communication Systems). The Centre started to operate in 2013. The first year was financially supported by the OP VaVpI programme.

In the first six months of 2013 the research teams involved in the 'Programme of Microwave Technology' and 'Programme of Wireless Technology' of the SIX centre were preparing for international research cooperation under the OP VK WICOMT project 'Wireless Communication Teams'. Professor Hans Hartnagel of Technical University Darmstadt was responsible for the preparation of the 'Programme of Microwave Technology', the 'Programme of Wireless Technology' was led by Dr. Michal Ries of Technische Universitat Wien.

In 2013 the department joined international activities of COST (IC1101 Optical Wireless Communications - An Emerging Technology (OPTICWISE), IC1102 Versatile, Integrated, and Signal-aware Technologies for Antennas (VISTA) and IC1003 European network on quality of experience in multimedia systems and services (QUALINET), IC0906 Wireless networking for moving objects (WiNeMO), and IC1004 Cooperative Radio Communications for Green Smart Environments. The department team was also involved in the international FP7 ENIAC JU project (ARTEMOS Agile RF Transceivers and Front-Ends for Future Smart Multi-Standard Communication Applications).

In 2013 cooperation with Volkswagen AG and CISC Semiconductor GmbH continued.

Major Research Projects

Agile RF Transceivers and Front-Ends for Future Smart Multi-Standard Communications Applications (ARTEMOS) – FP7 ENIAC JU 270683-2

Investigator: Tomáš Kratochvíl

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

Investigator: Zbyněk Raida

Millimetre-Wave Electromagnetic Structures for Biomedical Research – GAČR GAP102/12/1274

Investigator: Zbyněk Raida

Hybrid Wireless Technology for Municipal Networks – TAČR FR-TI4/148

Investigator: Zdeněk Kolka

Effect of Propagation Impairments on Error Performance of Future Broadband Terrestrial Wireless Systems – GAČR GAP102/11/1376

Investigator: Zdeněk Kolka

Selected Publications

BARCÍK, P.; HUDCOVÁ, L. Measurement of Spatial Coherence of Light Propagating in a Turbulent Atmosphere. *Radioengineering*. 2013. 22(1). p. 341 - 345. ISSN 1210-2512. (IF(2012)=0,687).

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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 přístrojové 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)
Počítačové systémy a jejich aplikace
(Ing. Aleš Povalač, Ph.D.)
Programovatelné logické obvody
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Radiofrekvenční identifikace
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Softwarové rádio
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Teorie rádiové komunikace
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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 Analogue Electronic Circuits (instruction in analogue electronics, Ivana Jakubová, Lubomír Brančík, Jiří Petržela)

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 (research and instruction in microprocessor and microcomputer technology, Tomáš Frýza, Aleš Povalač)

Laboratory of Communication Systems (research and instruction in communication systems, data transmission and digital radio communication, Aleš Prokeš, Roman Maršálek)

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)

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 and systems, Stanislav Hanus, Martin Slanina)

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, Ondřej Baran)

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, Aleš Povalač, 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, Ondřej Baran)

Research Laboratory of Optical Communications (research in measurement, testing and design of light-transmitting and atmospheric optical connectors, Otakar Wilfert, Lucie Hudcová)

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Main Interests

The department provides instruction in Teleinformatics in the Bachelor degree programme and Telecommunication and Information Technology in the Master degree programme. This reflects the currently progressing convergence of communication and information technologies. Instruction seeks balance between mobile and stationary communications, includes computer systems and networks, design of network applications in different programming languages. Students are instructed in design of analogue 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. There is a follow-up Ph.D. the study area Teleinformatics.

In the academic year 2013/2014 a new Bachelor degree programme Audio engineering was opened where instruction is provided in cooperation with Janáček Academy of Music and Performing Arts in Brno. It is an interdisciplinary programme preparing specialists in sound technology, sound signal processing and recording studio practices who will also possess knowledge of music and arts. The Master degree programme is being prepared.

The department has been successful in obtaining funding from various educational and research programmes. In 2013 our research and development teams were involved in projects relating to basic and applied research yielding more than 50m 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 MPO and Technology Agency ČR. Close cooperation continued with companies GiTy a.s., Webnode s.r.o., 2N Telekomunikace, MEgA-Měřicí Energetické aparáty, TTC telekomunikace a Satturn Holešov s.r.o. Its practical outcomes include the development of security systems, modular architecture for information and videoconferencing systems, new generation of a communication IP system, and sensor network for landscape retention. The department also cooperated in projects with commercial companies T-Mobile, Honeywell, and Telekom Austria and was involved in building of the ‘Centre of Sensor, Information and Communication Systems’.

Major Achievements

The main research interests of the department are converged information and communication systems focused on multimedia informatics, and also electronic systems for medical technology. In 2013 research was targeted at the following issues:

Cryptographic protection of communication and information systems, data networks and data protection, and the protection of electronic archives.

Design of advanced telematic systems in transportation.

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, transport, 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 digitally controlled circuits and systems (communication with converters, digitally controlled current and voltage amplifiers, power generators).

Design of optical networks and industrial applications, measurement and monitoring of optical networks.

Research and design of systems of speech and image processing, protected archiving of multimedia systems, evaluation of emotions in speech and mimics using genetic programming.

Major Research Projects

Computer Automation of Methods for Synthesis of Linear Operating Blocks and Research of Novel Active Elements – GAČR 102/09/1681

Investigator: Kamil Vrba

Electronically Tuneable First-Order Allpass Filters and Their Application to Quadrature Oscillators – GAČR GA102/11/P489

Investigator: Norbert Herencsár

Adaptive Wireless Sensor Networks with Data Visualisation for Crisis Management – MPO FR-TI2/571

Investigator: Milan Šimek

Intelligent Video Modules for Supervision Systems of Entrance to Critical Infrastructure Buildings – MPO FR-TI3/170

Investigator: Jiří Přinosil

Integration Server with Cryptographic Protection – MPO FR-TI4/647

Investigator: Kamil Vrba

Selected Publications

JEŘÁBEK, J.; KOTON, J.; ŠOTNER, R.; VRBA, K. Adjustable band-pass filter with current active elements: two fully-differential and single-ended solutions. *ANALOG INTEGRATED CIRCUITS AND SIGNAL PROCESSING*. 2013. 74(1). p. 129 - 139. ISSN 0925-1030. (IF(2012)=0,553).

BENEŠ, R.; BURGET, R.; KARÁSEK, J.; ŘÍHA, K. Automatically designed machine vision system for the localization of CCA transverse section in ultrasound images. *COMPUTER METHODS AND PROGRAMS IN BIOMEDICINE*. 2013. 109(3). p. 92 - 103. ISSN 0169-2607. (IF(2012)=1,555).

HERENCSÁR, N.; MINAEI, S.; KOTON, J.; YUCE, E.; VRBA, K. New Resistorless and Electronically Tunable Realization of Dual-Output VM All-Pass Filter Using VDIBA. *ANALOG INTEGRATED CIRCUITS AND SIGNAL PROCESSING*. 2013. 74(1). p. 141 - 154. ISSN 0925-1030. (IF(2012)=0,553).

YUCE, E.; MINAEI, S.; HERENCSÁR, N.; KOTON, J. Realization of first-order current-mode filters with low number of MOS transistors. *JOURNAL OF CIRCUITS SYSTEMS AND COMPUTERS*. 2013. 22(1). p. 1 - 14. ISSN 0218-1266. (IF(2012)=0,238).

ŠIMEK, M.; POKORNÝ, J.; BOTTA, M.; MRÁZ, Ľ. Handheld Analyzer of IEEE 802.15.4 PHY and MAC Frames. *In Springer Verlag Lectures Notes*. 01. 2013. p. 95 - 106. ISBN 978-1-936968-67-1.

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LÁZARO, A.; GIRBAU, D.; MORÁVEK, P.; VILLARINO, R. A Study on Localization in Wireless Sensor Networks using Frequency Diversity for Mitigating Multipath Effects. *Elektronika Ir Elektrotechnika*. 2013. 123(3). p. 49 - 54. ISSN 1392-1215. (IF(2012)=0,411).

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Bachelor Degree Programme Teleinformatics

Analogová technika
(prof. Ing. Kamil Vrba, CSc.)

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CISCO akademie II, V
(Ing. Milan Šimek, Ph.D.)

CISCO akademie III
(Ing. Jan Jeřábek, Ph.D.)

CISCO akademie IV
(Ing. Radim Burget, Ph.D.)

Číslicové filtry
(Ing. Petr Sysel, Ph.D.)

Číslicové zpracování signálů
(doc. Ing. Jiří Mišurec, CSc.)

Datová komunikace
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Elektroakustika
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Hardware počítačových sítí
(doc. Ing. Jaroslav Koton, Ph.D.)

Komunikační technologie
(Ing. Jan Jeřábek, Ph.D.)

Konstrukce elektronických zařízení
(prof. Ing. Kamil Vrba, CSc.)

Objektově orientované programování
(doc. Ing. Ivo Lattenberg, Ph.D.)

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(Ing. Petr Číka, Ph.D.)

Počítače a programování 1
(doc. Ing. Ivo Lattenberg, Ph.D.)

Počítače a programování 2
(Ing. Jiří Přinosil, Ph.D.)

Praktikum z informačních sítí
(doc. Ing. Jaroslav Koton, Ph.D.)

Přenosová média
(prof. Ing. Miloslav Filka, CSc.)

Přístupové a transportní sítě
(doc. Ing. Vladislav Škorpil, CSc.)

Síťové operační systémy
(doc. Ing. Dan Komosný, Ph.D.)

Studiová a hudební elektronika
(Ing. Jiří Schimmel, Ph.D.)

Zabezpečovací systémy
(doc. Ing. Karel Burda, CSc.)

Vysokorychlostní komunikační systémy
(doc. Ing. Vladislav Škorpil, CSc.)

Základy kryptografie
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Základy počítačové sazby a grafiky
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Bachelor Degree Programme Audio Engineering

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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
(Ing. Jiří Schimmel, Ph.D.)

Hudba v nových médiích
(Mgr. Martin Flašar, Ph.D., JAMU)

Hudební režie
(MgA. Petr Řezníček)

Hudební teorie
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(Ing. Radim Burget, Ph.D.)

Číslicové zpracování akustických signálů
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(prof. Ing. Zdeněk Smékal, CSc.)

Moderní počítačová grafika
(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
(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
(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 Analogue Techniques (research of analogue current-mode circuits, Kamil Vrba)

Laboratory of Converged Networks (research and instruction in modern data communication networks and services, 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 in modern communication technologies, design of electronic device, Radim Číž)

Laboratory of Sensor Networks and Signals (instruction and research in sensoric 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 Analogue Circuits and Mutual Analogue-Digital Conversion (instruction and research of analog 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)

Laboratory of CISCO Academy (instruction in Cisco Academy courses for all study areas at FEEC, research in computer networks, Dan Komosný)

Laboratory of Prototype Development (research, development and implementation of analogue and digital circuits and electronic devices including mechanic parts, their non-destructive testing and inspection, Pavel Hanák)

Telepresence Studio (research and development in videoconferencing and telepresenting services, Petr Číka)

Department of Theoretical and Experimental Electrical Engineering

Doc. Ing. Pavel Fiala, Ph.D.

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Prof. Ing. Libor Dědek, CSc.

Professors

Prof. Ing. Karel Bartušek, DrSc.
Prof. Ing. Jarmila Dědková, CSc.
Prof. Ing. Eva Gescheidtová, CSc.

Associate Professors

Doc. Ing. Petr Drexler, Ph.D.
Doc. Ing. Pavel Fiala, Ph.D.
Doc. Ing. Pavel Kaláb, CSc.
Doc. Ing. Eva Kroutilová, Ph.D.
Doc. Ing. Radek Kubásek, Ph.D.
Doc. Ing. Jiří Sedláček, CSc.
Doc. Ing. Miloslav Steinbauer, Ph.D.

Lecturers

Ing. Ivo Běhunek, Ph.D., Mgr. Přemysl Dohnal, Ing. Michal Hadinec, Ph.D., Ing. Petr Marcoň, Ph.D., Ing. Jan Mikulka, Ph.D., Ing. Zoltán Szabó, Ph.D., Ing. Robert Urban, Ph.D.

Ph.D. Students

Ing. Mouin Al Khaddour, Ing. Martin Čáp, Ing. Martin Friedl, Ing. Lubomír Frohlich, Ing. Michal Hanzelka, MBA, Ing. Eliška Hutová, Ing. Jiří Chytil, Ing. Radim Kadlec, Ing. Radim Kořínek, Ing. Pavel Křepelka, Ing. Tomáš Kříž, Ing. Dušan Nešpor, Ing. Ksenia Ostanina, Ing. Michaela Pokludová, Ing. Zdeněk Roubal

Administrative and Technical Staff

Ing. Tibor Bachorec, Ph.D., Eva Cupáková, Alena Javůrková, doc. Ing. Petr Koňas, Ph.D., Ing. Taťána Krajčírovičová

Main Interests

Apart from research the Department of Theoretical and Experimental Electrical Engineering provides instruction in related fields of industry. The research outcomes listed below specify the scope of the department's activities.

Last year, basic research results on wideband signal processing, noise spectroscopy (patent application on low-level measurement sensor modification), special applications of metamaterial structures (patent application) for nuclear magnetic resonance (NMR) and electron microscopy were published. So were NMR research results on material diffusion, NMR imaging and impedance tomography. Results on numerical models of velocities of single processes and measurements of the cryogenic device for DNA samples conservation were presented. The department continued cooperation in design and implementation of special cooling systems for electronic

devices. Unique systems for cooling and exposure of biological samples were completed. A system for detection and localization of partial charges in high-voltage transformers was further developed.

Research results on non-destructive measuring methods for scanning the velocity of fluid flow in parts of plants and root systems were published. Research results were presented at reputable conferences 'Progress in Electromagnetics Research Symposium' in Taiwan and Sweden, organized by the World Electromagnetics Academy in Cambridge, USA. The research also resulted in a number of unique operating samples.

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. Research was carried out in cooperation with Honeywell s.r.o in numerical models of tests of VN and EMC electronic systems. Research of cryogenic devices and techniques for sample conservation continued. A follow-up research with Masaryk University, Brno in theory of freezing potential continued. A system for mixing ions in a solution was created. It complemented the formerly designed apparatus for measurement of the potential of selected chemical solutions in order to improve the measurement results. Long-term cooperation with PROTOTYPA a.s. in research of special single-process measuring methods continued. Electron microscopy research was started in cooperation with FEI, Czech Academy of Sciences and Delong Instruments, with focus on biological material scanning avoiding damage or destruction. With TES s.r.o. a unique diagnostic system for detection and localization of partial charges in electric power converters was completed. The system, which enables to monitor the existence of partial charges, analyse their parameters and detect their location, was used and verified under the conditions of a real power station. The results presented at international conferences received significant response and a number of citations. Cooperation with the Mendel University in Brno in simulation of biological systems by means of controlled heat and light sources continued. The previously carried out analysis was followed by non-destructive measuring methods of scanning the velocity of fluid flow in parts of plants and root systems. Cooperation continued with the Faculty of Forestry and Wood Technology, Mendel University, Brno on the research of sensor systems for physiology processes in woody plants with possible landscape application. In cooperation with Thermosanace s.r.o. a measurement X-ray workplace was completed for detection of biological structure damage and wood-destroying pests in wooden constructions. At the same time, an operating sample of system for acoustic detection of vital activities in lower organisms in heterogeneous materials was developed. Research activities with Technische Universität Wien continued and a meeting on MEMS in Wien was organized. Research was carried out in nanomaterial engineering, heterogeneous structures for applications in a safety programme and electric power sources. Basic research of numerical models of mass elementary parts continued in cooperation with the Institute of Scientific Instruments, Czech Academy of Sciences, Brno. Intensive research activities were carried out within 2 GAČR projects in analysis of metabolism and localization of primary brain tumours and jaw bone tissue changes using MR imaging techniques.

In 2013 the department was involved in 2 projects: Institute of Experimental Technologies 1 (global grant of the South Moravian Region) and Institute of Experimental Technologies 2 (OP VK). IET1 focuses on increasing secondary school student motivation to study in electrical engineering study programmes and upgrading instruction in electrical engineering and physics including ICT. The objective of IET2 is to create a system of instruction that better suits the human resources demands of industrial companies.

In 2013, a competition 'Microcontrollers are in' for individuals and teams from secondary schools and universities was organised by the department.

Major Research Projects

Study of Metabolism and Localization of Primary Brain Tumour by MR Imaging Techniques – GAČR 102/12/1104

Investigator: Eva Gescheidtová

Analysis of Metabolism and Localization of Jaw Bone Tissue Changes by MR Imaging Techniques – GAP102/11/0318

Investigator: Eva Gescheidtová

Research and Development of Discharge Activity Detention Inside of Oil Transformers – MPO FR-TI1/001

Investigator: Pavel Fiala

Research of Electromagnetic Materials and Metamaterials Using Numerical and Imaging Methods – GAČR 13-09086S

Investigator: Pavel Fiala

Increasing the Potential of Human Resources for Research and Development in Electrical Engineering – MŠMT CZ.1.07/2.3.00/20.0175

Investigator: Miloslav Steinbauer

Selected Publications

DREXLER, P.; ČÁP, M.; MYŠKA, R.; FIALA, P.; STEINBAUER, M.; KŘÍŽ, T. Proposal of technical measures for a partial discharge detection system based on real measurement. In Proceedings of PIERS 2013 in Taipei, March 25-28, 2013. *Taipei: The Electromagnetics Academy*, 2013. s. 1233-1236. ISBN: 978-1-934142-24- 0.

FIALA, P.; BĚHUNEK, I.; HANZELKA, M. Stochastic Numerical Model of Electrodynamics and Application on HV Test. *In Proceedings of 21th SVSFEM ANSYS Users' Group Meeting and Conference 2013*. Brno: SVSFEM s.r.o., 2013. s. 35-42. ISBN: 978-80-905525-0- 0.

FIALA, P.; MIKULKA, J.; FRIEDL, M.; BĚHUNEK, I.; SZABÓ, Z. Low - level Measurement of the Electric Field Intensity around a Heterogeneous Structure. *In PIERS 2013 Stockholm Proceedings. Cambridge, MA 02138: The Electromagnetic Academy*, 2013. s. 925-929. ISBN: 978-1-934142-26- 4.

FIALA, P.; NEŠPOR, D.; DREXLER, P. A Resonance-based Solar Element: A Numerical Model and Micro/ Nano Technology Application. *In Proceedings of SPIE Smart Sensors, Actuators, and MEMS IV*. 8763. Bellingham, Washington, USA: SPIE, 2013. s. 87632A- 1 (87632A-7 s.)ISBN: 978-0-8194-9560- 0.

KOŘÍNEK, R.; VONDRÁK, J.; BARTUŠEK, K.; SEDLAŘÍKOVÁ, M. Experimental investigations of relaxation times of gel electrolytes during polymerization by MR methods. *Journal of Solid State Electrochemistry*, 2013, roč. 17, č. 8, s. 2109-2114. ISSN: 1432- 8488.

MARCOŇ, P.; BARTUŠEK, K.; MIKULKA, J.; GESCHEIDTOVÁ, E. Statistics - based Classification of Tissues in the Mandibular Region. *In 2013 36th International Conference on Telecommunications and Signal Processing* (id 21150). Řím: 2013. s. 624-627. ISBN: 978-1-4799-0403- 7.

MIKULKA, J.; GESCHEIDTOVÁ, E.; KABRDA, M.; PEŘINA, V. Classification of Jaw Bone Cysts and Necrosis via the Processing of Orthopantomograms. *Radioengineering*, 2013, roč. 22, č. 1, s. 114-122. ISSN: 1210- 2512.

MIKULKA, J.; ŠMIRG, O.; GALLEGO, D.; ESPÍN, F.; GIL, V.; FAÚNDEZ ZANUY, M.; JIMÉNEZ, M.; CLAVÉ, P. In vitro motor patterns and electrophysiological changes in patients with colonic diverticular disease. *INTERNATIONAL JOURNAL OF COLORECTAL DISEASE*, 2013, roč. 2013, č. 5, s. 1-34. ISSN: 0179- 1958.

BRADÁČ, Z.; ZEZULKA, F.; SZABÓ, Z.; ROUBAL, Z.; MARCOŇ, P. Design and functional description of experimental smart grid. *TechSys 2009 Internationa Conference Engieering, Technologies and Systems*, 2013, roč. 2013, č. 19, s. 313-317. ISSN: 1310- 8271.

Bachelor Degree Programme

Bezpečná elektrotechnika
(doc. Ing. Pavel Kaláb, CSc.)

Elektrotechnický seminář
(doc. Ing. Miloslav Steinbauer, Ph.D.)

Elektrotechnika
(Steinbauer Miloslav, doc. Ing., Ph.D.)

Elektrotechnika 1
(doc. Ing. Jiří Sedláček, CSc.)

Elektrotechnika 2
(doc. Ing. Jiří Sedláček, CSc.)

Měření v elektrotechnice (BMVA - prof. Ing. Karel Bartušek, DrSc., HMVA - prof. Ing. Eva Gescheidtová, CSc.)

Seminář C++
(doc. Ing. Pavel Fiala, Ph.D.)

Počítačové modelování elektrotechnických zařízení a komponentů polí (doc. Ing. Pavel Fiala, PhD.)

Master Degree Programme

Bezpečná elektrotechnika
(doc. Ing. Pavel Kaláb, CSc.)

Bezpečnost zařízení
(doc. Ing. Miloslav Steinbauer, Ph.D.)

Elektrické instalace
(doc. Ing. Pavel Kaláb, CSc.)

Modelování elektromagnetických polí
(prof. Ing. Jarmila Dědková, CSc.)

Doctoral Degree Programme

Numerické úlohy s parciálními diferenciálními rovnicemi (doc. Ing. Pavel Fiala, Ph.D.)

Speciální měřicí metody
(prof. Ing. Karel Bartušek, DrSc.)

Laboratories

Laboratory of Electrical Measurements (instruction in Measurements in Electrical Engineering, Radek Kubásek)

Laboratory of Electrical Engineering (instruction in Electrical Engineering 1 and 2, Martin Friedl)

Laboratory of Electrical Engineering and Electrical Installations (Electrical Engineering Seminar, Electrical Installations, Radim Kadlec)

IET Laboratory (instruction laboratory, Miloslav Steinbauer)

Computer Laboratory of Electrical Engineering (instruction in Electrical Engineering 1 and 2, Miloslav Steinbauer)

Computer Laboratory (Electrical Engineering Seminar, Computers and Programming 2, Electromagnetic Field Modelling, 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 parameters of light sources, Eva Kroutilová)

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. Josef Koláčný, CSc.
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. Marcel Janda, Ph.D., Mgr. Petr Kloc, Ph.D., Ing. Petr Procházka, Ph.D., Ing. Jiří Valenta, Ph.D., Ing. Ondřej Vítek, Ph.D.

Ph.D. Students

Ing. Radim Běloušek, Ing. Ramia Deeb, Ing. Lukáš Dostál, Ing. Petr Fajkus, Ing. Rostislav Huzlík, Ing. Josef Kadlec, Ing. Jan Knobloch, Ing. Jiří Kurfürst, Ing. Jan Kuzdas, Ing. Martin Mach, Ing. Zbyněk Makki, Ing. Petr Michailidis, Ing. Lukáš Mišinger, Ing. Tomáš Nevřivý, Ziad Nouman, Ing. Ivo Pazdera, Ing. Martin Prudík, Mousa Sattouf, Ing. Petr Španěl, Ing. Adam Vašíček, Ing. Vojtěch Vetiška, Ing. Eva Vítková, BA., Ing. Jiří Vondruš, Mgr. Elena Zotova

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 pulse DC/DC 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. In applied research electrical machines, power electronics, electrical drives and devices are in the focus of interest. Research is mainly concerned with 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. Research was also focused on 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.,etc.

Major Achievements

In 2013 the department moved to new premises of the Faculty of Electrical Engineering and Communication, Technická 12. The construction of the Laboratory of Switching Devices was completed.

In cooperation with the Institute of Aerospace Engineering of the Faculty of Mechanical Engineering a prototype VUT 051 RAY with accumulator electrical drive was developed.

In applied research 22 prototypes and operating samples were designed.

Major Research Projects

Redesign of High-Voltage High-Power Synchronous Generators – FR-TI3/457

Investigator: Čestmír Ondrůšek

Innovation of Forest Cableways Larix – TA02021320

Investigator: Bohumil Klíma

Research and Development of Lightweight Vehicles Compact Power Axes Series with an Integrated Electric Drive – TA01011060

Investigator: Pavel Vorel

Research and Development of the Insulation System of Small Electric Machines - FR-TI4/104

Investigator: Vítězslav Hájek

Synchronous Motors with Fractional Slot Winding for Use in Lift Trucks - FR-TI4/675

Investigator: Vítězslav Hájek

Selected Publications

HÁJEK, V.; VÍTEK, O.; MACH, M. Brushless Alternator in Automotive Applications. *In 2013 Eighth International Conference and Exhibition on Ecological Vehicles and Renewable Energies*. 2013. s. 1-4. ISBN: 978-1-4673-5270- 3

HÁJEK, V.; KUCHAŘ, L.; MACH, M.; VÍTEK, O. Small Electric Motors with Integrated Electronic Unit. *In 17th International Conference on Electrical Drives and Power Electronics 6th joint Croatian- Slovak Conference EDPE 2013*. 2013.s. 200-204. ISBN: 978-953-56937-8- 9.

NOUMAN, Z.; KNOBLOCH, J.; KLÍMA, B. FPGA usage for power inverters diagnostics. *In Proceedings of the IECON 2013 - 39th Annual Conference of the IEEE Industrial Electronics Society*. Vídeň, Rakousko: 2013. s. 1-5. ISBN: 978-1-4799-0223- 1.

PAZDERA, I.; PROCHÁZKA, P.; ČERVINKA, D.; KLÍMA, B. Electrical Drivetrain of the Small Airplane and Mutual Interaction of this Drivetrain. *In Proceedings of the IECON 2013 - 39th Annual Conference of the IEEE Industrial Electronics Society*.Vídeň, Rakousko: 2013. s. 1-6. ISBN: 978-1-4799-0223- 1.

KADLEC, J.; CIPÍN, R.; KLÍMA, B.; ČERVINKA, D.; VOREL, P. Li- ion accumulators for propulsion system of electric Airplane VUT 051 RAY. *Journal of Solid State Electrochemistry*, 2013, roč. 2013, č. 10, s. 1-7. ISSN: 1432- 8488.

NOUMAN, Z.; KNOBLOCH, J.; KLÍMA, B. Design and Implementation A Digital Sine- Cosine Generator Based FPGA.*International Journal of Engineering and Advanced Technology (IJEAT),* 2013, roč. 2, č. 5, s. 304-307. ISSN: 2249- 8958

ČERVINKA, D.; PAZDERA, I.; PROCHÁZKA, P.; KLÍMA, B. Battery for small Electric Airplane. *In Proceedings of the IECON 2013 - 39th Annual Conference of the IEEE Industrial Electronics Society*. Vídeň, Rakousko: 2013. s. 1-5. ISBN: 978-1-4799-0223- 1

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BARTLOVÁ, M.; AUBRECHT, V.; BOGATYREVA, N.; HOLCMAN, V. Multigroup Approximation of Radiation Transfer in SF6 Arc Plasmas. *Acta Polytechnica* (on-line), 2013, roč. 2013, č. 2, s. 98-102. ISSN: 1805- 2363.

CIPÍN, R.; ONDRŮŠEK, Č.; HUZLÍK, R. Fractional- order model of DC motor. *In Mechatronics 2013 Recent Technological and Scientific Advances. 1*. London: Springer, 2013. s. 363-370. ISBN: 978-3-319-02293- 2.

HADAŠ, Z.; VETIŠKA, V.; ANČÍK, Z.; ONDRŮŠEK, Č.; SINGULE, V. Development of energy harvester system for avionics. *InProceedings of SPIE Smart Sensors, Actuators, and MEMS VI. 8763. Bellingham, Washington*, USA: SPIE, 2013.s. 87631F- 1 (87631F-8 s.)ISBN: 978-0-8194-9560- 0.

ŠPANĚL, P.; PATOČKA, M. HF transformer winding arrangement for adjusting the leakage inductance. *ELECTROMOTION*,2013, roč. 20, č. 1- 4, s. 151-154. ISSN: 1223- 057X.

CIPÍN, R.; PATOČKA, M. Skin Effect in Rotor Bars of Induction Motor in Form of Transfer Function*. In Proceedings of the IECON 2013 - 39th Annual Conference of the IEEE Industrial Electronics Society*. Vídeň: 2013. s. 3146-3150. ISBN: 978-1-4799-0223- 1.

CIPÍN, R.; PATOČKA, M. Electromagnetic design of irregular three phase windings. *In Proceedings of EPE '13- ECCE Europe.Lille*, Francie: 2013. s. 1-10. ISBN: 978-90-75815-17- 7.

PATOČKA, M.; BĚLOUŠEK, R. Sensitivity analysis of the induction machine torque to the substituting circuit elements. InMechatronics 2013 - Recent Technological and Scientific Advances. *Springer International Publishing*, 2013.s. 355-361. ISBN: 978-3-319-02293- 2.

BĚLOUŠEK, R.; PATOČKA, M. Sensitivity analysis of the induction machine substituting circuit. *ELECTROMOTION*, 2013, roč. 20, č. 1- 4, s. 122-126. ISSN: 1223- 057X.

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KUZDAS, J.; VOREL, P. Powerful charger for electric aircraft. *In Proceedings of the IECON 2013 - 39th Annual Conference of the IEEE Industrial Electronics Society*. Vídeň, Rakousko: 2013. s. 1163-1166. ISBN: 978-1-4799-0223- 1.

PRUDÍK, M. DC/DC Converter Using Fast- switching Components. *In Student EEICT Proceedings of the 19th conference Volume 3*. Brno: LITERA, 2013. s. 118-122. ISBN: 978-80-214-4462- 1.

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Bachelor Degree Programme

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
(doc. Ing. Bohumil Klíma, 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
(doc. Ing. Bohumil Klíma, Ph.D.)

Elektrické mikropohony
(Ing. Ondřej Vítek, Ph.D.)

Elektrické regulované pohony
(prof. Ing. Jiří Skalický, CSc.)

Navrhování výkonových měničů
(doc. Dr. Ing. Miroslav Patočka)

Laboratoř elektrických pohonů
(Ing. Dalibor Červinka, Ph.D.)

Adaptivní a optimální řízení pohonů
(prof. Ing. Jiří Skalický, CSc.)

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
(doc. Ing. Bohumil Klíma, 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 in commutation of electrical machines, measurement of medium-power output, magnetic bearings, automated measurements, Ondřej Vítek)

Laboratory of Mechatronics (Ondřej Vítek)

Laboratory of Electrical Machines (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 in 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 Industrial Electronics (Pavel Vorel)

Laboratory of Microprocessor Technology (Bohumil Klíma)

Laboratory of Microelectronic Systems (Rostislav Huzlík)

Laboratory of Power Electronics 2 (Pavel Vorel)

Research and Development Laboratory (Petr Procházka)