

ANNUAL REPORT 2012

**FACULTY OF ELECTRICAL ENGINEERING
AND COMMUNICATION
BRNO UNIVERSITY OF TECHNOLOGY**

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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

The Faculty in 2012

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 2012 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.

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, 24,000 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 in 2002 of a new faculty - 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.

At the end of 2012 there were 222 academics at the faculty (professors, associate professors, lecturers and other pedagogical and research staff) and 3,921 students in all forms of government supported programmes. Moreover, instruction was provided for 298 students of the Faculty of Information Technology, 51 students of the Faculty of Mechanical Engineering and 98 students of the Faculty of Management. On the other hand, our faculty purchased tuition from the Faculty of Information Technology for 5 students. Then the number of students educated at the faculty totalled 4,197. In 2012 education was provided in study programmes Electrical Engineering, Electronics, Communication and Control Technology (EECR, accredited in 2001) and Biomedical Technology and Bioinformatics

(BTBIO-A, accredited in 2007), and Biomedical Engineering and Bioinformatics (BTBIO-F, accredited in 2010), English in Electrical Engineering and Information Technology (AJEI-H, accredited in 2012) in accordance with the Bologna Declaration. The study programmes at FEEC are now fully compatible with the educational systems applied in the European Union, and thus participation of FEEC students in European mobility programmes has been facilitated. Among the FEEC graduates in 2012 there were 441 students who completed their studies in the

Bachelor degree programme, 545 Master programme graduates, and 34 doctoral students completed the Ph.D. programme. There were 1,149 students coming to the Faculty, 643 students started the follow-up Master programme, and 96 the doctoral programme. Tuition in English was provided to 2 international students paying their fees. Two academics were habilitated and appointed associate professors with the title Docent. There was one appointment to professorship.

Events and Activities

- completion of the new premises at Technická 12 at the campus Pod Palackého vrchem which will accommodate departments now located at Kolejní 4, Purkyňova 118 and Technická 2.
- application for funding of the European project 'Reconstruction of BUT premises Technická 8, campus Pod Palackého vrchem' from operational programme 'Research and Development' - Priority axis 4 – infrastructure for tertiary education and research
- 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 Master study programme BTBIO-F Biomedical Engineering and Bioinformatics
- commencement of tuition in the new interdisciplinary Bachelor programme AJEI-H English in Electrical engineering and Information Technology
- accreditation of the inter-university interdisciplinary Bachelor programme Audio Engineering
- accreditation of the doctoral programme Biomedical Technology and Bioinformatics
- courses for secondary school students interested in study at FEEC organized by Department of Mathematics to help them prepare for entrance examinations at FEEC
- Open Door Days (November, December 2011, January 2013), visits by students to secondary schools, secondary school advisors visiting FEEC
- presentation of new study programmes at 19th European trade fair of higher and lifelong education Gaudeamus 2012, 10 October - 2 November 2012, 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 Bratislava, 22-24 May 2012
- publication of the faculty yearbook 2011/12
- development of programmes leading to habilitation and appointment procedures

STUDENT EEICT 2012 Conference and Competition organized in cooperation with the Faculty of Information Technology under the auspices of CzechInvest, with participation of media partners (Brno TV, TZB Info, Sdělovací technika) sponsored by Honeywell, ABB, ON Semiconductor, TES Vsetín, Freescale etc., with final 61 Bachelor, 95 Master, 91 doctoral papers and 12 papers by secondary-school students

- the Lifelong Learning Programme-Erasmus and other European programmes
- full use of the central BUT information system
- 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
- implementation of the European project Professor List Technological Park funded from the 'Prosperity and Innovation' operational programme
 - 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-sixth faculty ball at the Voroněž hotel

Achievements

Taking into account budget restrictions, the economic situation was satisfactory. The undesirable consequences of budget restrictions meant salary reductions and some unpopular measures in human resources management could not be avoided at the beginning of the new economic year. Stating that the trend in salaries and material supply has been favourable, we have to bear in mind that it is the result of 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 all those who under the leadership of chief investigators participated in those projects, in more than 30 projects OP VK, the OP PI project for Professor List Technological Park and mainly the two VaVpl 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 Electrotechnology
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.
Doc. Ing. Luboš 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.
Doc. 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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Facebook: <http://www.facebook.com/FEKTVUT>
Youtube: <http://www.youtube.com/user/perFEKTniFakulta>

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

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
Cybernetics, Control and Measurement
Microelectronics and Technology
Power Electrical and Electronic Engineering
Teleinformatics
Theoretical Electrical Engineering
Physical Electronics and Nanotechnology
Mathematics in Electrical Engineering

Accredited Areas for Habilitation Procedures and Procedures for Appointment to Professorship

- Biomedical Engineering
- Electronics and Communications
- Electrical and Electronic Technology
- Power Electrical and Electronic 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 Engineering and Information Technology' (AJEI-H) was launched. The full-time form of study covers the study area English in Electrical Engineering and Information Technology (H-AEI). English in Electrical Engineering and Information Technology as a specific professional variety has not yet been taught 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 entrance examination contained test from the English language (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 their knowledge

at the required level B2 of the 'Common European Reference Framework for languages' (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 101 applicants, 83 were admitted and 78 students registered.

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 tuition 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. They are also 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 tuition (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 2012/13 was 150. The written examination contained tests in

mathematics and biology. Applicants who took their school-leaving examination with 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 2012 there were 212 paid applications for study in the programme BTBIO-A, 122 applicants were admitted and 122 registered. In 2012 there were 285 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 format of study since academic year 2002/03 and in part-time format of study since academic year 2004/05.

There were 1,654 full-time students enrolled in the Bachelor programme EECR-B in 2012. The programme was completed by 346 students, 63 of them in the study area Automation and Measurement Technology (B-AMT), 66 in Electronics and Communications (B-EST), 56 in Microelectronics and Technology (B-MET), 72 in Power Electrical and Electronic Engineering (B-SEE) and 89 in Teleinformatics (B-TLI).

In the part-time Bachelor programme EECR-BK there were 222 students in 2012. The part-time study programme was completed by 64 students, 17 of them in study area Automation and Measurement Technology (BK-AMT), 10 in Electronics and Communications (BK-EST), 7 in Microelectronics and Technology (BK-MET), 12 in Power Electrical and Electronic Engineering (BK-SEE) and 18 in Teleinformatics (BK-TLI).

Admission procedure is a priority at the Faculty. 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 (OSP Z) with a minimum of 60% in all three assessed parts, or 60% in the first three parts of the expanded test of general study prerequisites (OSP R)
- 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 2012 there were 1,563 applications, 1,295 for full-time study and 268 for part-time study. Finally, 1,014 students were admitted, 837

students in full-time study and 177 in part-time study.

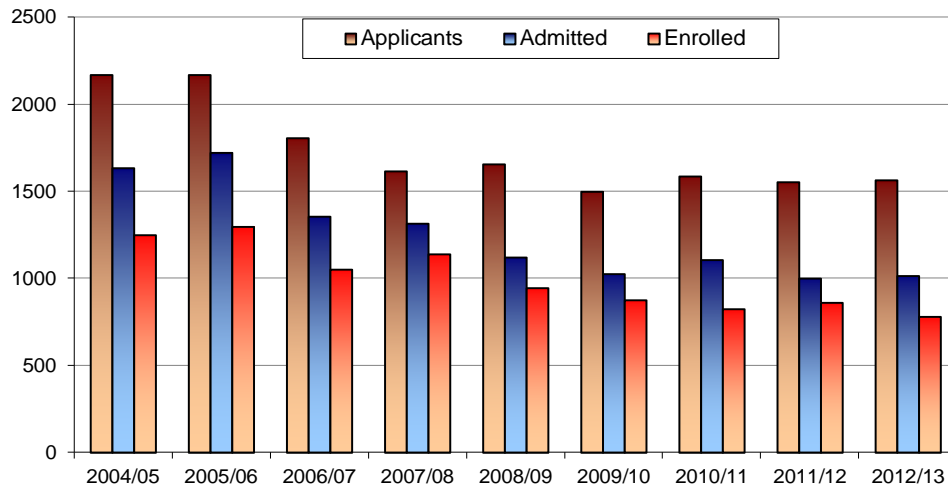
Graph 1 shows the numbers of applicants, admitted and enrolled full-time students since 2004. The decreasing trend in applications is apparent, due to the demographic trend and students' interest in newly accredited Bachelor programmes at other universities. For the first time in academic year 2010/11 applicants were admitted directly to a selected specialization, while in previous years they selected their specializations during their studies. Statistics for the period 2004/05 - 2012/13 and numbers of students enrolled in individual study areas for 2010/11 to 2012/13 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 study at university.

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.

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
2007/08	Number	152	178	51	98	195	45	719
	%	22,6	26,4	7,6	14,5	28,9		
2008/09	Number	98	127	50	90	153	47	565
	%	18,9	24,5	9,7	17,4	29,5		
2009/10	Number	94	101	48	77	101	0	421
	%	22,3	24,0	11,4	18,3	24,0		
2010/11	Number	144	151	47	146	214	-	702
	%	20,5	21,5	6,7	20,8	30,5		
2011/12	Number	138	109	100	160	189	-	696
	%	19,8	15,7	14,4	23,0	27,2		
2012/13	Number	140	97	71	159	182	-	649
	%	21,5	14,9	10,9	24,4	28,0		



Graph 1: Applicants, admitted and enrolled in full-time and part-time form of study in EECR-B in academic years 2004/05 - 2012/13

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 2012 there were 793 full-time students in the follow-up Master programme EECR-M, 371 in the first year of study and 422 in the second year. There were 196 part-time students in EECR-ML, 110 first-year students and 86 second-year students.

In 2012 full-time programmes were completed by 339 students, 23 in study area Biomedical and Ecological Engineering (M-BEI), 34 in Power Electrical Engineering (M-EEN), 68 in Electronics and Communications (M-EST), 29 in Electrotechnical Manufacturing and Management (M EVM), 71 in Cybernetics, Automation and Measurement (M-KAM), 13 in Microelectronics (M-MEL), 20 in Power Electrical and Electronic Engineering (M-SVE) and 81 in Telecommunications and Informatics (M-TIT). Part-time study programme was completed by 32 students, 1 in Biomedical and Ecological Engineering (ML-BEI), 2 in Power Electrical Engineering (ML-EEN), 4 in Electronics and Communications (ML-EST), 4 in Electrotechnical Manufacturing

and Management (ML EVM), 2 in Cybernetics, Automation and Measurement (ML-KAM), 2 in Power Electrical and Electronic Engineering (ML-SVE) and 12 in Telecommunications and Informatics (ML-TIT).

The total number of applicants for study in the EECR programme (with paid application) was 694. There were 534 applicants for full-time (EECR-M) programme and 160 applicants for part-time (EECR-ML) programme. For academic year 2012/13 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 29 June 2012 nearly all applicants enrolled. The second term of entrance examination 7 July 2012 and the Committee meeting scheduled for 23 August 2012 were cancelled. The total number of admitted was 651, 530 in full-time study and 121 in

part-time form of study. All admitted were registered for the study areas they had selected. Numbers of applicants and admitted by study areas are in Table 2, 507 of them enrolled, 392 in full-time and 115 in part-time study.

Follow-up Master Degree Programme Biomedical Engineering and Bioinformatics

In academic year 2010/11 the Faculty first offered a full-time format of study in the follow-up Master programme 'Biomedical Engineering and Bioinformatics' BTBIO-F. In 2012 there were 115 students in this programme, 48 first-year students and 68 second-year students.

In 2012 full-time study programme Biomedical Engineering (F-BTB) was completed by 38 students.

There were 72 applicants (with paid application) for the BTBIO-F programme. The maximum number of admissions approved by Academic Senate for academic year 2012/13 was 250. The written entrance examination consisted of 10 tasks selected from two thematic areas published on FEEC websites. The thematic areas were

selected by the Council of Study Programmes. 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 being 100 points. As the number of applicants was lower than the above approved maximum number of admissions, the Dean decided, in accordance with Admission Procedure Rules, on exemption from entrance examination and admission of all applicants. On the announced date of entrance examination 29 June 2012 nearly all applicants enrolled. The second term of entrance examination 10 July 2012 and the Committee meeting scheduled for 23 August 2012 were cancelled. There were 72 admitted, 47 of them enrolled.

Lifelong Education and Self-Paid Study

In accordance with the amendment to Act No 111/98 Coll. on higher education FEEC participates in the system of lifelong education. Apart from a range of specialized courses for professionals, the Faculty offers paid study of subjects of 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 2012 there were 27 students in the lifelong education programme.

In 2012 there was one international student paying his fees in the follow-up Master programme EECR-MN.

Table 2: Numbers of applicants and admitted in study areas of follow-up Master programmes EECR-M and EECR-ML in 2012: 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)

<i>Study area</i>	<i>Applicants</i>	<i>Admissions</i>	<i>Study area</i>	<i>Applicants</i>	<i>Admissions</i>
M-BEI	41	41	ML-BEI	13	10
M-EEN	62	61	ML-EEN	14	7
M-EST	73	73	ML-EST	14	12
M-EVM	64	63	ML-EVM	27	18
M-KAM	69	69	ML-KAM	27	24
M-MEL	44	44	ML-MEL	9	7
M-SVE	59	58	ML-SVE	15	8
M-TIT	122	121	ML-TIT	41	35

Tuition Support

There has been a consistent effort at the FEEC to improve and use more extensively the information system for management of study affairs and to make relevant information accessible to students. In 2012 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

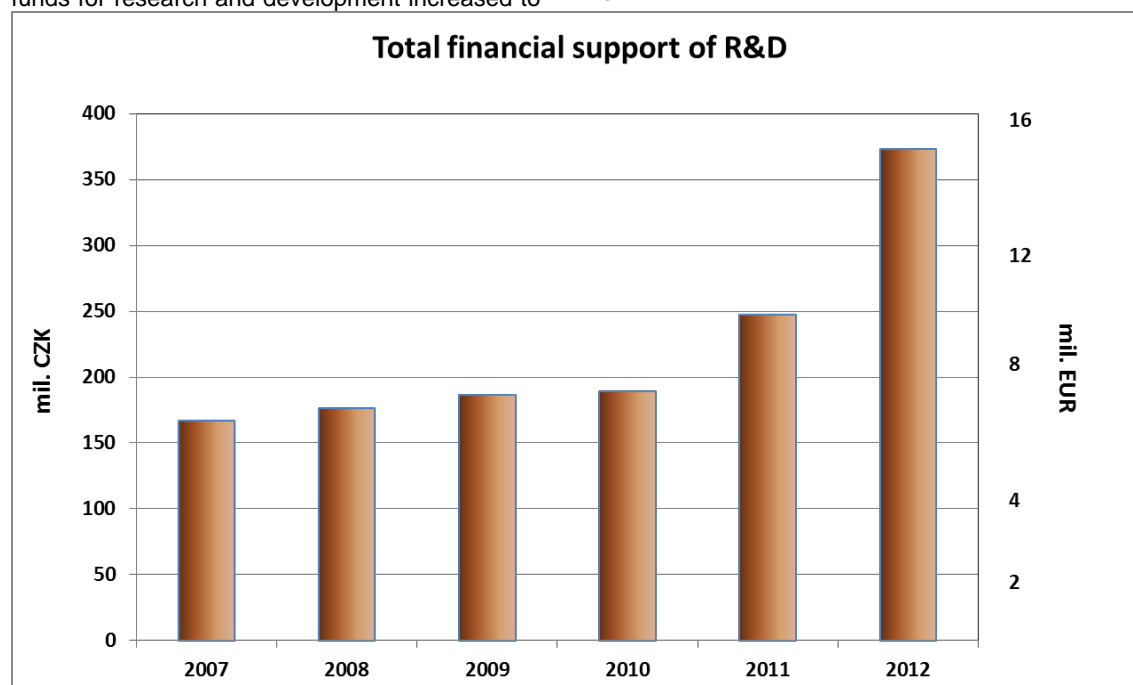
Creative Activities, Science and Research

The structure of funds for research and development changed in 2012. The four research plans that were the major sources of especially non-investment financing were completed. On the other hand, increased funding was obtained from the Operational Programme 'Research and Development for Innovations' (OP VaVpl), in two regional research centres, mainly investment funding. Owing to the programme, the total amount of funds for research and development increased to

over 370 mil. CZK, by 50% in comparison with the previous year (graph 4).

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 4 international monographs and in 137 articles in impact journals. FEEC was granted 12 national patents.



Graph 4: Total financial support in research and development in mil. CZK/EUR, 2007 - 2012

Regional Research Centres

The project of two regional centres continued in 2012. The centres will be financed by the Operational Programme 'Research and Development for Innovations' (OP VaVpl).

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 planned applications include ecological transport systems, development of ecological robots and innovation of cogeneration units for electrical energy generation.

The project CVVOZE received financial support of over 260 mil. CZK, 221 mil. CZK from the EU and 39 million from the budget of the Czech Republic. More than 200 mil. CZK will be used to equip laboratories with top apparatus and devices, the remaining funds will be used to support the research team in the next four years. To the end of 2012 the Centre employed 59 research workers.

Habilitations and Appointments to Professorship

In 2012 two new associate professors habilitated:

Doc. Ing. Bohumil Klíma, Ph.D.

Power Electrical Engineering

Doc. Ing. Eva Kroutilová, Ph.D.

Theoretical Electrical Engineering

For more information visit <http://www.cvvoze.cz>.

Centre of Sensoric, Information and Communication Systems (SIX)

(investigator Zbyněk Raida)

The research centre SIX is focused on applied research of near-future communication systems. Involved in the research centre SIX are the Departments of Physics, Microelectronics, Radioelectronics and Telecommunications.

In 2012 the Centre focused on purchase and installation of equipment for research laboratories. This should have been completed by the end of 2012. However, due to complicated competition procedure for unique devices that can be obtained from one supplier only, some laboratories will not be completed until the beginning of 2013.

During 2012 the Centre SIX gradually obtained research grants and orders, which could finance a new research position in the Centre. In 2013 the research team will be joined by new researchers supported from the starting project of Centre SIX.

In 2014 full operation of Centre SIX will start.

For more information go to

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

And there was one appointment to professorship

Prof. Ing. Lubomír Grmela, CSc.

Electrical and Electronic Technology

Doctoral Programme

In academic year 2012/13 there are 444 students in the doctoral degree programme. Three 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 2012 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 2008 to 2012

<i>year</i>	2008	2009	2010	2011	2012
1.	89	88	118	85	77
2.	84	80	76	96	82
3.	69	80	75	69	85
4.	20	60	64	71	64
5.	35	8	47	48	58
6.	35	18	7	43	37
7.	33	23	18	7	41
total	365	357	406	419	444

Table 5: Numbers of Ph.D. students by departments from 2008 to 2012

	2008	2009	2010	2011	2012	total
UAMT	3	8	1	0	3	15
UBMI	0	6	0	2	1	9
UEEN	2	4	0	4	0	10
UETE	4	4	1	2	0	11
UMAT	0	0	0	2	2	4
UFYZ	5	3	0	0	4	12
UMEL	4	11	0	3	3	21
UREL	9	12	7	8	7	43
UTEE	0	1	1	1	1	4
UTKO	9	10	3	4	7	33
UVEE	5	6	4	1	3	19
total	41	65	17	27	31	181

Student Creative Activities

The 18th FEEC STUDENT EEICT conference 2012 was jointly organized with the Faculty of Information Technology on 26 April 2012. 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. The 18 EEICT was organized under the auspices of CzechInvest and media partners (Brněnská televize, TZB Info, Sdělovací technika, etc.). In the finals of the competition there were 259 papers - 61 Bachelor, 95 Master, 91 Ph.D. papers and 12 papers presented by secondary

school students. The competition was sponsored by 11 industrial companies – the major ones being Honeywell, TYCO, ABB, ON Semiconductor, TES Vsetín, Freescale. The papers were evaluated by 27 expert committees including representatives of the sponsoring companies, academics and representatives of the club Students for Students.

Eighty one 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. As a result, 46 students were at placements of 215 months, and 27 teachers were on lecture stays of 33 weeks (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 LLP programme, 96 students came for placements of 410.5 months, which represents an increase by 26% in the number of students and 46% in the length of placements in comparison with 2011. Mobility figures for incoming and outgoing students in individual programmes in 2012 are in Table 7. Existing agreements in the Lifelong Learning Programme-Erasmus were renewed. On the whole, the Faculty has concluded 58 bilateral agreements. The list of universities cooperating with the Faculty on the basis of Lifelong Learning Programme-Erasmus in academic year 2012/13 is in Table 9.

In 2012 funding for longterm international placements for students of all study programmes from the Mobility Development Programme of the Ministry of Education amounted to 550,000 CZK and 149,500 CZK was received from the BUT mobility fund. Within the framework of the Development Programme of Ministry of

Education there were 13 students in placements of the total length of 34 months.

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 2012 is comparable with the previous year. The length of placements of FEEC students is 261 months, which is a decrease of 6% in comparison with 2011, taking into account the increased number of students at the faculty. On the other hand, placements of international students at FEEC reached 432.5 months. This is an increase of 45% in comparison with 2011.

The Faculty supports cooperation of departments and academics with international institutions based on interfaculty and LLP-Erasmus as well as newly made contacts. In 2012 the amount of 50 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 academics coming to short lecture stays at FEEC.

The Faculty of Electrical Engineering and Communication invites outstanding 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 280 thous. CZK for these activities was obtained from the Development Programme of Ministry of Education 2.5. The funds were provided to 10 experts of the faculty and used to pay the costs connected with the lecture stay of Professor Stevic of the Mathematical Institute, Serbian Academy of Sciences.

Discussed with some of the visiting experts was potential joint preparation of consortium research

projects funded by 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 Learning Programme-Erasmus from 2008 to 2012

Socrates (LLP)-Erasmus	2008	2009	2010	2011	2012
Students	42	45	51	54	46
Months	168	167	167,5	224	215
Lecture stays	30	28	25	27	27
Lecture weeks	35	34	29	32	33
Training					1
Weeks of training					2

Table 7: Student placements at FEEC and abroad by programmes, 2012 - summary

Activity	Arrivals		Departures	
	Students	Months	Students	Months
Socrates(LLP)-Erasmus	96	410,5	46	215
Inter-university agreements	3	13	-	-
Development Programme of Ministry of Education	-	-	13	34
Other	1	9	6	12

Table 8: Student placements at FEEC and abroad in all mobility programmes from 2008 to 2012

		2008	2009	2010	2011	2012
Arrivals	Students	64	68	74	86	100
	Months	216	235	285	298	432,5
Departures	Students	68	62	67	71	65
	Months	248	238	230	276	261

External Relations

External relations are focused on presentation 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 – visits by FEEC students at secondary schools.

Increased attention was paid to giving information in the media 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. Faculty management took part in the running race Strojářské schody organized every year, where our dean J.Dědková together with the deans of the Faculty of Fine Arts and the Faculty of Information Technology were members of dean relay and vice-deans S. Hanus, P.Fiedler and J.Háze were members of the FEEC relay.

As every year, the management attended the annual meeting of the Czech and Slovak faculties of electrical engineering and associated faculties held in Bratislava 22-24 May 2012. 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.

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 and others.

The cooperation intensified at the time of preparation and start of 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. 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 2012/13

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
Sekonda Università degli Studi di Napoli	Italy
Vilniaus Gedimino Technikos Universitetas	Lithuania
Duale Hochschule Baden-Württemberg Lörrach	Germany
Fachhochschule Wiesbaden	Germany
Friedrich-Alexander-Universität 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
Universität 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 València	Spain
Universitat Politècnica 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 2012 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, 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, EK, UBMI

Doc. Ing. Pavel Vorel, Ph.D., EK, PK, UVVE

Student Chamber

Bc. Tomáš Mejzlík, EK, PK, chair

Bc. Rastislav Červenák, PK

Juraj Jakubík, PK

Petr Jarchovský, EK, PK

Bc. Zuzana Moldříková, PK

Bc. Vojtěch Svatoš

Ing. Martin Zukal, EK

Academic Senate held 9 regular meetings, with an average attendance of 75.4%. Academic Senate dealt with legislative, economic and pedagogical issues. 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.

In 2012 positions of three members of the student chamber were taken by substitutes elected in regular elections in 2011. Two members completed their studies and one resigned on the membership in Academic Senate. As he also represented FEEC in BUT Academic Senate and there was no substitute elected, electronic election was held on 17 and 18 December 2012. The turnout

was 5.46 %. The new representative of FEEC in BUT Academic Senate is Bc. Tomáš Mejzlík.

Academic Senate discussed novels of internal guidelines and standards. 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

study programme EKT-P, concerned with the second round of admission procedure. Updating of the Longterm Intent of FEEC BUT for 2011-2015 for was dealt with and approved. The economic issues discussed and approved included economic report for 2011, proposal for the distribution of financial means in 2012 and proposal on the distribution of funds earned by teaching.

Campus Development

Construction of the new campus premises at Technická 12 was completed in 2012. The building that cost nearly 1 bil. CZK was ceremonially opened on 20 December 2012. This FEEC gradually, after decades of effort, finishes the concentration of all departments and laboratories into premises at the campus Brno – north.

The last project was the continuation of construction works on Professor List Science and Technology Park. In terms of location this building is a free continuation of the northern part of Technická 12. Completion of this complex is scheduled for June 2013.

Computer Networks and Information Systems

Priority was given to:

- upgrading of servers and adaptation of facilities

- centralization of network administration services at Technická 10
- network backup
- restructuring, innovation and administration of faculty websites in two languages
- full use of modern communication channels, start of faculty profile on social network Facebook and Youtube channel

Information Systems and Services

The economic system SAP and the central information system Apollo are in operation. Negotiations and analyses of the Apollo system modules and setting the faculty information system in operation are in progress. The process was underway for the whole year of 2012 and continues in 2013.

Other

Equal Opportunities

The 'Consultancy and Information Gender Studies Centre' continued its activities in 2012.

The Centre provided professional and personal consultancy, under the management of Department of Physics, 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.

Institute of Experimental Technology

Institute of Experimental Technology centres its activities on innovation of education methods and quality of training of professionals for the industrial sector.

The Institute dealt with two projects in 2012 - 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 tuition. The goal of the project IET2 is to create a human resources system reacting to the requirements of companies for training and profile of recruited employees.

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 Centre cooperated with the Department of Physics, the club Students for Students and members of other departments.

Contact: uhdeova@feec.vutbr.cz

Management:

Director

Doc. Ing. Pavel Fiala, Ph.D.

Coordinator IET1

Doc. Ing. Pavel Kaláb, CSc.

Coordinator IET2

Doc. Ing. Pavel Fiala, Ph.D.

Staff

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

Address:

IET (UTEE)

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Fax: +420 541 149 512

E-mail: fialap@feec.vutbr.cz

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), publishes the First-year Student Handbook 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 2012 students co-organized the ball of FEKT and FIT. They also co-organized the EEICT 2011 Student Conference and helped with FEEC presentation at the trade fair GAUDEAMUS 2011 and Roadshow, visits to secondary schools. On 26 September 2012 the club organized the 5th festival amateur groups Music from FEEC.

The band Rozsypané glukometry was the winner. Besides some gifts they received an invitation to BUT Majáles. The main guest of the event, the Austrian showman Rocky Leon drew about 2000 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 40 runners and faculty management in categories men, women, relays and VIP relays. There were about 100 viewers. 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. Winter-semester student activities organized by the club are described in the final report at <http://sps-fekt.cz/zhodnoceniZS2012>.

Department of Control, Instrumentation and Measurement

Doc. Ing. Václav Jirsík, CSc.

Head

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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 Václavěk, Ph.D.
Doc. Ing. Luděk Žalud, Ph.D.

Lecturers

Ing. Miloslav Čejka, CSc., Mgr. Terezie Filipenská, Ph.D., Ing. Marie Havlíková, Ph.D., Ing. Zdeněk Havránek, Ph.D., Ing. Radovan Holec, 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.

Ph.D. Students

Internal: Ing. Abdulrahman Wassem, Ing. Tomáš Babinec, Mgr. Radek Baránek, Ing. Luděk Buchta, Ing. František Burian, Ing. Vladimír Burlak, Ing. Luděk Červinka, Ing. Pavel Číp, Ing. Michal Dobias, Ing. Jakub Dokoupil, Ing. Martin Dvořáček, Ing. Jiří Fialka, Ing. Tomáš Florián, Ing. Lešek Franek, Ing. Petr Gábrlík, Ing. František Gogol, Ing. Miroslav Graf, Ing. Daniel Haupt, Ing. Tomáš Hynčica, Ing. Tomáš Jílek, Ing. Miroslav Jirgl, Ing. Miroslav Juhas, Ing. Václav Kaczmarczyk, Ing. Jan Klusáček, Ing. Vlastimil Kříž, Ing. Michal Kupčík, Ing. Aleš Lebeda, Ing. Karel Pavlata, Ing. Stanislav Pikula, Ing. Daniel Piši, Ing. Lukáš Pohl, Ing. Peter Rášo, Ing. David Skula, Ing. Michal Šír, Ing. Ladislav Šťastný, Mgr. Martin Tůma, Ing. Miroslav Uher, Ing. Martin Vágner, Ing. Ivo Veselý, Ing. Miroslav Vomela, Ing. Jan Vomočil, Ing. Dušan Zámečník, Ing. Viktor Žáček

External: Ing. František Burian, Ing. Miloš Čábel, Ing. Petr Feilhauer, Ing. Petr Fidler, Ing. František Gogol, Ing. Ondřej Hynčica, Ing. Luděk Chomát, Ing. Zdeněk Kaňa, Ing. Roman Koňarik, Ing. Ondřej Kotaba, Ing. Jolana Křišťůvková - 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 Sáblik, Mgr. Karel Stibor, Ing. Jaroslav Šembera, Ing. Miroslav Uher, Ing. Michal Vašina, Ing. Libor Veselý, Ing. Miloš Veselý, Ing. Pavel Zbranek.

Administrative and Technical Staff

Ing. Luděk Anděra, Ing. František Burian, Ing. Tomáš Florián, Ing. Daniel Haupt, Ing. Ondřej Hynčica, Ing. Marek Kváš, Ing. Karel Pavlata, Lenka Petrová, Ing. Petr Petyovský, Mgr. Martin Tůma, Ing. Miroslav Uher, Ing. Soběslav Valach, Ing. Libor Veselý, 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 group involved in automatic control concentrated mainly on robust and predictive electrical drives control. Research of nonlinear estimators for sensor-free drives control continued. The research outcomes have been applied within 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 cooperation with the company Freescale Semiconductor in design of robust and predictive algorithms for alternating electrical 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, thermodiagnosics, acoustic emission, flux and noise measurement.

The group involved in industrial automation concentrates on 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 concentrates on fault-tolerant systems and research of decentralized and distributed control and communication systems. Research is particularly centred on building management, safety and

authorization systems. The group closely cooperates with BD Sensors, Beta Control, Siemens, Rockwell Automation, Škoda Auto etc.

The group of artificial intelligence and robotics is involved in research of service mobile robotics. Research is mainly concerned with telepresence control of mobile robots in difficult terrain, self-localization in outer environment, in urban areas and inside buildings, design of highly reliable robotic systems for work under extreme conditions and automatic map-making. The group now also focuses on optical scanning and virtual-extended reality in biomedicine, mainly in cardio- and neurorehabilitation. Instruction covers introduction into stationary and mobile robotics and sections dealing with above mentioned research issues.

The group dealing with computer vision concentrates on applied research and development, and cooperates 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 (the European project Multimedia Interactive Didactic System) and equipment upgrading (regular FRVŠ grants).

Research teams are involved in an OP VaVpl project of CEITEC (Central European Institute of Technology). In the group Materials for sensors and technological processes control systems they deal with cutting-edge research of control, sensors, robotics and embedded systems.

The department's two laboratories are involved in the 'Centre for Research and Utilization of Renewable Energy' (CVVOZE). They focus on developing a smart grid model with different renew-

able sources to test grid stabilization algorithms, on designing a certified vibrodiagnostics laboratory

ry and a training and testing laboratory for safety control systems.

Major achievements

The group of automatic control continued work on the project 'Centre for Advanced Control and Sensoric Technology Research' focused on training of research workers. The organized seminars and courses which have been increasingly attended by trainees from all parts of the country. A major achievement by the department's young researchers was the publication of an article on observability of AC drives in the frequently quoted journal IEEE Transactions on Industrial Electronics.

The group of measurement technology involved in projects of the Operational Programme VaVPI invested in upgrading of research laboratories for measurement of noise, vibrations and temperature. A new course was launched on analog processing of sensor signals.

The group of industrial automation was involved in several significant projects. Important results include a SAVY client, SEVY server and SEVY client for mobile devices for elevator technology (MPO project KAIS), a prototype of Data Concentrator (IoE project), a method and system for

measurement of wireless signal coverage in automotive applications (GAČR project BAD).

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 exploratory robotic system Orpheus designed for operation in hazardous environments was further developed.

The group of computer vision continued work on the prestigious project 'Applied Cybernetics Centre' which has already been operating for 12 years under the Technology Agency ČR in the programme 'Centre of Competence'. The research focuses on sophisticated computer vision tasks in traffic applications, driving assistance systems and industrial camera inspection systems. It also deals with methods and devices for processing of high volume of data using platforms FPGA/DSP. Its outcomes include several prototypes and patents.

Major Research Projects

Centre of Applied Cybernetics – Technology Agency ČR – CK TE01020197

Investigator: Vladimír Kučera, Karel Horák

Research Centre of Advanced Control and Sensoric Technologies – MŠMT CZ.1.07/2.3.00/09.0031

Investigator: Pavel Václavěk

MISE- Application of Modern Intelligent MEMS Sensors in Automation and Safety of Buildings MPO - FR-TI4/642

Investigator: Zdeněk Bradáč

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

Investigator: Pavel Václavěk

Development, Creation and Verification of a Diagnostic System Prototype – MPO FR-TI3/703

Investigator: Soběslav Valach.

Research and Development of Filtrventilating Unit for Protection against Chemical Substances, Dust and Biological Infection in Personal Protective Equipment – TAČR - TA02010864

Investigator: Zdeněk Bradáč

Selected Publications

BARÁNEK, R.; ŠOLC, F. Attitude Control of Multicopter. *ElectroScope* - <http://www.electroscope.zcu.cz>. 2012. 2012(5). p. 1 - 5. ISSN 1802-4564.

RICHTER, M.; ZEMČÍK, P.; KRŠEK, P.; ŠPANĚL, M. Methods of 3D Object Shape Acquisition. In *3D Surface Geometry and Reconstruction*. 1. USA, IGI Global. 2012. p. 1 - 27. ISBN 978-1-4666-0113-0.

KRUPA, M. Prediktivní údržba a metody technické prognostiky – seznámení se s problematikou. *Journal of Safety Research and Applications (JOSRA)*. 2012. 4(4). ISSN 1803-3687.

KRUPA, M. Technická prognostika v kontextu prediktivní údržby. *Automa*. 2012. 2012(2). p. 16 - 19. ISSN 1210-9592.

Bachelor Degree Programme

Číslíková 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 (Ing. Miloslav Čejka, CSc.)

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

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

Moderní prostředky v automatizaci (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 (prof. Ing. Petr Vavřín, DrSc.)

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 Pressure and Flux Measurement (pressure and flux measurements – air track, workplace for Ph.D. students, Ludvík Bejček)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Ph.D. Students

Ing. Loyal Abo Khayal, Ing. Larisa Baiazitova, Ing. Jaroslav Balogh, Ing. Michal Bartoš, Ing. Miloš Bělehrad, Ing. Karel Bubník, Ing. Jan Bukartyk, Ing. Mgr. Jan Cimbálník, Ing. Petr Čech, Ing. Vratislav Čmiel, Ing. Jiří Dlouhý, Ing. Alena Drkošová, Ing. Jiří Gazárek, Ing. Lucie Grossová, Ing. Vratislav Harabiš, Ing. Jan Hrubeš, Ing. Martin Chrobák, Ing. Jiří Janeček, Ing. Oto Janoušek, Ing. Martin Klimek, Ing. Petr Klimeš, Ing. Jiří Kratochvíla, Ing. Vladimíra Kubicová, Ing. Zdeněk Kuna, Ing. René Labounek, Ing. Martin Lamoš, Mgr. Peter Langer, Ing. Pavel Leinveber, Ing. Ondřej Maciček, Ing. Pavlína Macková, Ing. Denisa Maděránková, Ing. Miloš Malínský, Ing. Martin Mézl, Ing. Karol Mikuláš, Ing. Jiří Nedvěd, Ing. Jan Odstrčilík, Ing. Pawan Kumar Pathak, Ing. Roman Peter, Ing. Petra Podlipná, Ing. Jiří Roleček, Ing. Pavla Ronková, Ing. Marina Ronzhina, Ing. Milan Rychtářík, Ing. Jiří Sekora, Ing. Abduljalil Sireis, Ing. Tomáš Slaviček, Ing. Vladimír Slávik, Ing. Lukáš Smital, Ing. Ladislav Soukup, 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., Miroslava Prášilová, Hana Rýznarová

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 ophthalmological 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 Ophthalmological 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, University Hospital Bohunice, Brno, and University Hospital U sv. Anny, Brno.

The department is involved in the International Clinical Research Centre (FNUSA-ICRC) working on non-invasive imaging methods in clinical and basic research, experimental electrophysiology and development of advanced technologies in rehabilitation. The department also works on

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), in MPO TIP projects (technology of barrier-free insulators for bone graft processing) and TAČR ALFA projects (development of artificial arteries). With the company Philips the department cooperates on 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 VaVpl project 'BUT Safety and Protection' centred on biometric technology for the retina and iris.

Major Achievements

In 2012 members of the department published a lot of articles in scientific journals and presented papers at international conferences, with favourable response within the scientific community. Most importantly two articles were published in the journal *Sleep Medicine Reviews* with IF 6,338 and in the *International Journal of Electrochemical Science* with IF 3,729. The members of the department were also awarded a European patent in ultrasound tomography, national patent in optical recording of electrical heart activity, 2 industrial samples were registered, authorized software and operating samples were created, and 2 national patent applications were submitted.

In 2012 cooperation continued with University Hospital U sv. Anny on a project of ICRC (International Clinical Research Center Brno) in section Biomedical Engineering supported by the Operational Programme Research and Development for Innovations. Within the project the La-

boratory of Biophysics was equipped with a unique confocal microscope with white laser. The participating teams are Experimental electrophysiology (Ivo Provazník), Rehabilitation techniques (Jana Kolářová) and Ultrasonic imaging (Radim Kolář).

In 2012 the first final exams in the follow-up Master programme Biomedical Engineering and Bioinformatics took place whereby the introduction of the pregradual interdisciplinary programme was completed. The Bachelor and the Master programme are accredited by the Ministry of Education and the Ministry of Healthcare for training of specialists in biomedical engineering in compliance with the law on non-medical healthcare.

At the end of 2012 the follow-up doctoral programme in Biomedical Technology and Bioinformatics was accredited by the Accreditation Commission of ČR with effect from January 1, 2013.

Major Research Projects

Analysis of Relations Between Electrical Activities and Blood Flow in Heart Chambers – GAČR P102/12/2034

Investigator: Jana Kolářová

Nano-Electro-Bio-Tools for Biochemical and Molecular-Biological Studies of Eukaryotic Cells (NanoBioTECell) – GAČR P102/11/1068

Investigator: Ivo Provazník

Optimization of the Methodology of Analysis and Evaluation of Simultaneous EEG-fMRI in Patients Suffering from Pharmacoresistant Epilepsy– GAČR P304/11/1318

Co-investigator: Jiří Jan

Technology for Transplantology – MPO FR-TI2/596

Investigator: Ivo Provazník

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

Investigator: Ivo Provazník

Selected Publications

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(2011)=2,278).

BABULA, P.; ADAM, V.; HAVEL, L.; PROVAZNÍK, I.; ŠKUTKOVÁ, H.; BEKLOVÁ, M.; KIZEK, R. Effect of fluoranthene on plant cell model: Tobacco BY-2 suspension culture. *ENVIRONMENTAL AND EXPERIMENTAL BOTANY*. 2012. 2012(78). p. 117 - 130. ISSN 0098-8472. (IF(2011)=2,985).

ABO KHAYAL, L.; KIZEK, R.; PROVAZNÍK, I. Improvement of Electrophoresis Performance by Spectral Analysis. *AFRICAN JOURNAL OF BIOTECHNOLOGY*. 2012. 11(51). p. 11329 - 11332. ISSN 1684-5315. (IF(2010)=0,573).

DRKOŠOVÁ, A.; ŠVEHLÍKOVÁ, J. Individuálne umiestnenie modelu srdca v štandardnom modeli hrudníka na základe mnohozvodových EKG signálov. *Elektrorevue - Internetový časopis (<http://www.elektrorevue.cz>)*. 2012. 2012(14). p. 14-1 (5 p.). ISSN 1213-1539.

ŠMERKOVÁ, K.; DOSTÁLOVÁ, S.; ŠKUTKOVÁ, H.; VACULOVICHOVÁ, M.; ADAM, V.; PROVAZNÍK, I.; KIZEK, R. Isolation of Xis Gen Fragment of lambda Phage from Agarose Gel Using Magnetic Particles for Subsequent Enzymatic DNA Sequencing. *CHROMATOGRAPHIA*. 2012. 2012(10). p. 1 - 6. ISSN 0009-5893. (IF(2011)=1,195).

VOŽDA, M.; SEKORA, J.; PENHAKER, M. Precise Temperature Stabilizing System of Liquids for the purpose Biomedical Applications. *Elektronika Ir Elektrotechnika*. 2012. 18(10). p. 29 - 32. ISSN 1392-1215. (IF(2011)=0,913).

JÍRA, I.; OUŘEDNÍČEK, P.; SKOTÁKOVÁ, J.; WALEK, P.; JATEL, T.; JAN, J. První zkušenosti s hybridní iterativní technikou iDose při CT vyšetřování mozku u dětí, adolescentů a dospělých. *Česká radiologie*. 2012. 66(1). p. 18 - 22. ISSN 1210-7883.

JAN, J.; ODSTRČILÍK, J.; GAZÁREK, J.; KOLÁŘ, R. Retinal Image Analysis Aimed at Blood Vessel Tree Segmentation and Early Detection of Neural-Layer Deterioration. *COMPUTERIZED MEDICAL IMAGING AND GRAPHICS*. 2012. 2012(6). p. 431 - 441. ISSN 0895-6111. (IF(2011)=1,467).

TAXT, T.; JIŘÍK, R.; RYGH, C.; GRÜNER, R.; BARTOŠ, M.; ANDERSEN, E.; CURRY, F.; REED, R. Single-channel blind estimation of arterial input function and tissue impulse response in DCE-MRI. *IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING*. 2012. 59(4). p. 1012 - 1021. ISSN 0018-9294. (IF(2011)=2,278).

RONZHINA, M.; JANOUŠEK, O.; KOLÁŘOVÁ, J.; NOVÁKOVÁ, M.; HONZÍK, P.; PROVAZNÍK, I. Sleep Scoring using Artificial Neural Networks. *SLEEP MEDICINE REVIEWS*. 2012. 2012(16). p. 251 - 263. ISSN 1087-0792. (IF(2011)=6,931).

JIŘÍK, R.; PETERLÍK, I.; RUITER, N.; FOUSEK, J.; DAPP, R.; ZAPF, M.; JAN, J. Sound-Speed Image Reconstruction in Sparse-Aperture 3D Ultrasound Transmission Tomography. *IEEE Transactions on*

Ultrasonocs, Ferroelectrics, and Frequency Control. 2012. 2012(2). p. 254 - 264. ISSN 0885-3010. (IF(2011)=1,694).

ŠKUTKOVÁ, H.; BABULA, P.; STIBOROVÁ, M.; ECKSCHLAGER, T.; TRNKOVÁ, L.; PROVAZNÍK, I.; HUBÁLEK, J.; KIZEK, R.; ADAM, V. Structure, Polymorphisms and Electrochemistry of Mammalian Metallothioneins – A Review. *INTERNATIONAL JOURNAL OF ELECTROCHEMICAL SCIENCE*. 2012. 2012(7). p. 12415 - 12430. ISSN 1452-3981. (IF(2011)=3,729).

SADILOVA, P. YU., GASNIKOV, K. V., LISINA, E. B., BAYAZITOVA, L. A. The change of biological properties of blood when it is affected by low-intensity laser radiation in case of different exposition of test. *Medicinskij al'manah*. 2012. 21(2). p. 104 - 367. ISSN 1997-7689.

FILIPÍK, A.; JAN, J.; PETERLÍK, I. Time-of-Flight Based Calibration of an Ultrasonic Computed Tomography System. *Radioengineering*. 2012. 2012 (21)(1). p. 533 - 544. ISSN 1210-2512. (IF(2011)=0,739).

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.)

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

Číslíkové 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.)

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

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

Multimediální data v biomedicíně (prof. Ing. Jiří Jan, CSc.)

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

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

Počítače a programování 1 (prof. Ing. Ivo Provazník, Ph.D.)

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

Praktika z biomedicínské a klinické techniky (doc. Ing. Milan Chmelař, CSc.)

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 Jířík, 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.)

Laboratories

Laboratory of Diagnostic Technology (instruction in Medical Diagnostic Technology, Diagnostics of bio- and ecosystems, experimental part of research and student projects, Radim Kolář)

Laboratory of Biomedical Technology (instruction in Special Medical and Ecological Technology, Ecological Engineering, Design and Operation of Complex Systems, research and student project experiments, Jana Kolářová)

Laboratory of Bionics (instruction in Human Biology, Biophysics, Clinical Physiology, Healthcare, Analysis and Interpretation of Biological Data, experimental measurements for research and student projects, Jiří Kozumplík)

Laboratory of Ecological Engineering (instruction in Ecological Engineering, Ecology in Electrical Engineering, ecology in Healthcare, experimental measurements for research and student projects, Jiří Rozman)

Laboratory of Biomedical Electronics (instruction in Practice in Biomedical and Clinical Technology experimental parts of research and student projects, Jana Kolářová)

Laboratory of Information Systems (instruction in Medical Information Systems, Computer Support for Medical Diagnostics, Modelling of Biological Systems, Radovan Jiřík)

Laboratory of Signal Processing (instruction in Digital Signal Processing and Analysis, Multimedia Data in Biomedical Engineering, Analysis of Images and Signals, Advanced Methods of Signal Processing, Multicycle Systems, Ivo Provazník)

Laboratory of Imaging Technology (instruction in Microscopy Imaging Technology, experimental part of research and students projects, Radim Kolář)

Laboratory of Biophysics (research of electrophysiology of cells, evaluation of biological specimens by means of optical coherent tomography for oncological and implant applications, Ivo Provazník)

Laboratory of Functional Diagnostics (instruction in Human Biology and Biomedical and Clinical Technology, research of brain and muscle electrophysiology, Ivo Provazník)

Laboratory of Genomics and Proteomics (a clean environment for isolation and handling of biological samples, measurement and diagnostics of DNA, RNA and proteins, instruction in Laboratory Technology in Genomics and Proteomics and Bioinformatics, bioinformatics research, Ivo Provazník)

Laboratory of Ultrasonography (research of ultrasonographic images measurement, calibration of instruments and ultrasound probes, Radim Kolář)

Department of Power Electrical Engineering

Doc. Ing. Petr Toman, Ph.D.

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Associate Professors

Doc. Ing. Vladimír Blažek, CSc.
Doc. Ing. Petr Baxant, Ph.D.
Doc. Ing. Jiří Drápela, Ph.D.
Doc. Ing. Evžen Haluzík, CSc.
Doc. Ing. Ilona Lázníčková, 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. Petr Toman, Ph.D.
Doc. RNDr. Oldřich Coufal, CSc.

Lecturers

Ing. Jan Gregor, CSc., Ing. Karel Katovský, Ph.D., Ing. Jan Macháček, Ph.D., Ing. Martin Paar, Ph.D., Ing. Stanislav Sumec, Ing. Jan Škoda, Ph.D., Ing. Radek Škoda, Ph.D., Ing. David Topolánek, Ph.D.

Ph.D. Students

Ing. Almbrok Abdoalhade, Ing. Tomáš Bartošík, Ing. Branislav Batora, 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 Kopicčka, 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. Lukáš Radil, Ing. Jan Šlezinger, Ing. Jaroslav Špaček, Ing. Martin Štefanka, Ing. René Vápeník, Ing. Jan Varmuža, Ing. Josef Vávra

Administrative and Technical Staff

Ing. Filip Koval, Jitka Langerová, František Matoušek, Ing. Josef Šenk, CSc.

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 and exploitation 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, reduction of losses and fast localization of network failures, impact of electrical appliances, 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, 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.

Major Achievements

In 2012 members of the department were involved in 1 MPO TIP project, 6 FRVŠ projects, 4 OP VK projects, 1 project of international cooperation with Texas A&M University Kontakt II, 1 Leonardo da Vinci project and 16 projects of cooperation with industrial companies.

The department organized the '13th International Scientific Conference Electric Power Engineering 2012' with over 200 participants from European and Asian countries.

The major results published in reputable journals and presented at national and international conferences included 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, a patent for 'A Device for Time Regulation of Camera

The department cooperates in research and graduate and doctoral training with a number of companies, e.g. skupina E. ON, Skupina ČEZ, ČEPS, a.s., ABB, s.r.o., EGÚ Brno, a.s., Teplárny Brno, a.s., Siemens, s.r.o.. There has also been cooperation with departments of power electrical engineering at all Czech and Slovak technical universities.

'Shutter' was awarded and a new generation of LDA brightness analyzer was developed for assessment of street illumination.

In 2012 cooperation with EGÚ Brno, a.s. centred on connecting photovoltaic and wind-powered stations in the electrification system. Cooperation with Unicontrols-Tramex s.r.o. focused on development of railway signal lamps. There was also cooperation with TU Graz in electrical network safety in regard to contact voltage.

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

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

Investigator: Petr Baxant

Selected Publications

COUFAL, O. A method for the accurate and smooth approximation of standard thermodynamic functions. *COMPUTER PHYSICS COMMUNICATIONS*. 2012. 184(2013)(1). p. 194 - 200. ISSN 0010-4655. (IF(2011)=3,268).

BHATIA, C.; ADAM, J.; KUMAR, V.; KATOVSKÝ, K.; MAJERLE, M.; SOLNYSHKIN, A.; TSOUPOKOSITNIKOV, V. A study of non-elastic reaction rates for the ADS materials in the environment of spallation neutrons produced by 1.6 GeV d-beam. *APPLIED RADIATION AND ISOTOPES*. 2012. 70(7). p. 1254 - 1260. ISSN 0969-8043. (IF(2011)=1,172).

ALMABROK, A. Comparison Between Cogeneration and Separate Production of Heat and Electricity. *Academic Journals*. 2012. p. 167 - 172. ISSN 1897-0737.

VARMUŽA, J.; BAXANT, P. Odhad spotřeby elektrické energie na veřejné osvětlení. *Světlo*. 2012. 15(3). p. 57 - 59. ISSN 1212-0812.

COUFAL, O. On inductance and resistance of solitary long solid conductor. *Acta Technica ČSAV*. 2012. 57(2012)(1). p. 75 - 89. ISSN 0001-7043.

ŠKODA, J.; SUMEC, S.; BAXANT, P. Pokroky v počítačovém vyhodnocení obrazů a využití ve světelné technice. *Světlo*. 2012. 15(6). p. 52 - 54. ISSN 1212-0812.

VÁPENÍK, R. Problematika provádění prací pod napětí na vedení vysokého napětí distribuční soustavy. *Elektrorevue - Internetový časopis (<http://www.elektrorevue.cz>)*. 2012. 2012(51). p. 51-1 (6 p.). ISSN 1213-1539.

MACHÁČEK, J.; HALUZA, M.; BÁTORA, B. Proč dát přednost systémové elektroinstalaci - 2 část. *Elektroinstalatér*. 2012. XVIII(1). p. 16 - 18. ISSN 1211-2291.

HALUZA, M.; MACHÁČEK, J. Spotřeba elektrické energie domácností, predikce a potenciální úspory pomocí BACS. *TZB-info*. 2012. 2012(-). p. 1 - 5. ISSN 1801-4399.

ŠTEFÁNIK, M.; BÉM, P.; KATOVSKÝ, K. The p-D2O Generator Neutron Spectrum Determination by Multi-Foil Activation Method. *Transactions of the American Nuclear Society*. 2012. 106(1). p. 894 - 896. ISSN 0003-018X.

COUFAL, O.; ŽIVNÝ, O., ADINEH V. Thermodynamic and Radiative Properties of Plasma Excited in EDM Process Through N2 Taking Into Account Fe. *IEEE Transactions on Plasma Science*. 2012. 40(10). p. 2723 - 2735. ISSN 0093-3813. (IF(2011)=1,174).

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.)

Vysoké napětí a elektrické přístroje (doc. Ing. Vladimír Blažek, CSc.)

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 Lázníčková, 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.)

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

Power Plant and Protection Laboratory (instruction in Systems Protection, Information and Control Systems in Power Electrical Engineering, Integrated Protection Systems, preparation for 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 Appliance-Electrical Network Compatibility (impact of appliances on the distribution network under different network conditions, 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)

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

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

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 electrical 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, Petr Baxant, Petr Mastný)

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

Department of Electrotechnology

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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 Křivík, Ph.D., Ing. Helena Polsterová, CSc., Ing. Zdenka Rozsivalová, Ing. Jiří Starý, Ph.D., Ing. Jiří Špinka

Ph.D. Students

Ing. Pavel Abraham, Ing. Radek Bilko, Ing. Ondřej Čech, Ing. Pavel Čudek, Ing. Jan Dolenský, Ing. Petr Dvořák, Ing. Roman Gvritishvili, Ing. Chladi Ladislav, Ing. Ivan Jakubis, Ing. Ondřej Kaválek, Ing. Tomáš Kazda, Ing. Tomáš Knotek, Ing. Miroslav Kunovjánek, Ing. Radek Lábus, Ing. Jiří Libich, Ing. Josef Máca, Ing. Tomáš Máca, Ing. Michal Musil, Ing. Jiří Neoral, Ing. David Pléha, Ing. Marek Solčanský, Ing. Petr Stejskal, Ing. Radek Stojan, Mgr. Silvie Svidenská, Ing. Lucie Šimonová, Ing. Zuzana Štichová, Ing. Jiří Šubarda, Ing. Eva Tihlaříková, Ing. Jiří Tichý, Ing. Pavel Tošer, Ing. Karel Tonar, Ing. Sebastian Vaculík, Ing. Aleš Veselý, Ing. Jiří Vognar, Ing. Jiří Vrbický, Ing. Petr Vyroubal, Ing. Jana Zimáková

Administrative and Technical Staff

Jarmila Bartošková, František Chudáček, Ing. Kristýna Jandová, Ph.D., Ing. Petr Kahle, František Kořínek, Ing. Petr Špičák, Bc. Věra Špičáková, Ing. Miroslav Zatloukal

Main Interests

The department provides instruction in electro-technical 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 of the subject Materials and Components for Biomedicine. In the summer semester of the academic year 2012/2013 instruction of the subject Materials and Technical Documentation starts in the Bachelor programme English in Electrical Engineering and Informatics (AJEI).

The department continued upgrading and automation of instruction laboratories, internet connection with measuring workplaces and extended use of computer rooms for self-study. Ten subjects in the specialization Electrotechnical Manufacturing and Management (EVM) in category free subjects were offered to students of other BUT faculties.

Research activities are centred on basic and applied research of 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

Major Achievements

The department coorganized the 33rd international conference 'Nonconventional Sources of Electric Energy' in Hrotovice, 21 – 23 May 2012. 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 13th international conference 'Advanced Batteries, Accumulators and Fuel Cells', 26 – 30 August 2012, under the auspices of American electrochemical group the Electrochemical Socie-

ty 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, ČeMe-Bo 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 2013 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 34th conference 'Nonconventional Electric Energy Sources' in Blansko, 29 – 31 May, 2013, and the 14th international conference 'Advanced Batteries, Accumulators and Fuel Cells' (ABAF – 14th) in Brno, 1 – 5 September, 2013.

ty ECS and BUT Brno (ABAF – 13th), (Marie Sedlaříková, Jiří Vondrák).

Members of the department also participated in the meeting of Czech and Slovak colleagues, the 39th international conference 'Electrotechnology 2012', organized by the Institute of Power and Applied Electrical Engineering FEI STU, Bratislava (Jiří Kazelle).

In March members of the department met and signed contract of cooperation with the director of CLAIO Poznań Matiej Kopczyk and the director of the Institute for Non-iron Metals Gliwice Miec-

zyclov Woch. In October there were negotiations with Marek Slavík from f.LITHIO s.r.o., Bratislava and a joint project 7RP LiTHIO 'Improved Materials for Innovative Ageing Resistant Batteries' was submitted.

In November 2012 Jo Fenstad, a specialist in metallurgy and chemical synthesis and technology director of INDO SCAN LIMITED, Hagan, Norway visited the department. Possible cooperation in nanofiber synthesis of conductive titanate suboxides was discussed.

The department was involved in a GAČR project (Increasing of Li-ion Batteries Safety), an MPO project (Research of New Electrodes for Alkaline Accumulators), a BUT project (Materials and Technologies in Electrical Engineering) and 10 FRVŠ projects (Implementation of uncertainty in measurement and instrumental calibration in laboratories of subjects in diagnostics and testing, Implementation of BluePrint in instruction, Innovation of laboratories of printed circuits and surface mount technology, Ion-selective measurement, Measurement of discharge characteristics of alkaline accumulators, Thermographic measurement of photovoltaic section characteristics, Measurement of wind power characteristics and application in instruction, Mobile internet access of laboratories in material subjects, Extending laboratories in the subject Materials Structure and Characteristics and New laboratories in the subjects of diagnostics, testing and manufacturing processes using ultraacoustics and microscopy of near fields.

Major Research Projects

Research of New Electrodes for Alkaline Accumulators - MPO FR-T13/198

Investigator: Miroslav Zatloukal

Increasing the Safety of Li-Ion Batteries – GAČR P102/10/2091

Investigator: Marie Sedlaříková

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

Investigator: Josef Jirák

Materials and Technologies in Electrical Engineering – FEKT-S-11-7

Investigator: Petr Bača

Selected Publications

ABRAHAM, P.; BAČA, P.; TOŠER, P.; TONAR, K. An Apparatus to Measure Efficiency of Hydrogen Energy Storage. *ECS Transactions*. 2012. 40(1). p. 213 - 218. ISSN 1938-5862.

In cooperation with the Department of Microelectronics the project 'Innovation and Upgrading of Bachelor study area Microelectronics and Technology and Master study area Microelectronics', Operational Programme Education for Competitiveness was concluded.

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

The department continued cooperation with the Institute of Scientific Instruments AVČR Brno, in 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 staff are also involved in the European project 'Centre for Research and Utilization of Renewable Energy' (CVVOZE), Operational Programme Research and Development, Priority Axis 2 and in research programme 2 – 'Chemical and Photovoltaic Energy Sources'.

Two articles dealing with research of new additives of active lead accumulator substances were published in international Journal of Power Sources.

- MAXA, J.; NEDĚLA, V.; JIRÁK, J.; VYROUBAL, P.; HLADKÁ, K. Analysis of gas flow in a secondary electron scintillation detector for ESEM with a new system of pressure limiting apertures. *Advances in Military Technology*. 2012. 7(2). p. 39 - 44. ISSN 1802-2308.
- MAXA, J.; NEDĚLA, V.; JIRÁK, J. Analysis Of Gas Flow In The New System Of Apertures In The Secondary Electron Scintillation Detector For ESEM. *MICROSCOPY AND MICROANALYSIS*. 2012. 2012(18)(Suppl 2). p. 1264 - 1265. ISSN 1431-9276. (IF(2011)=3,007).
- PLÉHA, D.; DVOŘÁK, P.; KUNOVJÁNEK, M.; MUSIL, M.; ČECH, O. Battery Separators. *ECS Transactions*. 2012. 40(1). p. 153 - 158. ISSN 1938-5862.
- ČECH, O.; THOMAS, J.; SEDLAŘÍKOVÁ, M.; VONDRÁK, J.; VISINTIN, A. Cobalt Doped LiFePO₄/C Composite Material for Li-Ion Cathodes. *ECS Transaction*. 2012. 40(1). p. 93 - 97. ISSN 1938-6737.
- TIHLAŘÍKOVÁ, E.; NEDĚLA, V.; HAMPL, A.; SEDLÁČKOVÁ, M. Comparative Study Of Human Embryonic Stem Cell Surface Structure Using SEM And ESEM. *MICROSCOPY AND MICROANALYSIS*. 2012. 2012 (18)(Suppl 2). p. 1268 - 1269. ISSN 1431-9276. (IF(2011)=3,007).
- VESELÝ, A.; VANĚK, J.; STOJAN, R. Concentrator Photovoltaic Systems. *ECS Transactions*. 2012. 40(1). p. 161 - 165. ISSN 1938-5862.
- ČUDEK, P.; FLODROVÁ, E.; PLÉHA, D. Diagnostika projevu stárnutí zinkových elektrod elektrochemických zdrojů elektrické energie. *ElectroScope* - <http://www.electroscope.zcu.cz>. 2012. 2012(1). p. 1 - 4. ISSN 1802-4564.
- KŘIVÍK, P.; BAČA, P.; TONAR, K.; TOŠER, P.; MICKA, K. Effect of additives on the performance of negative lead-acid battery electrodes during formation and partial state of charge operation. *Journal of Power Sources*. 2012. 1(1). p. 15 - 18. ISSN 0378-7753. (IF(2011)=4,951).
- VONDRÁK, J.; SEDLAŘÍKOVÁ, M. Elektrody pro superkondenzátory. *ElectroScope* - <http://www.electroscope.zcu.cz>. 2012. 2012(1). p. 1 - 3. ISSN 1802-4564.
- NEDĚLA, V.; SVIDENSKÁ, S. Environmental Scanning Electron Microscope As A Tool For Imaging Of Native State Somatic Embryogenesis. *MICROSCOPY AND MICROANALYSIS*. 2012. 2012 (8)(Suppl 2). p. 1270 - 1271. ISSN 1431-9276. (IF(2011)=3,007).
- NEDĚLA, V.; HŘIB, J.; VOOKOVÁ, B. Imaging of early conifer embryogenic tissues with the environmental scanning electron microscope. *BIOLOGIA PLANTARUM*. 2012. 56(3). p. 595 - 598. ISSN 0006-3134. (IF(2011)=1,974).
- KŘIVÍK, P.; TOŠER, P.; BAČA, P.; TONAR, K. Improving of the negative lead-acid battery electrodes by using extra additives. *ECS Transactions*. 2012. 1(1). p. 145 - 152. ISSN 1938-5862.
- MÁČA, T.; VONDRÁK, J.; SEDLAŘÍKOVÁ, M.; NEZGODA, L. Incorporation of Multielement Doping into LDH Structure of Alpha Nickel Hydroxide. *ECS Transaction*. 2012. 2012(40)(1). p. 119 - 130. ISSN 1938-6737.
- VANĚK, J.; BAŘINKA, R.; INDRA, J. Influence of Different Conditions to the Light Induced Degradation of Solar Cells. *ECS Transactions*. 2012. 40(1). p. 167 - 176. ISSN 1938-5862.
- MICKA, K.; KŘIVÍK, P.; BAČA, P.; TONAR, K.; TOŠER, P. Investigation of the effect of mechanical pressure on the performance of negative lead accumulator electrodes during PSoC operation. *Journal of Power Sources*. 2012. 1(1). p. 37 - 44. ISSN 0378-7753. (IF(2011)=4,951).
- ŠUBARDA, J.; NOVÁK, V.; PLÉHA, D. Katalyzátor na bázi MnO_x pro palivové články a studium jeho vlastností metodou křemenných mikrovah (EQCM). *Elektrorevue - Internetový časopis* (<http://www.elektrorevue.cz>). 2012. 2012(12). p. 12-1 (4 p.). ISSN 1213-1539.
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Bachelor Degree Programme

- | | |
|---|--|
| Diagnostika a zkušebnictv (doc. Ing. Josef Jirák, CSc.) | Plošné spoje a povrchová montáž (Ing. Jiří Starý, Ph.D.) |
| Elektrotechnické materiály a výrobní procesy (prof. Ing. Jiří Kazelle, CSc.) | Počítačové projektování výrob, logistika a ekologie výroby (doc. Ing. Jiří Vaněk, Ph.D.) |
| Materiály a komponenty pro biomedicínu (doc. Ing. Marie Sedlaříková, CSc.) | Počítačová podpora technických a manažerských prací (doc. Ing. Jiří Maxa, Ph.D.) |
| Materiály a technická dokumentace (doc. Ing. Josef Jirák, CSc.) | Řízení a kontrola jakosti (Ing. Helena Polsterová, CSc.) |
| Návrh a konstrukce elektrotechnických zařízení (doc. Ing. Vítězslav Novák, Ph.D.) | Řízení jakosti a metrologie (Ing. Helena Polsterová, CSc.) |
| Návrhové systémy plošných spojů (doc. Ing. Petr Bača, Ph.D.) | Spolehlivost v elektrotechnice (Ing. Helena Polsterová, CSc.) |

Master Degree Programme

- | | |
|---|--|
| Alternativní zdroje energie (doc. Ing. Jiří Vaněk, Ph.D.) | Ekologie výroby (doc. Ing. Petr Bača, Ph.D.) |
| Diagnostické metody v elektrotechnice (doc. Ing. Josef Jirák, CSc.) | 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 Jiráček, 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 Jiráček, 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 Jiráček, CSc.)

Laboratories

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

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

Laboratory of Diagnostic Methods (diagnostics of materials and testing methods, experiments for 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 supercondensators, 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, supercondensators 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 Rozsivalová, 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 Jiráček, 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. RNDr. Ing. Josef Šíkula, DrSc.
Prof. RNDr. Pavel Tománek, CSc.

Associate Professors

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

Lecturers

Ing. Jitka Brüstlová, CSc., RNDr. Pavel Dobis, CSc., Ing. Vladimír Holcman, Ph.D., Ing. Petr Sedlák, Ph.D., RNDr. Naděžda Uhdeová, Ph.D.

Research Workers

Ing. Alexey Andreev, Ph.D., Ing. Robert Macků, Ph.D., Ing. Pavel Škarvada, Ph.D.

Ph.D. Students

Hamed Mohamed Abubaker, MSc., Ing. Faisal Inas Abuetwirat, Mgr. Naděžda Bogatyreva, Ing. Gabriel Cséfalvay, Mgr. Dinara Dallaeva, Ing. Miloš Chvátal, Ing. Marián Klampár, Ing. Alexandr Knápek, Ing. Martin Kopecký, Ing. Jiří Ovsík, Ing. Martin Plachý, Ing. Elena Prokopyeva, Mgr. Evgeny Sergeev, Ing. Milan Spohner, Ing. Jiří Šicner, Ing. Ondřej Šik, Ing. Tomáš Trčka, Ing. Marek Vondra

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Main Interests

In 2012 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 Information Technology, Physics 1 and Physics 2 for the programme Biomedical Technology and Bioinformatics. 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.

The tasks 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. Major 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 and dielectric relaxation spectroscopy of inorganic and organic materials. 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 cooperated with leading Czech laboratories in the development and enhancement of the parameters of CdTe radiation detectors.

Cooperation with the industrial sector continued on the basis of 5 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 by means of 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 Emissions (Lubomír Grmela) and Laboratory of Nanometrology (Vladimír Holcman).

In 2012 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 were 5 articles in scientific journals, 1 patent, 4 prototypes and 1 utility software.

The department was also involved in 5 GAČR, 1 TAČR, 2 FRVŠ projects, 2 MPO, 1 INGO project, 3 Kontakt projects, 1 BUT specified research project and 5 commercial contracts with industrial companies.

The GAČR projects centred 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 projects 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.

Owing to the project INGO, Professor Pavel Tománek became member of Research Advisory Committee of European Optical Association.

Research of the methodology of increasing the quality of optoelectronic materials and components was supported by a BUT grant.

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 Operation 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 Cells – MPO FR-TI1/305

Investigator at Department of Physics: Pavel Koktavý

Research Team Incubator for Physical Electronics and Nanotechnology – MŠMT 1.07/2.3.09.0214/S

Investigator: Petr Sadovský

Nanoscience in Electrical Engineering – Innovation of Study Programmes – MŠMT 1.07/2.2.00/15.0147

Investigator: Pavel Dobis

Research and Development of Progressive Tools for Increasing the Surface Quality of Cast Billets, Bars and Wires – MPO FR-TI2/536

Investigator: Lubomír Grmela

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

Investigators at Department of Physics: 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

SEDLÁK, P.; ŠIKULA, J.; MAJZNER, J.; VRŇATA, M.; FITL, P.; KOPECKÝ, D.; VYSLOUŽIL, F.; HANDEL, P. Adsorption–desorption noise in QCM gas sensors. *Sensors and Actuators B: Chemical*. 2012. 166-167(1). p. 264 - 268. ISSN 0925-4005. (IF(2011)=3,898).

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ABUBAKER, H.; TOMÁNEK, P. Backward nultiscattering and transport of photons in biological tissue: Experiment and simulation. *Advances in Electrical and Electronic Engineering - internetový časopis*(<http://advances.utc.sk>). 2012. 10(2). p. 115 - 119. ISSN 1804-3119.

KNÁPEK, A.; GRMELA, L.; ŠIKULA, J.; ŠIK, O. Cold field-emission cathode noise analysis. *METROL MEAS SYST*. 2012. 2012(2). p. 417 - 422. ISSN 0860-8229. (IF(2011)=0,764).

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- GRILL, R.; FRANC, J.; ELHADIDY, H.; BELAS, E.; UXA, Š.; BUGÁR, M.; MORAVEC, P.; HÖSCHL, P. Theory of Deep Level Spectroscopy in Semi-Insulating CdTe. *IEEE TRANSACTIONS ON NUCLEAR SCIENCE*. 2012. 59(5). p. 2383 - 2391. ISSN 0018-9499. (IF(2011)=1,447).
- GRMELA, L.; ŠKARVADA, P.; TOMÁNEK, P.; MACKŮ, R.; SMITH, S. Thermal dependence of light emission from reverse-biased monocrystalline silicon solar cells. *SOLAR ENERGY MATERIALS AND SOLAR CELLS*. 2012. 96(1). p. 108 - 111. ISSN 0927-0248. (IF(2011)=4,542).
- ŠKARVADA, P.; TOFEL, P.; TOMÁNEK, P. Ultrasonic transducer peak-to-peak optical measurement. *Advances in Electrical and Electronic Engineering - internetový časopis* (<http://advances.utc.sk>). 2012. 10(2). p. 125 - 129. ISSN 1804-3119.

Bachelor Degree Programme

Fyzika 1 (RNDr. Pavel Dobis, CSc.)

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

Fyzika v elektrotechnice (doc. Ing. Karel Liedermann, CSc.)

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

Fyzikální seminář (Ing. Jitka Brüstlová, CSc.)

Master Degree Programme

Fyzika pevné fáze (doc. 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 (doc. Ing. Karel Liedermann, CSc.)

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)

Department of Languages

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Doc. PhDr. Milena Krhutová, Ph.D.

Lecturers

PaedDr. Alena Baumgartnerová, Mgr. Petra Fílová, PhDr. Marcela Borecká, Kenneth Froehling, M.A., 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 2012 a new Bachelor programme 'English in Electrical Engineering and Informatics' was accredited. 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 number of students interested in the programme which started in the academic year 2012/13 was very high. The programme is unique in the Czech Republic equipping 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 I and Grammar Structures were introduced and new materials were created.

In 2012 the department became involved in 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 research results were presented at the 'International Conference for Academic Disciplines' at Ryerson University, Toronto and at Harvard University, Boston. 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 2012 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.

Selected Publications

KRHUTOVÁ, M. Approaches to Recipients in Professional Texts. *Journal of Teaching and Education*, 2012, roč. 1, č. 1/ 7, s. 33-41. ISSN: 2165- 6266

KRHUTOVÁ, M. Discourse Community of Professionals. *International Journal of Arts and Sciences*, 2012, roč. 5, č. 3, s. 391-398. ISSN: 1944- 6934.

KRHUTOVÁ, M.; SEDLÁČEK, P. Politeness Principle in Scientific Texts. *Academic Journal of Science*, 2012, roč. 1(2), č. 1, s. 449-457. ISSN: 2165- 6282.

KOTÁSEK, M. *Dick Hebdige: Subkultura a styl*. Praha: Dauphin, Volvox Globator, 2012. 240 s. ISBN: 978-80-7272-197- 9.

KOTÁSEK, M. *Slovokraj aneb prostor textu*. In *Místo - prostor - krajina v literatuře a kultuře*. Olomouc: UP, 2012. s. 25-32. ISBN: 978-80-244-3023- 2.

SEDLÁČEK, P. *Urban Ways*. *Humanities and Social Sciences Review*, 2012, roč. 1, č. 2, s. 357-364. ISSN: 2165- 6258.

SMUTNÝ, M. Compound Adjectives in Medical English. *Journal of Teaching and Education*, 2012, roč. 2012(01), č. 3, s. 187-199. ISSN: 2165- 6266.

SMUTNÝ, M. Compound Adjectives in English for Electrical Engineering. *International Journal of Arts and Sciences*, 2012, roč. 2012(5), č. 3, s. 381-390. ISSN: 1944- 6934.

Bachelor Degree Programme

Practical English I (Pavel Sedláček)

Introduction into Linguistics (Milan Smutný)

English – Grammar Practice (Alena Baumgartnerová)

Professional Style in Czech and English (Miroslav Kotásek)

English for Bachelor Students- pre-Intermediate 1 (Alena Baumgartnerová)

English for Bachelor Students- pre-Intermediate 2 (Alena Baumgartnerová)

English for Bachelor Students-Intermediate 1 (Agata Walek)

English for Bachelor Students - Intermediate 2 (Pavel Sedláček)

English for Europe (Milan Smutný)

Ethics in Business (Martin Jílek)

Engineering Pedagogy and Didactics (Martin Jílek)

Culture of Speech and Generation of Texts (Martin Jílek)

Bookkeeping for Managers (Martin Jílek)

Professional English for Electrical Engineering and Information Technology (Milan Smutný)

Laboratory Didactics (Ing. Martin Jílek)

Bookkeeping for Managers (Martin Jílek)

German - pre-Intermediate (Pavel Sedláček)

German - Intermediate (Pavel Sedláček)

German - Beginners (Pavel Sedláček)

Pedagogical Psychology (Martin Jílek)

Russian – pre-Intermediate (Alena Baumgartnerová)

Russian - Beginners (Alena Baumgartnerová)

Spanish - Intermediate (Marcela Borecká)

Spanish - Beginners (Marcela Borecká)

Master Degree Programme

English for Europe (Milan Smutný)

English for Life (Pavel Sedláček, Kenneth Froehling)

Ethics in Business (Martin Jílek)

Culture of Speech and Generation of Texts (Martin Jílek)

Professional English for Electrical Engineering and Information Technology (Milan Smutný)

Bookkeeping for Managers (Ing. Martin Jílek)

German- pre-Intermediate (Pavel Sedláček)

German - Advanced (Pavel Sedláček)

German- Beginners (Pavel Sedláček)

Bookkeeping for Managers (Martin Jílek)

Russian – pre-Intermediate (Alena Baumgartnerová)

Russian - Beginners (Alena Baumgartnerová)

Spanish – pre-Intermediate (Marcela Borecká)

Spanish - Beginners (Marcela Borecká)

Doctoral Degree Programme

English for Ph.D. Students (Dagmar Malíková)

Department of Mathematics

Doc. RNDr. Zdeněk Šmarda, CSc.

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Prof. RNDr. Václav Havel, DrSc.
Prof. RNDr. Jan Chvalina, DrSc.
Prof. RNDr. František Neuman, DrSc.

Associate Professors

Doc. RNDr. Jaromír Baštinec, CSc.
Doc. RNDr. Martin Kovár, Ph.D.
Doc. RNDr. Zdeněk Šmarda, CSc.

Lecturers

RNDr. Petr Fuchs, Ph.D., Mgr. Irena Hlavičková, Ph.D., RNDr. Dana Hliněná, 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

Ing. Olga Archalousová, Mgr. Blanka Morávková, Mgr. Vladimír Biba, Mgr. Alena Baštincová, Ing. Petr Skorkovský, Mgr. Hana Halfarová, Alena Chernikava, Ganna Konstantinivna Piddubna, Mgr. Štěpán Křehlík

Administrative and Technical Staff

Eva Šimečková

Main Interests

In 2012 the department was responsible for tuition in subjects in full-time and part-time Bachelor programme (Mathematics 1, Mathematics 2, Mathematics 3, Selected Chapters in Mathematics) in full-time and part-time Master programme (Modern Numerical Methods, Matrix and Tensor Calculus, Random Processes, Differential Equations in Electrical Engineering, Probability, Statistics and Operations Research). The department also provided tuition in two Ph.D. courses (Discrete Processes in Electrical Engineering, Probability, Stochastic Processes, Operations Research) and in a numbers of mathematical courses for the Faculty of Information Technology.

Research mainly in investigation of continuous and discrete dynamical systems 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. L. Berezanský, University in Beer-Sheva, Israel, with Prof. Chr. Nowak, Technical University in Klagenfurt, Austria, Prof. E. Schmeidel, University in Bialystok, Poland, Prof. S. Stevic, Serbian

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

Research of dynamical systems centred on asymptotic characteristics of discrete systems, global attractivity and solution permanence of some differential equations with a deviating argument, new solving algorithms for Lane-Emden and fractional differential equations and stability of trivial solution of nonlinear systems with random parameters.

Major Achievements

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

Analytical formal series solution of autonomous linear partial differential equations of parabolic type with a single delay was constructed and discussion of convergence was carried out. An explicit solution for some classes of nonlinear systems was constructed and a new solving method for fractional telegraph equations was designed. New outcomes in global attractivity and permanence of solution were deduced in the study of equations describing population dynamics with a delay and quadratic nonlinearities. The differential transform method was applied in solution of Lane-Emden equations and new transform formulas for exponential and logarithmic nonlinearities were deduced. In the study of stabilisation of nonlinear assignments of Lurier's indirect control with a delay sufficient conditions of absolute stability were deduced by Lyapunov's direct method. A new construction method of Lyapunov's functions was used in the study of L_2 stability of trivial solution in nonlinear systems with random parameters.

Results of research in causal structures for quantum gravitation formerly proved for Minkowsky spacetime were generalized to the Lorentz variety.

Constructions of fuzzy implications consisting in a replacement of the uninorm product and strictly

Activities in fuzzy structures focused on fuzzy implications with possible application in fuzzy decision making and fuzzy control, and on uninorms of t-norms transformations and their impact on fuzzy implication characteristics.

Research of topological structures centred on practical applications of not-Hausdorffov's topologies, causal structures motivated by quantum gravitation and representation of some topologies by context structures of formal concept analysis.

monotonous functions of non-increasing functions were generalized. Conditions were established in which implications of the new class have the known characteristics (principles of neutrality, identity, contrapositivity etc). Non-vacant intersection was proved between a new class of implications and the known classes (Q-implications, SN-implications, R-implications).

22 articles were published in scientific journals Abstract and Applied Analysis, Applied Mathematics and Computation, Advances in Difference Equations, Nonlinear Dynamics and Systems Theory, Kybernetika.

In connection with investigation of qualitative characteristics of dynamical systems 11 software application modules were created.

The department staff coorganized international conferences:

Conference on Differential and Difference Equations and Applications 2012 (CDDEA 2012), Tërchová, Slovakia,

Constructive Methods for Non-Linear Boundary Value Problems in Tokaj, Hungary,

Modelling, Control and Stability (MCS-2012) in Sevastopol, Ukraine.

The department staff also gave a number of presentations.

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

Differential 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

KHAN, Y.; ŠMARDA, Z. A Novel Computing Approach for Third Order Boundary Layer Equation. *Sains Malaysiana*. 2012. 41(11). p. 1489 - 1493. ISSN 0126-6039. (IF(2011)=0,268).

KHAN, Y.; DIBLÍK, J.; FARAZ, N.; ŠMARDA, Z. An efficient new perturbative Laplace method for space-time fractional telegraph equations. *Advances in Difference Equations*. 2012. 2012(204)(doi:10.1186/1687). p. 1 - 11. ISSN 1687-1847. (IF(2011)=0,845).

KOLÁŘOVÁ, E.; BRANČÍK, L. Application of Stochastic Differential Equations in Second-Order Electrical Circuits Analysis. *Przeglad Elektrotechniczny*. 2012. 2012(7a). p. 103 - 107. ISSN 0033-2097. (IF(2011)=0,244).

ŠMARDA, Z.; REBENDA, J. Asymptotic Behaviour of a Two-Dimensional Differential System with a Finite Number of Nonconstant Delays under the Conditions of Instability. *Abstract and Applied Analysis*. 2012. 2012(Article ID 95260). p. 1 - 20. ISSN 1085-3375. (IF(2011)=1,318).

DIBLÍK, J.; RŮŽIČKOVÁ, M.; ŠUTÁ, Z. Asymptotic convergence of the solutions of a discrete system with delays. *APPLIED MATHEMATICS AND COMPUTATION*. 2012. 2012(18). p. 4036 - 4044. ISSN 0096-3003. (IF(2011)=1,317).

DIBLÍK, J.; RŮŽIČKOVÁ, M.; ŠMARDA, Z.; ŠUTÁ, Z. Asymptotic convergence of the solutions of a dynamic equation on discrete time scales. *Abstract and Applied Analysis*. 2012. 2012(ID 580750). p. 1 - 20. ISSN 1085-3375. (IF(2011)=1,318).

DIBLÍK, J.; HLAVIČKOVÁ, I. Asymptotic upper and lower estimates of a class of positive solutions of a discrete linear equation with a single delay. *Abstract and Applied Analysis*. 2012. 2012(ArticleID 764351). p. 1 - 12. ISSN 1085-3375. (IF(2011)=1,318).

DIBLÍK, J.; VÍTOVEC, J. Bounded solutions of delay dynamic equations on time scales. *Advances in Difference Equations*. 2012. 2012(2012). p. 1 - 9. ISSN 1687-1847. (IF(2011)=0,845).

STEVÍČ, S. Bounded solutions of some systems of nonlinear functional differential equations with iterated deviating argument. *APPLIED MATHEMATICS AND COMPUTATION*. 2012. 2012(218(21)). p. 10429 - 10433. ISSN 0096-3003. (IF(2011)=1,317).

NOVÁK, M. EL-hyperstructures: an overview. *Ratio Mathematica*. 2012. 2012(23). p. 125 - 139. ISSN 1592-7415.

HLINĚNÁ, D.; BIBA, V. Evaluating many valued modus ponens. *Kybernetika*. 2012. 48(2012)(3). p. 465 - 477. ISSN 0023-5954. (IF(2011)=0,454).

STEVÍČ, S. Existence of bounded solutions of some systems of nonlinear functional differential equations with complicated deviating argument. *APPLIED MATHEMATICS AND COMPUTATION*. 2012. 218(19). p. 9974 - 9978. ISSN 0096-3003. (IF(2011)=1,317).

HLINĚNÁ, D.; BIBA, V. Generated fuzzy implications and fuzzy preference structures. *Kybernetika*. 2012. 48(2012)(3). p. 453 - 464. ISSN 0023-5954. (IF(2011)=0,454).

- HLINĚNÁ, D.; KALINA, M.; KRÁL, P. Generated Implications Revisited. *Communications in Computer and Information Science*. 2012. 298(2012)(6). p. 345 - 355. ISSN 1865-0929.
- DIBLÍK, J.; BAŠTINEC, J.; KHUSAINOV, D.; BAŠTINCOVÁ, A. Interval stability of linear systems of neural type. *Žurnal obščisljuvalnoji ta prikladnoji matematiki*. 2012. 2011(391060). p. 148 - 160. ISSN 0868-6912.
- CHVALINA, J.; KŘEHLÍK, Š. Normal subhypergroups of hypergroups of ordinary linear second-order differential operators. *South Bohemia Mathematical Letters*. 2012. 2012(1). p. 1 - 9. ISSN 1804-1450.
- BAŠTINEC, J. Odešel Jaroslav Folta. *Učitel matematiky*. 2012. p. 124 - 127. ISSN 1210-9037.
- BEREZANSKY, L.; BAŠTINEC, J.; DIBLÍK, J.; ŠMARDA, Z. On a delay population model with quadratic nonlinearity. *Advances in Difference Equations*. 2012. 2012:230(10.1186/1687-184). p. 1 - 13. ISSN 1687-1847. (IF(2011)=0,845).
- STEVÍČ, S.; DIBLÍK, J.; IRIČANIN, B.; ŠMARDA, Z. On a Periodic System of Difference Equations. *Abstract and Applied Analysis*. 2012. 2012(Article ID 25871). p. 1 - 5. ISSN 1085-3375. (IF(2011)=1,318).
- STEVÍČ, S.; DIBLÍK, J.; IRIČANIN, B.; ŠMARDA, Z. On a Third-Order System of Difference Equations with Variable Coefficients. *Abstract and Applied Analysis*. 2012. 2012(Article ID 50852). p. 1 - 22. ISSN 1085-3375. (IF(2011)=1,318).
- STEVÍČ, S.; DIBLÍK, J.; IRIČANIN, B.; ŠMARDA, Z. On Some Solvable Difference Equations and Systems of Difference Equations. *Abstract and Applied Analysis*. 2012. 2012(ID 54176). p. 1 - 11. ISSN 1085-3375. (IF(2011)=1,318).
- STEVÍČ, S.; DIBLÍK, J.; IRIČANIN, B.; ŠMARDA, Z. On the Difference Equation $x_n = a_n x_{n-k} / (b_n x_{n-1} \dots x_{n-k})$. *Abstract and Applied Analysis*. 2012. 2012(ID 409237). p. 1 - 20. ISSN 1085-3375. (IF(2011)=1,318).
- STEVÍČ, S.; DIBLÍK, J.; IRIČANIN, B.; ŠMARDA, Z. On the Difference Equation $x_{n+1} = x_n x_{n-k} / x_{n-k+1} (a + b x_n x_{n-k})$. *Abstract and Applied Analysis*. 2012. 2012(Article ID 10804). p. 1 - 9. ISSN 1085-3375. (IF(2011)=1,318).
- DIBLÍK, J.; SCHMEIDEL, E. On the existence of solutions of linear Volterra difference equations asymptotically equivalent to a given sequence. *APPLIED MATHEMATICS AND COMPUTATION*. 2012. 2012(18). p. 9310 - 9320. ISSN 0096-3003. (IF(2011)=1,317).
- ŠMARDA, Z.; KHAN, Y. Singular Initial Value Problem for a System of Integro-Differential Equations. *Abstract and Applied Analysis*. 2012. 2012(ID 918281). p. 1 - 18. ISSN 1085-3375. (IF(2011)=1,318).
- DIBLÍK, J.; KHUSAINOV, D.; KUKHARENKO, O.; SVOBODA, Z. Solution of the first boundary-value problem for a system of autonomous second-order linear partial differential equations of parabolic type with a single delay. *Abstract and Applied Analysis*. 2012. 2012(Article ID 21904). p. 1 - 27. ISSN 1085-3375. (IF(2011)=1,318).
- STEVÍČ, S. Solutions of a max-type system of difference equations. *APPLIED MATHEMATICS AND COMPUTATION*. 2012. 218(19). p. 9825 - 9830. ISSN 0096-3003. (IF(2011)=1,317).
- KHAN, Y.; SVOBODA, Z.; ŠMARDA, Z. Solving certain classes of Lane-Emden type equations using differential transformation method. *Advances in Difference Equations*. 2012. 2012:174(DOI: 10.1186/1687-1847). p. 1 - 13. ISSN 1687-1847. (IF(2011)=0,845).
- NOVÁK, M. Some basic properties of EL-hyperstructures. *EUROPEAN JOURNAL OF COMBINATORICS*. 2013. 2013 (34)(2). p. 446 - 459. ISSN 0195-6698. (IF(2011)=0,677).
- DIBLÍK, J.; KHUSAINOV, D.; RŮŽIČKOVÁ, M.; SHATYRKO, A. Stabilization of Lure-type Nonlinear Control Systems by Lyapunov-Krasovskii Functionals. *Advances in Difference Equations*. 2012. 2012(2012). p. 1 - 11. ISSN 1687-1847. (IF(2011)=0,845).
- NOVÁK, M. Synergy of technologies in teaching mathematics. *Journal of Technology and Information Education. Univerzita Palackého v Olomouci AM*. 2012. 2012(4)(1). p. 15 - 20. ISSN 1803-537X.
- PERNICA, M.; BAŠTINEC, J. Vliv nákupního chování zákazníků na oceňování majetku. *TRENDY EKONOMIKY A MANAGEMENTU*. 2012. VI(10). p. 83 - 89. ISSN 1802-8527.

STEVIČ, S. Weighted radial operator from the mixed-norm space to the n th weighted-type space on the unit ball. *APPLIED MATHEMATICS AND COMPUTATION*. 2012. 218(18). p. 9241 - 9247. ISSN 0096-3003. (IF(2011)=1,317).

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 the Matlab, Maple, Mathematical software, Petr Fuchs)

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

Department of Microelectronics

Prof. Ing. Vladislav Musil, CSc.

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

Associate Professors

Doc. RNDr. Vojtěch Adam, Ph.D.
Doc. Ing. Lukáš Fucík, 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. Daniel Bečvář, 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. Jiří Panáček, 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. Daniel Široký, Ing. Olga Švecová, Ing. Jiří Vávra, Ing. Marina Vorozhtsova, Ing. Doaa Yahya, Ing. Jaromír Žák, Ing. Jakub Cieslar, Ing. Martin Holain, Ing. Milan Holík, Ing. Martin Klíma, Ing. Vladimír Levek, Ing. Petr Schnederle, Ing. Dina Younes

Administrative and Technical Staff

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

Main Interests

In 2012 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 programmes.

Research was centred on basic and applied research 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),
- simulation and evaluation of 3D linking systems reliability,
- new methods of thixotropic material non-vacuum depositions in 3D circuits,
- reliability of lead-free solders,

Major Achievements

In 2012 members of the department were involved in 1 project of the 6th FP EU, 3 projects of the 7th FP EU in programmes ARTEMIS JU and ENIAC JU, in 7 GAČR, 1 AV, 6 MPO (cooperation with industry), 2 TAČR projects and 1 project of the National Research Programme of the Ministry of Education.

In June 2012 the department coorganised international conference 'Electronic Devices and Systems EDS 2012' with participation of Czech and international experts. There were 60 papers on microelectronics and technology.

- 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, TU Ilmenau and IMMS Erfurt, Germany, 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 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.

The team of Prof. Jaroslav Boušek continued in research of sputtered passivation and antireflection layers of crystalline solar cells. The team also commenced research of measurement of bound charge in silicon-dielectric.

The group involved in microelectronic technology headed by Ivan Szendiuch in cooperation with the company REHM (dr. Bell) focused on lead-free solders, 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. 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. Solution of unique thermal balance sensor was concluded (MPO project), prototypes were tested in industrial applications. A system for thixotropy material deposition was developed, the patent application was submitted, and the Dispensing Apparatus Arrangement for Selective Deposition of Pastes and Adhesives was used. Results were published at the Web of Science (ISI) conferences. In cooperation with the French company THALES application for the European programme Euripides (Board on Board) was submitted in new printed circuit board substrates with 3D configuration.

The team LabSensNano (Laboratory of Microsensors and Nanotechnology) led by Jaromír 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 two utility samples and a patent 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 Lukáš Fojčík focused on the development of intelligent submicrone 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 designed and implemented on chip. The universal integrated circuit is designed to process signals from MEMS microsensors used in vibration diagnostics of rotating machines. The struc-

ture was awarded a patent and results were published in 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 Dalibor Bielek focused on basic research of memsystems, particularly memristors. Theoretical relations were revealed between memristor definitional relationships and its fingerprints in the time domain, mainly by its hysteresis loop in the voltage and current coordinates. 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 journals. Cooperation of the research team with international partners will be presented in a monograph coauthored by Prof. Chua from UC Berkeley and Dr. Williamd from HP. To be published in 2013 by the Springer publishing house. In 2012 international response to published results was received, among other a number of quotations on the Web of Science.

Major Research Projects

E3Car Nanoelectronics for an Energy Efficient Electrical Car – ENIAC JU Project 120001 (FP7)

Investigator: Radimír Vrba

Memristive, Memcapacitive and Meminductive Systems: Basic Research, Modelling and Simulation – GAČR P102/10/1614

Investigator: Dalibor Bielek

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

Investigator: Radimír Vrba

Novel Constructions and Utilization of Nanobiosensors and Nanosensors in Medicine (NANOSE-MED) – GA AV ČR KAN208130801

Investigator: Jaromír Hubálek

Miniaturized Intelligent Systems and Nanostructured Electrodes in Chemical, Biologic and Pharmaceutical Applications (NANIMEL) – GA ČR 102/08/1546

Investigator: Jaromír Hubálek

Selected Publications

BIOLEK, D.; TESKA, T.; HOLAS, J.; WEISS, L.; VEŠKRNA, F. Analogová realizace prvků vyšších řádů z Chuovy tabulky pomocí inkrementálních mutátorů. *Slaboproudý obzor*. 2012. 2012(3). p. 7 - 13. ISSN 0037-668X.

BIOLEK, Z.; BIOLEK, D.; BIOLKOVÁ, V. Analytical Solution of Circuits Employing Voltage- and Current-Excited Memristors. *IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS I-REGULAR PAPERS*. 2012. 2012(11). p. 2619 - 2628. ISSN 1549-8328. (IF(2011)=1,97).

POHANKA, M.; SOCHOR, J.; RUTTKAY-NEDECKÝ, B.; CERNEI, N.; ADAM, V.; HUBÁLEK, J.; STIBOROVÁ, M.; ECKSCHLAGER, T.; KIZEK, R. Automated assay of the potency of natural antioxidants using pipetting robot and spectrophotometry. *Journal of Applied Biomedecine*. 2012. 10(3). p. 155 - 167. ISSN 1214-0287.

KHATEB, F.; HORSKÝ, P.; FUJCIK, L.; VRBA, R.; PAVLÍK, M. Comment on "High performance low-voltage QFG-based DVCC and a novel fully differential SC integrator based on it". *IEICE Electronics Express*. 2012. 2012 (9)(18, IF: 0.461). p. 1492 - 1493. ISSN 1349-2543. (IF(2011)=0,461).

BIOLEK, Z.; BIOLEK, D.; BIOLKOVÁ, V. Computation of the Area of Memristor Pinched Hysteresis Loop. *IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS II-EXPRESS BRIEFS*. 2012. 2012 (59)(9). p. 607 - 611. ISSN 1549-7747. (IF(2011)=1,41).

SVATOŠ, V.; MĀRIK, M.; PEKÁREK, J.; SLAVÍK, J.; CHOMOUCKÁ, J.; HUBÁLEK, J. Design and Fabrication of MEMS Low Power Heating Membrane. *ElectroScope* - <http://www.electroscope.zcu.cz>. 2012. 2012(VI). p. 1 - 3. ISSN 1802-4564.

PAVLÍK, M.; HÁZE, J.; KLEDROWETZ, V. Design of the 12bits Delta-Sigma Modulator using SC Technique. *Radioengineering*. 2012. 21(1). p. 246 - 251. ISSN 1210-2512. (IF(2011)=0,739).

KHATEB, F.; JAIKLA, W.; KUBÁNEK, D.; KHATIB, N. Electronically tunable voltage-mode quadrature oscillator based on high performance CCCDBA. *ANALOG INTEGRATED CIRCUITS AND SIGNAL PROCESSING*. 2012. 73(3, IF: 0.592). p. 1 - 7. ISSN 0925-1030. (IF(2011)=0,592).

ALSIBAI, Z. Floating-Gate Operational Transconductance Amplifier. *International Proceedings of Computer Science and Information Technology (IPCSIT)*. 2012. 2012(8)(8). p. 25 - 29. ISSN 2010-460X.

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KOLKA, Z.; BIOLEK, D.; BIOLKOVÁ, V. Hybrid modelling and emulation of mem-systems. *International Journal of Numerical Modelling: Electronic Networks, Devices and Fields*. 2012. 2012(3). p. 216 - 225. ISSN 0894-3370. (IF(2011)=0,6).

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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 (prof. Ing. Radimír Vrba, CSc.)
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.)

Master Degree Programme

Analogové integrované obvody (doc. Ing. Jiří Háze, Ph.D.)
Aplikovaná počítačová technika (Ing. Radovan Novotný, Ph.D.)
Digitální integrované obvody (doc. Ing. Pavel Štefan, Ph.D.)
Integrovaná optoelektronika (doc. Ing. František Urban, CSc.)
Konstrukce a technologie elektronických zařízení (prof. Ing. Vladislav Musil, CSc.)
Metody návrhu analogových integrovaných obvodů (prof. Ing. Vladislav Musil, CSc.)
Metody návrhu digitálních integrovaných obvodů (prof. Ing. Vladislav Musil, CSc.)
Microelectronics in English (prof. Ing. Jaromír Brzobohatý, CSc.)
Mikroelektronické obvody (Ing. Daniel Bečvář, Ph.D.)
Mikroelektronické prvky a struktury (Ing. Ondřej Hégr, Ph.D.)

Doctoral Degree Programme

Mikroelektronické systémy (prof. Ing. Vladislav Musil, CSc.)

Modelování a počítačová simulace (prof. Ing. Dalibor Bielek, 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.)

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.)

Mikroelektronické technologie (doc. Ing. Jaromír Hubálek, Ph.D.)

Laboratories

Laboratory of Electronic Components (instruction in Electronic Components, Ondřej Hégr, Jaroslav Boušek)

Laboratory of Analog Circuits and Microelectronic Practice (instruction in Analog Integrated Circuits and Microelectronic Practice, Jiří Háze, Josef Šandera)

Laboratory of Microsensors and Nanotechnologies (research laboratory of chemistry, chemical sensors and biosensors, development of electronic devices, electron microscopy and lithography, dispersive X-ray spectroscopy, Jaromír Hubálek)

Laboratory of Microelectronic Mount Technology and Casing (thick films, solder surface mount, lead-free soldering and casing, instruction in Microelectronics and Component Technology, Manufacturing of Components and Construction Elements, Modern Technology of Electronic Circuits and Systems, student projects, Ivan Szendiuch)

Laboratory of Vacuum Technology (research and development laboratory, Jaroslav Boušek, Josef Šandera)

Laboratory of Microsensors (instruction in Microsensors and Micromechanical Systems, 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 Analog Integrated Circuits and Design of Digital Integrated Circuits, student projects, Roman Prokop)

Laboratory of Optoelectronics and Laser Technology (instruction in Optoelectronics, student projects, František Urban)

Computer Laboratory (computer exercises for various subjects, self-study, Internet, David Nejezchleb)

Laboratory for Semiconductor Components Characterization – Testing of Chips (instruction in Manufacturing of Components and Construction Elements, student projects, Jaromír Hubálek)

Department of Radioelectronics

Prof. Dr. Ing. Zbyněk Raida

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Prof. Ing. Vladimír Šebesta, CSc.

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.

Associate Professors

Doc. Ing. Tomáš Frýza, Ph.D.
Doc. Ing. Tomáš Kratochvíl, Ph.D.
Doc. Ing. Roman Maršálek, Ph.D.
Doc. Ing. Jiří Petržela, Ph.D.
Doc. Ing. Jiří Šebesta, Ph.D.

Lecturers

Ing. Viera Biolková, Ing. Jiří Dřínovský, Ph.D., Ing. Zbyněk Fedra, Ph.D., Ing. Lucie Hudcová, Ph.D., Ing. Ivana Jakobová, Ing. Michal Kubíček, Ph.D., Ing. Jaroslav Láčák, Ph.D., Ing. Zbyněk Lukeš, Ph.D., Ing. Jan Prokopec, Ph.D., Ing. Martin Slanina, Ph.D. Ing. Tomáš Urbanec, Ph.D., Ing. Petr Vágner, Ph.D.

Research Workers

Ing. Ondřej Baran, Ph.D., Dr. Techn. Vojtěch Derbek, prof. Hans Ludwig Hartnagel, Ing. Petr Kadlec, Ph.D., Ing. Peter Kovács, Ph.D., Ing. Michal Pokorný, Ph.D., doc. RNDr. Jitka Poměnková, Ph.D., Ing. Jan Puskely, Ph.D., Dipl. Ing. Dr. Techn. Michal Ries, Ing. Roman Šotner, Ph.D.

Ph.D. Students

Ing. Radek Balada, Ing. Peter Barčík, Ing. Jiří Blumenstein, Ing. Libor Boleček, Ing. Jan Cigánek, Ing. Ivo Dufek, Ing. Martin Dušek, Ing. Jiří Dvořák, Ing. Tomáš Götthans, Ing. Vladimír Hebelka, Ing. Jan Hofman, Ing. Zdeněk Hruboš, Ing. Ondřej Kaller, Ing. Edward Kasem, Ing. Zdeněk Kincl, Ing. Lukáš Klozar, Ing. Vlastimil Koudelka, Ing. Zenon Kuder, MSc., Ing. Martin Kufa, Ing. Pavel Kukolev, Ing. Demian Lekomtcev, Ing. Roman Mego, Ing. Tomáš Mikulášek, Ing. Jiří Miloš, Ing. Marek Müller, Ing. Kamil Pítra, Ing. Ladislav Polák, Ing. Juraj Poliak, Ing. Martin Pospíšil, Ing. Aleš Povalač, Ing. Václav Růžek, Ing. Miroslav Štaněk, Ing. Jitka Svobodová, Ing. Vladimír Šeděnka, Ing. Vladimír Šporik, Ing. Milan Štohanzl, Ing. Pavel Štraus, Ing. Lenka Tejmlová, Ing. Petr Všetula, Ing. David Wolanský, Ing. Filip Záplata, Ing. Petr Zatloukal

Administrative and Technical Staff

Bc. Josef Báňa, Ing. Jan Bartyzal, Ing. Philip Bělohlávek, Dora Šebestová, 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 videotechnology, microprocessor technology, low-frequency and audio electronics, and electromagnetic compatibility.

In 2012 research was supported by 2 research projects of the Operational Programme 'Education for Competitiveness' (OP VK) and 1 VaVpl project 'Research and Development for Innovations'.

The staff participated in 5 GAČR (Grant Agency of the Czech Republic) projects and in 3 TAČR projects (Technology Agency of the Czech Republic), in 6 MPO projects and 1 project of the Ministry of the Interior, Czech Republic, and 3 internal BUT grants.

Major Achievements

The department continued, in cooperation with Departments of Telecommunications, Microelectronics and Physics, building the regional 'Centre of Applied Research SIX' (Centre of Sensoric, Information and Communication Systems). The Centre was completed at the end of 2012 and in 2013 its operation will commence, in the first year financially supported by the OP VaVpl programme.

The research teams involved in the 'Programme of Microwave Technology' and 'Programme of Wireless Technology' of Centre SIX have been intensively preparing for international research cooperation within the framework of the OP VK WICOMT project 'Wireless Communication Teams'. Responsible for preparation of the 'Programme of Microwave Technology' is Professor Hans Hartnagel of Technical University Darmstadt, the 'Programme of Wireless Technology' is led by Dr. Michal Ries of Technische Universität Wien.

The department was also involved in 3 FP7 projects and 6 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 programmes. Upgrading of the educational process was supported by 17 FRVŠ projects.

The department cooperates with many organizations and societies. Staff members are engaged in the committee of the Czech and Slovak section of IEEE. The department supports activities of the Radioclub OK2KOJ and the Student Section of IEEE at Brno University of Technology. There has been active cooperation with the Czech Electrotechnical Society. The department is a collective member of the international organization AMSAT.

In 2011 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), IC0803 RF/microwave communication subsystems for emerging wireless technologies (RFCSET) a IC1004 Cooperative Radio Communications for Green Smart Environments.

In addition to the two FP7 projects (HIRF-SE, High Intensity Radiated Field – Synthetic Environment and ACOST, Advanced Communication Systems and Technologies) our team joined the project ARTEMOS (Agile RF Transceivers and Front-Ends for Future Smart Multi-Standard Communication Applications).

In 2012 cooperation with Volkswagen AG and CISC Semiconductor GmbH continued.

Major Research Projects

Advanced Communication Systems and Technologies (ACOST) – FP7-REGPOT 230126

Investigator: Zdeněk Kolka

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

Investigator: Tomáš Kratochvíl

High Intensity Radiated Fields (HIRF) – Synthetic Environment – FP7-TRANSPORT 205294

Investigator: Zbyněk Raida

Wireless Communication Teams (WICOMT) – MŠMT ČR CZ.1.07/2.3.00/20.0007

Investigator: Zbyněk Raida

Center of Sensoric, Information and Communication Systems (SIX) – MŠMT ČR CZ.1.05/2.1.00/03.0072

Investigator: Zbyněk Raida

Selected Publications

BOLEČEK, L.; ŘÍČNÝ, V. Algoritmus pro detekci stínů v aplikaci profilometrie. *Elektrorevue - Internetový časopis* (<http://www.elektrorevue.cz>). 2012. 2011(58). p. 1 - 7. ISSN 1213-1539.

ŠOTNER, R.; KARTCI, A.; JEŘÁBEK, J.; HERENCŠÁR, N.; DOSTÁL, T.; VRBA, K. An Additional Approach to Model Current Followers and Amplifiers with Electronically Controllable Parameters from Commercially Available ICs. *Measurement Science Review*. 2012. 12(6). p. 255 - 265. ISSN 1335-8871. (IF(2011)=0,418).

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ZÁPLATA, F.; KASAL, M. Architektury a základní vzorkovací techniky SDR. *Elektrorevue - Internetový časopis* (<http://www.elektrorevue.cz>). 2012. 2012(43). p. 43-1 (7 p.). ISSN 1213-1539.

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LÁČÍK, J. Circularly Polarized SIW Square Ring-Slot Antenna for X-Band Applications. *Microwave and Optical Technology Letters*. 2012. 54(11). p. 2590 - 2594. ISSN 0895-2477. (IF(2011)=0,618).

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Bachelor Degree Programme

- | | |
|--|---|
| Analogové elektronické obvody (prof. Ing. Lubomír Brancík, CSc.) | Počítače a programování 2 (doc. Ing. Jiří Šebesta, Ph.D.) |
| Návrh analogových filtrů (doc. Ing. Jiří Petržela, Ph.D.) | Počítačové řešení elektronických obvodů (prof. Dr. Ing. Zdeněk Kolka) |
| Elektromagnetická kompatibilita (Ing. Jiří Dřínovský, Ph.D.) | Počítačové řešení komunikačních subsystémů (Ing. Petr Vágner, Ph.D.) |
| Elektromagnetické vlny, antény a vedení (prof. Dr. Ing. Zbyněk Raida) | Rádiové a mobilní komunikace (prof. Ing. Stanislav Hanus, CSc.) |
| Elektronické praktikum (Ing. Ivana Jakobová) | Rádiové přijímače a vysílače (prof. Ing. Aleš Prokeš, Ph.D.) |
| Impulzová a číslicová technika (doc. Ing. Tomáš Frýza, Ph.D.) | Signály a soustavy (prof. Ing. Milan Sigmund, CSc.) |
| Komunikační systémy (prof. Ing. Aleš Prokeš, Ph.D.) | Moderní bezdrátová komunikace (Ing. Martin Slanina, Ph.D.) |
| Mikroprocesorová technika a embedded systémy (doc. Ing. Tomáš Frýza, Ph.D.) | Vysokofrekvenční a mikrovlnná technika (Ing. Petr Vágner, Ph.D.) |
| Napájení elektronických zařízení (Ing. Michal Kubíček, Ph.D.) | Vysokofrekvenční technika a antény (prof. Ing. Miroslav Kasal, CSc.) |
| Nízkofrekvenční a audio elektronika (doc. Ing. Tomáš Kratochvíl, Ph.D.) | Základy televizní techniky (prof. Ing. Stanislav Hanus, CSc.) |
| Základy optických komunikací a optoelektronika (prof. Ing. Otakar Wilfert, CSc.) | |

Master Degree Programme

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|--|---|
| Advanced radio communication systems (Ing. Martin Slanina, Ph.D.) | Kvantová a laserová elektronika (prof. Ing. Otakar Wilfert, CSc.) |
| Antény a jejich aplikace (Ing. Zbyněk Lukeš, Ph.D.) | Mikrokontrolery pro přístrojové aplikace (Ing. Zbyněk Fedra, Ph.D.) |
| CAD v mikrovlnné technice (prof. Dr. Ing. Zbyněk Raida) | Mikrovlnná integrovaná technika (Ing. Zbyněk Lukeš, Ph.D.) |
| Digitální televizní a rozhlasové systémy (doc. Ing. Tomáš Kratochvíl, Ph.D.) | Navrhování rádiových spojů (Ing. Jaroslav Láčik, Ph.D.) |
| Fotonika a optické komunikace (Ing. Lucie Hudcová, Ph.D.) | Počítačové a komunikační sítě (prof. Dr. Ing. Zdeněk Kolka) |

Počítačové systémy a jejich aplikace (Ing. Zbyněk Fedra, Ph.D.)
Programovatelné logické obvody (Ing. Michal Kubíček, Ph.D.)
Radioelektronická měření (Ing. Jiří Dřínovský, Ph.D.)
Radiolokační a radionavigační systémy (doc. Ing. Jiří Šebesta, Ph.D.)
Směrové a družicové spoje (prof. Ing. Miroslav Kasal, CSc.)
Softwarové rádio (doc. Ing. Roman Maršálek, Ph.D.)

Systémy mobilních komunikací (Ing. Jan Prokopec, Ph.D.)
Teorie elektronických obvodů (doc. Ing. Jiří Petržela, Ph.D.)
Teorie rádiové komunikace (doc. Ing. Roman Maršálek, Ph.D.)
Videotechnika a multimediální technika (Ing. Martin Slanina, Ph.D.)
Radiofrekvenční identifikace (Dr. Techn. Vojtěch Derbek)

Doctoral Degree Programme

Moderní digitální bezdrátová komunikace (prof. Ing. Milan Sigmund, CSc.)

Návrh moderních elektronických obvodů (prof. Dr. Ing. Zdeněk Kolka)

Laboratories

Laboratory of Analog Electronic Circuits (instruction in analog electronics, Ivana Jakubová, Lubomír Brančík, Jiří Petržela)

Laboratory of Electromagnetic Compatibility EMC (instruction and practice in EMC and pre-certifying tests of interference and resistance according to European norms, Jiří Dřínovský)

Laboratory of Low-Frequency Applications (instruction in audio technology, low-frequency electronics and power supply systems for electronic devices, Tomáš Kratochvíl, Michal Kubíček)

Laboratory of Signals and Digital Technology (instruction in signals and digital technology, Viera Biolková, Milan Sigmund, Tomáš Frýza)

Laboratory of Microprocessor Technology (instruction in microprocessor and microcomputer technology, Tomáš Frýza, Zbyněk Fedra)

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

Laboratory in Optoelectronics and Photonics (instruction in optoelectronics, photonics and optical communications, Otakar Wilfert, Lucie Hudcová)

Laboratory of TV and Video Technology (instruction in analog and 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 communications and systems, Stanislav Hanus, Jan Prokopec)

Laboratory of Antennas and Electromagnetic Field (research and instruction in EM fields, antennas and design of radio links, Jaroslav Láčák, Zbyněk Lukeš)

Laboratory of Radio Relay and Satellite Communication (instruction in radio and satellite communication, radiolocation and navigation, Miroslav Kasal, Petr Vágr)

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 Laboratory (two laboratories for computer-aided exercises in circuits, signals and systems, special areas of radioelectronics and communication technology, Zbyněk Fedra)

Research Laboratory of Experimental Satellite Communication (research and development of subsystems for satellite communication and navigation, telemetric and command stations of experimental AMSAT satellites, Miroslav Kasal)

Research Laboratory of Numeric Methods (research in applied electromagnetism and electromagnetic field modelling, Zbyněk Raida, Michal Pokorný)

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

Research Laboratory of Signal Processing (research in digital radio communication and perspective methods of digital signal processing, Roman Maršálek)

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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. The conception 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 analog and digital circuits, microprocessors and signal processors and their applications. They can specialize in media informatics i.e. digital processing of speech, music or images. There is a follow-up Ph.D. study area Teleinformatics.

The department has been successful in obtaining funding from various educational and research programmes. In 2012 our research and development teams were involved in projects

relating to basic and applied research yielding more than 41 mil. CZK. A research team has been very successful in providing up-to-date multimedia service via mobile and wireless network. 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., DISK Multimédia s.r.o., WESTCOM s.r.o., 2N Telekomunikace, MEgA-Měřicí Energetické aparáty, TTC and Saturn Holešov s.r.o. The practical outcome is 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, Inveatech and Honeywell and was involved in building of the 'Center of Sensoric, Information and Communication Systems'.

Major Achievements

The main research interests of the department are converged information and communication systems focused on media informatics, but also electronic systems for medical technology. In 2012 research was targeted at the following issues:

Research and development of HW and SW end-user devices (telephone, fixed and mobile networks, modems, etc.), design and development of the telephone exchange I-tel and special equipment for telephone exchanges.

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

Verification of the behaviour of new algorithms and protocols for data networking in the simulation environment OPNET Modeler. Monitoring and analysis of data network operation. 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 sensoric 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

Research and Development of Technology for Detection of Emotions in Non-structured Data – MPO FR-TI4/151

Investigator: Zdeněk Smékal

Adaptable Wireless Sensor Networks with Data Visualisation in Crisis Management – MPO FR-TI2/571

Investigator: Milan Šimek

Hybrid Telephone Exchange with Direct Connection to Optical Network – MPO FR-TI4/580

Investigator: Ondřej Krajsa

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

Investigator: Kamil Vrba

Selected Publications

METIN, B.; HERENCŠÁR, N.; VRBA, K. A CMOS DCCII with a Grounded Capacitor Based Cascadable All-Pass Filter Application. *Radioengineering*. 2012. 21(2). p. 718 - 724. ISSN 1210-2512. (IF(2011)=0,739).

HERENCŠÁR, N.; KOTON, J.; VRBA, K. A Modified CFTA (MCFTA) and Its Application to SITO-Type Current-Mode Universal Active-C Filter. *Journal of Active and Passive Electronic Devices*. 2013. 7(4). p. 1 - 9. ISSN 1555-0281.

ESPINOSA-DURÓ, V.; FAÚNDEZ ZANUY, M.; MEKYSKA, J. A New Face Database Simultaneously Acquired in Visible, Near-Infrared and Thermal Spectrums. *Cognitive Computation*. 2012. 4(2). p. 1 - 17. ISSN 1866-9956.

HERENCŠÁR, N.; VRBA, K.; KOTON, J. A Novel Current-Mode KHN-Equivalent Biquad Using Three CFTAs. *Journal of Active and Passive Electronic Devices*. 2012. 7(3). p. 201 - 208. ISSN 1555-0281.

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(2011)=0,913).

HERENCŠÁR, N.; KOTON, J.; LAHIRI, A.; METIN, B.; VRBA, K. A Voltage Gain-Controlled Modified CFOA And Its Application in Electronically Tunable Four-Mode All-Pass Filter Design. *International Journal of Advances in Telecommunications, Electrotechnics, Signals and Systems*. 2012. 1(1). p. 20 - 25. ISSN 1805-5443.

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- FILKA, M.; ŠPORIK, J.; REICHERT, P.; DOSTÁL, O. Vývoj a měření brněnské akademické optické sítě - druhá část. *Sdělovací technika*. 2012. 2012(3). p. 2 - 4. ISSN 0036-9942.
- ČÍKA, P. Watermarking method based on Discrete Wavelet Transform and Singular Value Decomposition. *Elektrorevue - Internetový časopis* (<http://www.elektrorevue.cz>). 2012. 3(1). p. 45 - 49. ISSN 1213-1539.
- MARTINÁSEK, Z.; ČLUPEK, V.; ZEMAN, V.; SYSEL, P. Základní metody diferenciální proudové analýzy. *Elektrorevue - Internetový časopis* (<http://www.elektrorevue.cz>). 2013. 2013(3). p. 1 - 10. ISSN 1213-1539.
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Bachelor Degree Programme

Analogová technika (prof. Ing. Kamil Vrba, CSc.)	Hardware počítačových sítí (Ing. Jaroslav Koton, Ph.D.)
Analýza signálů a soustav (prof. Ing. Zdeněk Smékal, CSc.)	Komunikační technologie (Ing. Jan Jeřábek, Ph.D.)
Architektura sítí (doc. Ing. Vít Novotný, Ph.D.)	Konstrukce elektronických zařízení (prof. Ing. Kamil Vrba, CSc.)
CISCO akademie I, (doc. Ing. Dan Komosný, Ph.D.)	Objektově orientované programování (doc. Ing. Ivo Lattenberg, Ph.D.)
CISCO akademie II, V, (Ing. Milan Šimek, Ph.D.)	Multimediální služby (Ing. Petr Číka, Ph.D.)
CISCO akademie III, (Ing. Jan Jeřábek, Ph.D.)	Praktikum z informačních sítí (Ing. Jaroslav Koton, Ph.D.)
CISCO akademie IV, (Ing. Radim Burget, Ph.D.)	Přenosová média (prof. Ing. Miloslav Filka, CSc.)
Číslíkové filtry (Ing. Petr Sysel, Ph.D.)	Přístupové a transportní sítě (doc. Ing. Vladislav Škorpil, CSc.)
Číslíkové zpracování signálů (doc. Ing. Jiří Mišurec, CSc.)	Síťové operační systémy (doc. Ing. Dan Komosný, Ph.D.)
Datová komunikace (Ing. Pavel Šilhavý, Ph.D.)	
Elektroakustika (Ing. Jiří Schimmel, 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 počítačové sazby a grafiky (Mgr. Pavel Rajmic, Ph.D.)

Master Degree Programme

Bezpečnost informačních systémů (doc. Ing. Karel Burda, CSc.)

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 zpracování akustických signálů (Ing. Miroslav Balík, Ph.D.)

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

Grafické a multimediální procesory (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)

Pokročilé techniky zpracování obrazu (Ing. Kamil Říha, Ph.D.)

Bezdrátové sensorové 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.)

Theory of Communication (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 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 Analog Techniques (research of non-conventional current-mode circuits, Kamil Vrba)

Laboratory of Converged Networks and Information Systems (convergence of network technology into a united communications system including fixed, wireless and mobile technologies, support of communication services integration, e.g. VoIP services, videoconferencing, IPTV, research and development of VoIP elements, QoS support, Pavel Šilhavý, Vít Novotný)

Laboratory of Digital Music Studio (instruction and research in synthesis, analysis, processing and reproduction of music signals, including multicast systems Surround Sound, Zdeněk Smékal, Jiří Schimmel)

Laboratory of Electroacoustics, Studio and Music Electronics (measurement of electroacoustic converters, audio instruction programmes, examination of human hearing, testing of electroacoustic devices, evaluation of emotions in speech, anechoic chamber, Jiří Schimmel)

Laboratory of Modern 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, Karol Molnár, Jaroslav Koton)

Laboratory of Multimedia Services (design and multimedia communication services including multimedia data digital processing, Petr Číka)

Laboratory of Optical Links (instruction and research of optical transmission, mechanical work with fibres, direct and reflectometric methods, special measurement, Miloslav Filka)

Laboratory of Data Transmission (instruction in Data Communication, research of modems, modelling of the characteristics of access networks and end devices, Pavel Šilhavý)

Laboratory of Access Networks (instruction and research of end network devices, efficiency of access networks with regard to wire and wireless media, Vladislav Škorpil)

Laboratory of Communication Systems (instruction in the theory of systems and signals, and theory of communication, Radim Číž)

Laboratory of Sensoric Networks (instruction and research in sensoric networks based on the IEEE 802.15.4 standard, analysis of Zigbee and 6lowPAN protocols, sensor units configurations, 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 High-Rate Communication Systems (instruction and research of high-rate data transmission up to 100 Gb/s, Vladislav Škorpil)

Laboratory of Mutual Analog-Digital Conversion (instruction and research of 'mixed-mode' circuits, Kamil Vrba)

Laboratory of Acoustic Signal Processing (design, optimization and implementation of algorithms for speech and acoustic signal processing, DVD matrix, Miroslav Balík)

Research Laboratory of Signal Processors (applications with digital signal processors with Harvard architecture and VLIW architecture, instruction in Signal Processors, Digital Filters and Digital Signal Processing, Zdeněk Smékal, Petr Sysel)

Research and Instruction Laboratory of Safety Systems (research and development of cryptographically protected extensive data files, research of biometric authentication methods, research of security of multifunction two-way communication technology for warning systems, Karel Burda)

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

Department of Theoretical and Experimental Electrical Engineering

Doc. Ing. Pavel Fiala, Ph.D.

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Prof. Ing. Libor Dědek, CSc.
Prof. Ing. Juraj Valsa, 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. Jiří Sedláček, CSc.
Doc. Ing. Miloslav Steinbauer, Ph.D.

Lecturers

Mgr. Přemysl Dohnal, Ing. Michal Hadinec, Ph.D., Ing. Eva Kroutilová, Ph.D., Ing. Radek Kubásek, 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. Jan Hrozek, Ing. Eliška Hutová, Ing. Radim Kadlec, Ing. Radim Kořínek, Ing. Pavel Křepelka, Ing. Tomáš Kříž, Ing. Petr Marcoň, Ing. Radek Myška, Ing. Dušan Nešpor, Ing. Ksenia Ostanina, Ing. Michaela Pokludová, Ing. Zdeněk Roubal, Ing. Zoltán Szabó

Administrative and Technical Staff

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

Main Interests

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 were presented, 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 of partial charges in high-voltage power transformers was developed. Research results in special methods of single-process measurement were tested on unique systems and compared. Systems for detection and localization of partial charges in power converters with liquid dielectric were verified in laboratory conditions. 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 Malaysia and Russia, organized by the World Electromagnetics Academy in Cambridge, USA. The research also resulted in a number of unique operating samples.

Major Achievements

Research was focused on wideband signal processing, noise spectroscopy, special applications of metamaterial structures for NMR and electron microscopy in cooperation with Spacek Labs, Santa Barbara, California, USA. 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 was commenced. A system for mixing ions in a solution completed the formerly designed apparatus for measurement of the potential of selected chemical solutions in order to improve the measurement results. 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. We established contacts with the company DRAKA Kably s r.o. and continued longterm cooperation with PROTOTYPA a.s. in research of special single-process measuring methods. With the company TES s.r.o. we continued work on detection and localization of partial charges in electric power converters with liquid dielectric. We also continued cooperation with Mendel

University in Brno in simulation of biological systems by means of controlled heat and light sources. Our research also included non-destructive measuring methods of scanning the velocity of fluid flow in parts of plants and root systems. Cooperation started with the Faculty of Forestry and Wood Technology, Mendel University, Brno on the research of sensoric systems for physiology processes in woody plants with possible landscape application. In cooperation with the company Thermosanace s.r.o. a measurement X-ray workplace was developed for detection of biological structure damage and wood-destroying pests in wooden constructions. 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 Institute of Scientific Instruments, Czech Academy of Sciences. Intensive research activities commenced within two GAČR projects in analysis of metabolism and localization of primary brain tumours and jaw bone tissue changes using MR imaging techniques.

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 Burst Activity Detection in Performance Oil Transformers – MPO FR-TI1/001

Investigator: Pavel Fiala

Study of the Properties of Metamaterials and Microwave Structures Using Noise Spectroscopy and Magnetic Resonance – GAČR 102/09/0314

Investigator: Pavel Fiala

Diagnostics of Ultrafast Objects for Safety Tests – MPO FR-TI1/368

Investigator: Pavel Fiala

Selected Publications

PLÉHA, D.; DVOŘÁK, P.; KUNOVJÁNEK, M.; MUSIL, M.; ČECH, O. Battery Separators. *ECS Transactions*. 2012. 40(1). p. 153 - 158. ISSN 1938-5862.

MARCOŇ, P.; BARTUŠEK, K.; GESCHEIDTOVÁ, E.; DOKOUPIL, Z. Diffusion MRI: magnetic field inhomogeneities mitigation. *Measurement Science Review*. 2012. 12(5). p. 205 - 212. ISSN 1335-8871. (IF(2011)=0,418).

KOŘÍNEK, R.; VONDRÁK, J.; BARTUŠEK, K.; SEDLAŘIKOVÁ, M. Experimental investigations of relaxation times of gel electrolytes during polymerization by MR methods. *Journal of Solid State Electrochemistry*. 2012. 2012(14). p. 1 - 6. ISSN 1432-8488. (IF(2011)=2,131).

KUČERA, S. Index lomu vzduchu v laserové metrologii. *Československý časopis pro fyziku*. 2012. 2012(3). p. 191 - 195. ISSN 0009-0700.

MIKULKA, J.; KABRDA, M.; GESCHEIDTOVÁ, E.; PEŘINA, V. Počáteční studie možnosti klasifikace kostních čelistních cyst pomocí zpracování ortopantomogramů. *Elektrorevue - Internetový časopis* (<http://www.elektrorevue.cz>). 2012. 2012(22). p. 1 - 5. ISSN 1213-1539.

KUNOVJÁNEK, M. Polyvinylalcohol separator membrane design for electrolyzers. *ECS Transactions*. 2012. 40(1). p. 139 - 144. ISSN 1938-5862.

DREXLER, P.; FIALA, P. Power supply sources based on resonant energy harvesting. *Microsystem Technologies*. 2012. 18(7-8). p. 1181 - 1192. ISSN 0946-7076. (IF(2011)=0,931).

JAKUBIS, I.; SEDLAŘIKOVÁ, M.; VONDRÁK, J.; ČUDEK, P. Reversible incorporation of lithium ions into electrodeposited layers of TiO₂. *ECS Transaction*. 2012. 2012(40)(1). p. 85 - 91. ISSN 1938-6737.

MARCOŇ, P.; GESCHEIDTOVÁ, E.; BARTUŠEK, K. Signal processing of 3D reaction field in vicinity of non-ferromagnetic specimen and its magnetic susceptibility calculation. *Elektrorevue - Internetový časopis* (<http://www.elektrorevue.cz>). 2012. 2012 (3)(1). p. 14 - 19. ISSN 1213-1539.

MIKULKA, J.; GESCHEIDTOVÁ, E.; BARTUŠEK, K. Soft-tissues image processing: comparison of traditional segmentation methods with 2D active contour methods. *Measurement Science Review*. 2012. 12(4). p. 153 - 161. ISSN 1335-8871. (IF(2011)=0,418).

DĚDKOVÁ, J.; OSTANINA, K. Two-dimensional Tissue Image Reconstruction Based on Magnetic Field Data. *Radioengineering*. 2012. 21(3). p. 917 - 922. ISSN 1210-2512. (IF(2011)=0,739).

Bachelor Degree Programme

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

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

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

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

Měření v elektrotechnice (prof. Ing. Karel Bartušek, DrSc.)

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

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

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)

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

Computer Laboratory (Electrical Engineering, Computers and Programming 2, Electromagnetic Field Modelling, Seminar C++, Miloslav Steinbauer)

Research Laboratory of Magnetic Measurement (research laboratory of magnetic measurement, Zdeněk Roubal)

Research Laboratory of Light Technology (parameters of light sources, Eva Kroutilová)

Research Laboratory for Modelling and Optimization in Electromechanical Systems of FEEC, BUT, Brno (basic and applied research of numerical methods, Pavel Fiala)

Research Laboratory of Numerical Modelling (solution of extensive numerical problems, Miloslav Steinbauer)

Research Laboratory of Electrical Circuits (Ph.D. projects, Zoltán Szabó)

Research Laboratory of Pulse Sources and Microwave Devices (basic research, low-noise measurements, shielded laboratory, semi-anechoic laboratory, Pavel Fiala)

Research Laboratory of Electro-Optics (optoelectronic measuring methods, Eva Kroutilová)

IET Laboratory (instruction, Miloslav Steinbauer)

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

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

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 Huták, Ph.D., Ing. Marcel Janda, Ph.D., Ing. Petr Procházka, Ph.D., Ing. Jiří Valenta, Ph.D., Ing. Ondřej Vítek, Ph.D.

Ph.D. Students

Ing. Ramia Deeb, Ing. Lukáš Dostál, Ing. Petr Fajkus, Ing. Petr Grmela, Ing. Rostislav Huzlík, Ing. Josef Kadlec, Ing. Jan Kachlík, Ing. Jan Knobloch, Ing. Jiří Kurfürst, Ing. Jan Kuzdas, Ing. Martin Mach, Ing. Zbyněk Makki, Ing. Petr Michailidis, Ing. Aleš Mikulčík, Ing. Lukáš Mišinger, Ziad Nouman, Ing. Ivo Pazdera, Ing. Martin Prudík, Mousa Sattouf, Ing. Petr Španěl, Ing. Eva Vítková, BA., Ing. Vojtěch Vetiška, Ing. Jiří Vondruš

Administrative and Technical Staff

Ing. Zdeněk Feiler, Ph.D., Zdeněk Liška, Ing. Miroslav Skalka, Ph.D., 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 Electronics and Power 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 have experience in development of special machines such as startergenerators, controlled magnetic bearings and levitation systems. We also focused 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 (Kineshmarf), 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

Laboratories 'Electrical Machines' and 'Electrical Drives' (a FRVŠ project, category A) were upgraded and possibilities of parallel instruction were improved.

Students Adam Vašíček and Tomáš Žurek were awarded by the company HELLA AUTOTECHNIKA s.r.o. for their Master and Bachelor theses.

In 2012 the department organized the annual international conference LVEM.

In cooperation with the Institute of Aerospace Engineering of the Faculty of Mechanical

Engineering, Brno University of Technology we continued research of a drive system for the airplane VUT 051 RAY. In 2012 accumulator battery with advanced monitoring system was implemented, so as other electrical drive components: flight control computer, converter for synchronous motor 50kW etc.

In applied research 4 prototypes and 19 operating samples were developed.

Major Research Projects

Development of Electric Motors of IE4 'Super-Premium' Category according to International Standard IEC 60034-30 Ed.2 – TA02010967

Investigator: Bohumil Klíma

Innovation of Forest Cableways Larix – TA02021320

Investigator: Bohumil Klíma

Research and Development of Insulating System for Small Electric Machines - FR-TI4/104

Investigator: Vítězslav Hájek

Synchronous Motors with Fractional Winding in Handling Machinery - FR-TI4/675

Investigator: Vítězslav Hájek

Small Electric Motors with Integrated Electronic Unit - TA02010309

Investigator: Vítězslav Hájek

Selected Publications

DEEB, R. Analysis of Magnetic Field in PM Servo Motor. *PROCEEDINGS OF ELECTROTECHNICAL INSTITUTE*. 2012. 2012(258). p. 157 - 165. ISSN 0032-6216.

- CIPÍN, R.; KLÍMA, B.; HUTÁK, P.; NOUMAN, Z.; KNOBLOCH, J.; VONDRUŠ, J. Battery Monitoring System for the Airplane VUT 051 RAY. *ECS Transaction*. 2012. 2012(40)(1). p. 261 - 264. ISSN 1938-6737.
- ČERVINKA, D.; KLÍMA, B.; PAZDERA, I.; PÍŠTĚK, A.; HLINKA, J. Battery System of Electric Airplane VUT 051 RAY. *ECS Transaction*. 2012. 2012(40). p. 267 - 273. ISSN 1938-6737.
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Bachelor Degree Programme

Informatika v silnoproudé elektrotechnice (prof. RNDr. Vladimír Aubrecht, CSc.)

Výkonová elektronika (doc. Dr. Ing. Miroslav Patočka)

Elektrické Přístroje (doc. Ing. Bohuslav Bušov, CSc.)

Elektrické stroje (doc. Ing. Čestmír Ondrůšek, CSc.)

Teorie řízení (Ing. Petr Huták, Ph.D.)

Elektrické pohony (Ing. Dalibor Červinka, Ph.D.)

Automobilová elektrotechnika (prof. Ing. Vítězslav Hájek, CSc.)

Řídicí elektronika (doc. Dr. Ing. Miroslav Patočka)

Elektrické stroje 2 (Ing. Ondřej Vítek, Ph.D.)

Inspekční a revizní činnost (doc. Ing. František Veselka, CSc.)

Mikroprocesorová technika v pohonech (Ing. 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.)

Řídící členy v elektrických pohonech (doc. Ing. Pavel Vorel, Ph.D.)

Stavba elektrických strojů a 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 (commutation of electrical machines, measurement of medium-power output, magnetic bearings, automated measurements, Čestmír Ondrůšek)

Laboratory of Mechatronics (Čestmír Ondrůšek)

Laboratory of Electrical Apparatus (switching devices, Jiří Valenta)

Laboratory of Electric Arc (non-electric characteristics, optical diagnostics of switching arc in low-voltage and high-voltage switches, Bohuslav Bušov)

High-Voltage Laboratory (high-voltage switching effects, Bohuslav Bušov)

Laboratory of Small Electrical Machines (DC motors, measurement of universal high-revolution commutator motors, Čestmír Ondrůšek)

Laboratory of Automotive Electrical Machines (alternators, starters and low-voltage engines, Vítězslav Hájek)

Laboratory of Holographic Interferometry (optical stand for holographic interferometry, e.g. diagnostics of torque vibrations, Marcel Janda)

Laboratory of Electrical Drives (electrical drives with focus on independent traction, Dalibor Červinka)

Laboratory of Power Electronics (research of pulse converters, Miroslav Patočka)

Laboratory of High Current Electronics (DC/DC converters, alternators and low-voltage brushless drives, Pavel Vorel)

Laboratory of Industrial Electronics (analog electronics, logical circuits, pulse techniques, Pavel Vorel)

Digital Control Laboratory (microprocessor techniques, digital control and diagnostics of electrical drives, power converters and mechatronic systems, Bohumil Klíma)

Laboratory of Special Diagnostics and Fast Processes Recording (digital high-speed camera scanning of fast processes and equidensitometric evaluation of images, Vladimír Aubrecht)

Laboratory of Dynamic Properties of Electrical Machines (experimental analysis of transient performances in electrical machines, Ondřej Vítek)