ANNUAL REPORT 2010

FACULTY OF ELECTRICAL ENGINEERING

AND COMMUNICATION

BRNO UNIVERSITY OF TECHNOLOGY

Contents

Introduction

History

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

Electrotechnical disciplines were first taught at the university in 1905. Since the Faculty of Power Engineering was founded in 1959, and subsequently transformed into Electrotechnical Faculty, over 23,000 students have graduated from the faculty. In 1993, the structure of the faculty was changed. It received a new name Faculty of Electrical Engineering and Computer Science (FEECS). The faculty was the third largest among the then existing seven faculties of BUT after, at the beginning of 2000, the Faculty of Technology and the Faculty of Management joined to establish Tomáš Baťa University in Zlín.

A number of historical decisions were taken at FEECS in 2001 in connection with the founding of a new faculty - 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).

Faculty in 2010

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, Professor Radimír Vrba served his second term in office until 31 January 2010, together with four vice-deans and the faculty bursar: Professor Jarmila Dědková (Vice-Dean for Bachelor Programme, Acting Vice-Dean), Professor Stanislav Hanus (Vice-Dean for Master Programme), Professor Ivo Provazník (Vice-Dean for External Relations and International Affairs), Professor Vladimír Aubrecht (Vice-Dean for Research and Postgraduate Study), Miloslav Morda (Faculty Bursar). Since 1 February 2010 the new Dean Professor Jarmila Dědková has been in office. The vice-deans are Professor Radimír Vrba, (Vice-Dean for External Relations and International Affairs, Acting Vice-Dean), Petr Fiedler, Ph.D., (Vice-Dean for Bachelor Programme), Professor Stanislav Hanus (Vice-Dean for Master Programme), Professor Vladimír Aubrecht (Vice-Dean for Research and Postgraduate Study) Miloslav Morda has been the Faculty Bursar.

At the end of 2010 there were 222 academics (professors, associate professors, lecturers and other research and pedagogical staff) and 3,921 students in all forms of state-supported programmes. Moreover, education was provided for 325 students of the Faculty of Information Technology, 46 students of the Faculty of Mechanical Engineering and 21 students of the Faculty of

Management. On the other hand, the Faculty purchased tuition for 19 students from the Faculty of Management and for 6 students from the Faculty of Information Technology. As a result, the total number of students taught at the Faculty is 4,305. In 2010 education was provided in study programmes Electrical Engineering, Electronics, Communication and Control Technology (EECR) accredited in 2001 and Biomedical Technology and Bioinformatics (BTBIO-F) accredited in 2010 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 2010 there were 463 students who completed their studies in the Bachelor degree programme, 487 Master programme graduates and 17 doctoral students completed their postgraduate studies. There were 1,300 students coming to the Faculty, 609 students in the follow-up Master programme, and 124 in the doctoral programme. Tuition in English was provided to 11 international students paying their fees. Eight academics were habilitated and appointed associate professors with the title Docent. There was one appointment to professorship.

Events and Activities

Completion of the new FEEC building at Technická 10 in the campus Pod Palackého vrchem, and moving in the Dean´s Office, departments of Electrotechnology, Languages and Microelectronics

Ceremonial opening of Technická 10 on the occasion of the founding of the independent department of electrical engineering at the Czech Technical School in Brno 100 years ago

Start of construction of Technická 12 in the campus Pod Palackého vrchem

Meeting of the former deans and first graduates of the Electrotechnical Faculty on 24 September 2010 organized by the club Elektron

Commencement of the first year of the Master degree programme BTBIO-F Biomedical Engineering and Bioinformatics

Courses for secondary school students interested in study at FEEC to help them prepare for entrance examinations at FEEC, organized by the Department of Mathematics

Open Door Days (December 2010, January 2011), visits by students and teachers to secondary schools, secondary school advisors visiting FEEC

Presentation of new study programmes at the trade fair of higher and lifelong education Gaudeamus 2010, November 2-5, to promote FEEC and arise interest of secondary school students in study at FEEC

Meeting of the leaderships of Czech and Slovak faculties of electrical engineering and associated faculties in Liberec, 19-21 May 2010

Publication of the faculty yearbook 2009/10

Development of programmes leading to habilitations and professorship

STUDENT EEICT 2010 Conference and Competition organized in cooperation with the Faculty of Information Technology and sponsored by ABB, Honeywell, ČEPS, a.s., Škoda Auto, Freescale Semiconductor, UNIS, etc. with 59 Bachelor, 124 Master and 98 doctoral papers, and 4 papers by secondary school students

The Lifelong Learning Programme Erasmus and other European programmes

Full operation of IS Apollo

Continuation of three research plans commenced in 2005 (scheduled 2005-2009 or 2011), chief investigators Jiří Kazelle, Zbyněk Raida who substituted the late Jiří Svačina, Radimír Vrba, and another research plan commenced in 2007, chief investigator Pavel Jura

Commencement of two European projects funded by the Operational Programme Research and Development for Innovations, Priority axis 2 – regional R & D centres ´SIX – Centre for Sensoric, Information and Communication Systems´ and ´CVVOZE – Centre for Renewable Electric Energy Sources´, investigators Zbyněk Raida and Vladimír Aubrecht

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 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-fourth faculty ball at the Voroněž hotel

Achievements

Taking into account the BUT budget restrictions and the consequent cuts at the end of the year, the economic results of FEEC in 2010 were good. The undesirable consequences of budget restrictions also meant salary cuts, and at the start of the new economic year some unpopular human resources measures were unavoidable. Stating that the trend in salaries and material supply has been stable, we have to bear in mind that it is the result of maximal achievements of FEEC academic staff in pedagogical and research work. The economic stability was to a great extent due to involvement in research projects of the Czech Science Foundation, Foundation of Czech Academy of Sciences, Ministry of Industry and Trade, European Commission (FP6 and FP7) and Higher Education Development Fund mainly owing to the efforts of all those who under the leadership of chief investigators participated in four research plans and three research centres.

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. Ing. Radimír Vrba, CSc.
Acting Dean, Vice-Dean for External Relations and International Affairs

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

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

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

Chairman of Academic Senate
Doc. Ing. Miloslav Steinbauer, Ph.D.

Faculty Secretary
Ing. Miloslav Morda

Student Advisor to the Dean
Tomáš Szöllősi

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 Physics
Department of Biomedical Engineering	Department of Power Electrical and Electronic Engineering
Department of Electric Power Engineering	
Department of Electrotechnology	Department of Radioelectronics
Department of Languages	Department of Telecommunications
Department of Mathematics	Department of Theoretical and Experimental Electrical Engineering
Department of Microelectronics	

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.
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
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.

Contacts

Address: FEKT VUT, Technická 3058/10, 616 00 Brno
Phone: operator 54114 1111, 54114 xxxx
E-mail: info@feec.vutbr.cz
Fax: 54114 6300
Internet: http://www.feec.vutbr.cz

Accredited Programmes and Study Areas

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

Follow-up Master Degree Programme Electrical, Electronic, Communication and Control Technology
Study Areas: Biomedical and Ecological Engineering

Power Electrical Engineering

Electronics and Wireless 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 Areas: Biomedical Engineering and Bioinformatics

Doctoral Degree Programme Electrical Engineering and Communication Technology
Study Areas: Biomedical Electronics and Biocybernetics

Electronics and Wireless 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 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 the study area Biomedical Technology and Bioinformatics (A-BTB). Also taking part in tuition in this interdisciplinary programme is the Medical Faculty of 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 and Masaryk University). Students gain theoretical knowledge in mathematics, physics and chemistry, basic knowledge in biology, human anatomy and physiology, necessary for understanding 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.

Included in the programme is a four-week professional training in hospitals, health centres, insti-tutions and companies focused on medical treatment, research, production 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 semesters (mainly during the summer holidays) before completion of Bachelor studies.

The top limit approved by Academic Senate for admission to full-time study in academic year 2010/11 was 150. The entrance examination took place on 8 June 2010. The written examination contained tests in mathematics and biology. Applicants who took their school-leaving examination in biology or mathematics with grades 1 or 2 and achieved an average of 1.7 were exempt from the examination. Also applicants who completed the FEEC preparatory course in mathematics with grade 1 or 2 and achieved a school-leaving examination average of 2 or better were exempt from entrance examination. The maximum number of points to be achieved in each subject was 50 and the pass was 12 points for each subject. All applicants who passed the entrance examination and all those exempt from the examination were admitted.

In 2010 FEEC received 233 paid applications for admission to BTBIO-A, 150 applicants were admitted and 120 registered for study at FEEC. There were 268 students in the BTBIO-A programme in 2010.

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 2004/05.

In 2010, 1488 full-time students enrolled in the Bachelor programme EECR-B. Studies were completed by 394 full-time students, 89 of them in the study area Automation and Measurement Technology (B-AMT), 112 in Electronics and Communications (B-EST), 37 in Microelectronics and Technology (B-MET), 68 in Power Electrical and Electronic Engineering (B-SEE) and 88 in Teleinformatics (B-TLI).

In the part-time Bachelor programme EECR-BK there were 206 students in 2010. The part-time study programme was completed by 28 students, 7 of them in Automation and Measurement Technology (BK-AMT), 5 in Electronics and Communi-

cations (BK-EST), 7 in Microelectronics (BK-MET), 1 in Power Electrical and Electronic Engineering (BK-SEE) and 8 in Teleinformatics (BK-TLI).

Admission procedure is a priority at the Faculty. It took place on 8 June 2010. Applications for full-time and part-time formats of 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 study average of 1.7 (arithmetical average of grades in final reports for 1st, 2nd and 3rd year and the first half of the 4th year). 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 were exempt from the examination were admitted. In 2010 there were 1,440 applicants, 1,219 of them for full-time study and 221 for part-time study. Finally, 961 students were admitted, 808 to full-time study and 153 to part-time study. A second round took place, with 118 applicants for full-time study and 28 applicants for part-time study. Finally, a total of 825 students enrolled, 702 full-time students and 123 part-time students. The statistics show lasting interest in part-time

study. Graph 1 shows numbers of applicants, admitted and enrolled full-time students since 2004. The decreasing numbers of applicants are due to the demographic trend and students´ interest in newly accredited Bachelor programmes at other universities. In academic year 2010/11 applicants were admitted directly to a selected specialization. In the previous years they selected their specializations during their studies. Statistics from academic years 2004/05 - 2009/10 and numbers of students enrolled in individual study areas in academic year 2010/2011 are in Table 1.

The level of incoming students has been monitored for many years. An important factor is the percentage of admitted students who have taken the school-leaving examination in mathematics or physics, see Graph 2. Another indicator are the percentages of applicants coming from different types of secondary schools, as seen in Graph 3 (G – gymnasium-type schools, SPŠ – technical secondary schools, SOU – technical training centres). The graph shows that numbers of applicants coming from gymnasium-type schools remains stagnant.

Preparatory courses were offered by the Departments of Mathematics and Physics to assist applicants preparing for entrance examinations and help them adapt to university study.

Information on study programmes and qualifications such as Certificate of Electrotechnical Qualification, Certificate of Pedagogical Practice, Micrososft Certificate, Cisco Certificate are regularly presented in the media, on Open Door Days, visits of teachers and students to secondary schools, at the Gaudeamus fair to promote the study programmes offered at FEEC and raise interest of secondary-school students

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

Acade-mic year		B-AMT	B-EST	B-MET	B-SEE	B-TLI	Not given	Total
2004/05	Number	155	243	77	96	362	119	1052
	%	16,6	26,0	8,3	10,3	38,8		
2005/06	Number	153	241	74	120	331	119	1038
	%	16,6	26,2	8,1	13,1	36,0		
2006/07	Number	139	172	68	95	221	89	784
	%	20,0	24,7	9,8	13,7	31,8		
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		
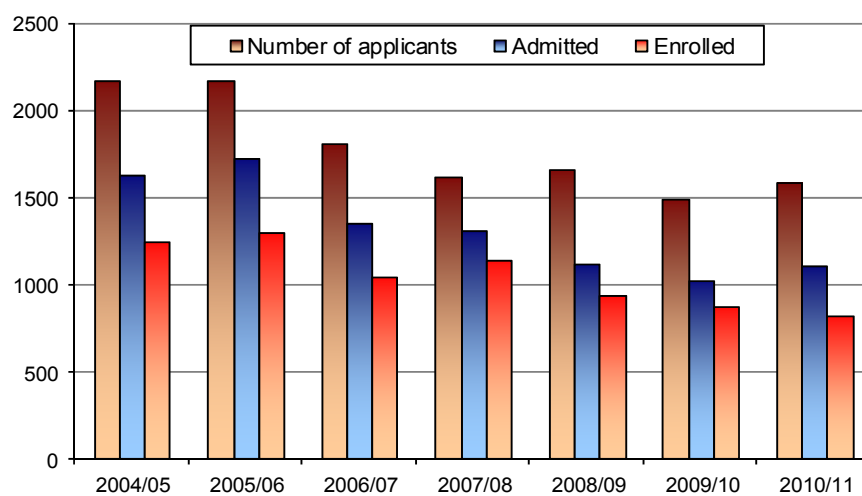
Graph 1: Applicants, admitted and enrolled in full-time and part-time format of EECR-B
in academic years 2004/05 - 2010/2011
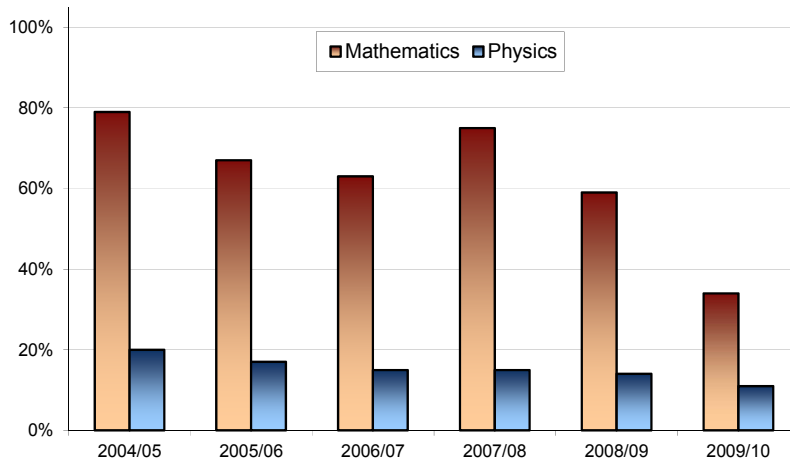
Graph 2: Percentages of applicants who have taken school-leaving examination in mathematics or physics
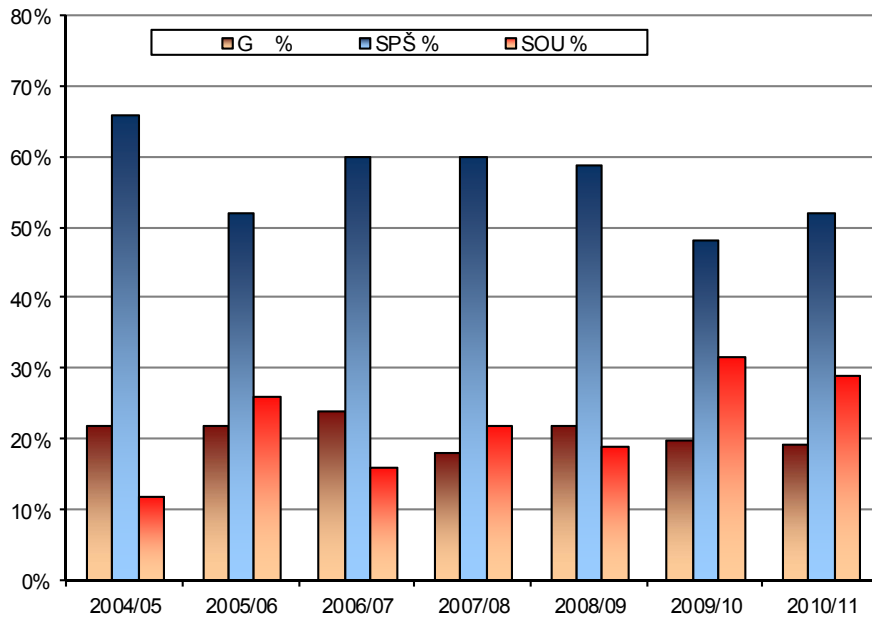
Graph 3: Percentages of students coming from different types of schools
(G – secondary schools, SPŠ – secondary technical schools, SOU – training centres)

14

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

The Faculty has provided education in the follow-up Master programme Electrical, Electronic, Communication and Control Technology in full-time format of study since academic year 2005/06 and in part-time format of study since academic year 2007/08. In 2010 there were 1,020 full-time students in the follow-up Master programme EECR-M, 404 in the first year and 616 in the second year. And there were 180 part-time students in the EECR-ML programme, 97 in the first year and 83 in the second year of study.

In 2010 the full-time programmes were completed by 449 students, 53 of them in the study area Biomedical and Ecological Engineering (M-BEI), 16 in the study area Power Electrical Engineering (M-EEN), 81 in the study area Electronics and Communications (M-EST), 44 in Electrotechnical Manufacturing and Management (M-EVM), 50 in Cybernetics, Automation and Measurement (M-KAM), 38 in Microelectronics (M-MEL), 26 in Power Electrical and Electronic Engineering (M-SVE) and 141 in Telecommunications and Informatics (M-TIT).

The total number of applicants for study in the follow-up Master programme EECR (sending in the required application fee) was 725, 590 applied for admission in the full-time programme (EECR-M) and 135 to the part-time programme (EECR-ML). For academic year 2010/2011 the maximum numbers of admissions approved by Academic Senate were 850 (full-time study) and 250 (part-time study). The written entrance examination consisted of 10 tasks, two from each of the five subjects approved by the Council of Study Programmes – Electrotechnical Engineering 1, Electrotechnical Engineering 2, Electronic Components, Signals, Structures, Systems and Measurement in Electrical Engineering. The time limit was 75 minutes. Applicants were divided into five groups with subgroups A and B. An applicant could achieve a maximum of 100 points, 10 for each task. 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 25 June 2010 nearly all applicants enrolled. The second term of entrance examination on 8 July 2010 and the Committee meeting on 26 August 2010 were cancelled. The total number of admitted was 696, 589 in full-time study and 107 in part-time study. All admitted students were registered for the study areas they had selected. Numbers of applicants and admitted by study areas are in Table 2, 676 of them enrolled, 571 in full-time and 105 in part-time study.

Follow-up Master Degree Programme Biomedical Engineering and Bioinformatics

In academic year 2010/11 the Faculty has opened the follow-up Master degree programme Biomedical Engineering and Bioinformatics BTBIO-F in full-time format of study. In 2010 there were 43 students in the first year of study. The total number of applicants for study in the BTBIO-F (with paid fee) was 52. The maximum number of admissions approved by Academic Senate for full-time study in academic year 2010/2011 was 250. The written entrance examination consisted of 10 problems from two thematic areas selected by the Council of Study Programmes and published on FEEC websites. The time limit was 75 minutes. An applicant could achieve a maximum of 100 points, 10 for each task. As the number of applicants was lower than the number approved for admission, 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 25 June 2010 nearly all applicants enrolled. The second term of entrance examination on 8 July 2010 and the Committee meeting on 26 August 2010 were cancelled. The total number of admitted was 52, and 43 of them enrolled.

Lifelong Education and Self-Paid Study

Following Amendment to the Higher Education Act No.111/98, FEEC started activities in the lifelong education system. A whole range of specialized courses for professionals are offered. For those interested in the study programme EECR, paid courses are offered in both the Bachelor programme and the follow-up Master programme. Having completed these courses and earned the prescribed number of credits, students can enrol in full-time study at FEEC without being required to pass entrance examination, and the earned credits will be recognized. In 2010 there were 55 students in the lifelong education programme

In 2010 there were four international students paying their fees, two of them in the three-year of the Bachelor programme EECR and two in the follow-up Master programme.

Table 2: Numbers of applicants and admitted in study areas in the follow-up Master programmes EECR-M and EECR-ML in 2010. 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 Information Technology (M-TIT, ML-TIT)

Study area	Numbers of applicants	Numbers of admitted	Study area	Numbers of applicants	Numbers of admitted
M-BEI	57	57	ML-BEI	16	14
M-EEN	67	67	ML-EEN	12	9
M-EST	127	127	ML-EST	15	12
M-EVM	63	63	ML-EVM	23	21
M-KAM	97	96	ML-KAM	20	16
M-MEL	25	25	ML-MEL	7	7
M-SVE	29	29	ML-SVE	11	7
M-TIT	125	125	ML-TIT	31	21

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 2010 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 Activites, Science and Research

Growth in research continued in 2010, in terms of both the funds and quality of research. As compared with the previous year, the funding obtained for research and development (graph 4) increased by approximately 3%. The major sources were four research plans including institutional support followed by the Czech Science Foundation projects and projects conducted in cooperation with industrial companies as well as international projects.

Original scientific and research results were published in three international monographs and in 67 articles in impact journals. FEEC received two national patents.

Research and development funding scheme
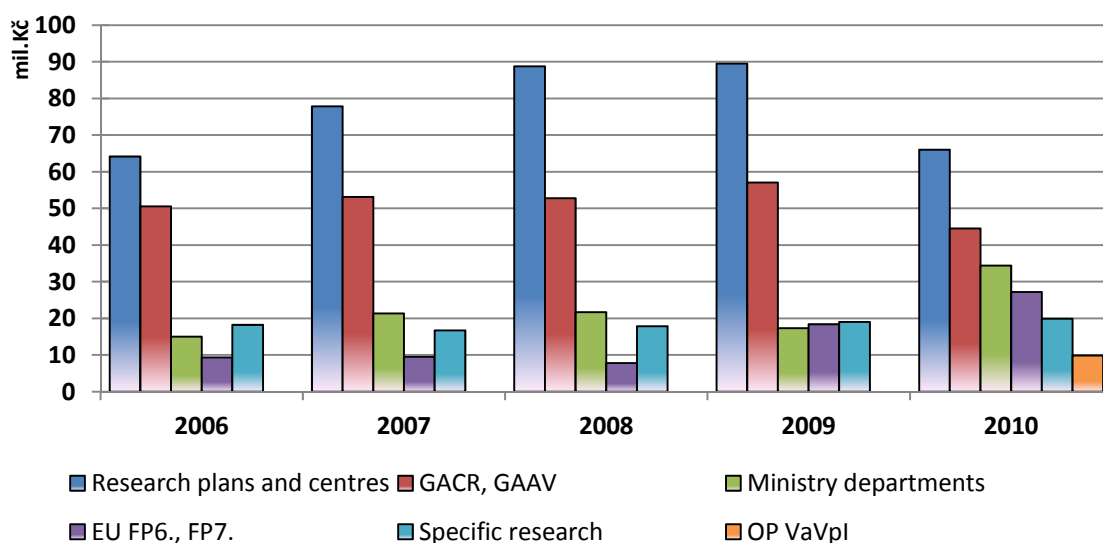
Graph 4: Research and development funds at FEEC in million CZK, 2006 - 2010

Research Plans, Research Centres

Outstanding development and research results were achieved by teams involved in four research plans and three research centres. A brief evaluation follows:

New Trends in Microelectronic Systems and Nanotechnologies (MIKROSYN)
(Investigator: Radimír Vrba)

The research plan is focused on basic and applied research on microeletronic systems and technologies. The research covers several interconnected study areas with focus on integrated circuits and systems and their elements and technology. The research is based on and supported by modelling and simulation of semi-

conductor circuit structures, their diagnostics and development of implementation technology.

Involved in the research plan in 2010 were academics and Ph.D. students from departments of Microelectronics, Physics, Control, Measurement and Instrumentation, Mathematics, Theoretical and Experimental Electrical Engineering, Radioelectronics and Languages. Also taking part in the research plan were researchers from the Faculty of Information Technology and Faculty of Mechanical Engineering. There were 37 investigators in category D1, 38 in category D2 and 7 in category D3 -17 professors, 17 associate professors, 26 senior lecturers, 2 lecturers and technical and administrative staff of 29 and 36 full-time Ph.D. students.

The research plan covered five areas where the following major results have been achieved.

1.Theory, design and diagnostics of low-voltage and low-power integrated circuits (IO) in submicron technologies: Two operating samples of ONSemiconductor CMOS07 integrated circuits were prepared for manufacturing. The circuits were designed and simulated in the design environment Cadence. The designed circuits and systems deal with analog/digital signal conversion, systems of digitally controlled analog circuits, improvement of characteristics or digital tuning of conventional analog circuits. It is namely the sigma-delta 14 bit A/D converter with input voltage range ±2 V, input voltage asymmetry compensation system in operational amplifier for continuous operation of compensated amplifier. A DP second-order tunable analog filter with gm-C topology was designed, composed of active OTA circuits with tunable gm parameters and capacitors. New topology was designed for the digital generator of reference tunable harmonic signals for spectrometric integrated systems. An SPI communication was designed – a digital block for standard serial communication between an integrated system on chip and a peripheral device.

2. Modelling and simulation of integrated circuits: NMOS simulations of direct tunneling current were performed, including channel and gate overlap contributions. Quantum phenomena in the NMOS transistor channel were simulated using the phenomenological van Dort model and compared with the conventional model neglecting quantization phenomena and with exact direct solutions of equation systems (Schroedinger and Poisson). Modification of conventional drift-

diffusion equations via material parameters was investigated as well as the posibility of using modified equations for quasi-ballistic transistors MOSFET simulations. Electromagnetic emission interaction with so called artificial dielectrics was studied, mainly wave scattering on scattering centres of various shapes and properties (dielectric, metal) randomly distributed in dielectric substrate

3. Microsystems and nanosystems: Comparative measurements of electrochemical sensors with surface covered with metal nanotubes were carried out. The impact of nanowires on diffusion layer dimensions was confirmed. Operating electrodes on Cu_2O basis were prepared. The Cu_2O nanoparticles were made by simple two-step synthesis using copper acetate as the basic substance. New technologies of preparation high-capacity condensers on chip were investigated. Research was also centred on thick-layer sensors for detection of substances dissolved in solutions with multi-walled nanotubes. A suitable polymer adhesive for TLV pastes for silkscreen printing deposition was developed. The three-electrode sensor system was optimized and an optimal electrode shape determined. A testing station for verification of detection abilities of sensors. The potentiostat measurement device was redesigned. Research was also focused on application of ontology for interoperability during processing data transfer from scanners. Processing data ontology can minimize transferred data distortion in heterogeneous systems and this way achieve interoperability, which was the primary goal of the research.

4. Advanced microelectronic and nanoelectronic technologies: A heated thermodynamic chamber for cyclic voltammetry analysis of fluids, dispension heads for selective deposition of viscose materials with additive ultrasound energy was manufactured. An operating model and operating sample of thermal radiation thermodynamic sensor for glass fibre damage monitoring and an operating sample for measurement of solid materials thermal properties were produced. Methodology of connecting tensometric pressure meters was developed. A thermodynamic sensor modified for monitoring the process of milk curdling was used for a series of tests. Multilayer structures on the basis of low contraction LCTT substrate were investigated. Experimental LTCC structures were created for electrochemical sensors. The LTCC technology was used to design and

18

manufacture a calorimetric sensor principle for low flow measurement. Topology was designed and properties of planar (interdigital) capacitors on anorganic substrate were experimentally verified.

5. *Modern diagnostics of materials and components:* Diagrams for contacting solar cells with optically thin semiconductor layers for removing problems occurring in upper contacts of cells. Signal/noise characteristics of oxide layers of noble metals were obtained for cold emission into vacuum. Experimental samples of cold-emission cathode were manufactured and research on increasing their service life has been carried out. A COMSOL model of two-phase nanocircuit was made and its behaviour in electrostatic field was studied. Also investigated were nanosensors of physical and chemical QCM substances. Significant information on solar cells defects were obtained by measuring cell topology, local reflectivity, local emission from the vicinity of defects or local radiation electric response scanning (Electron Beam Induced Current – EBIC, Light Beam Induced Current – LBIC, Near Optic Beam Induced Current – NOBIC) and by monitoring their connection with measured electric characteristics. Remarkable results were achieved in localization of defects by measurement of transport and noise characteristics in CdTe radiation detectors. A relationship was revealed between ion diffusion time and conductivity change.

Research results achieved in 2010 were published in 4 monographs, 88 articles in international journals, 181 papers at international and national conferences. Five dissertations and three habilitations were defended, and one team member was appointed to professorship. The research team defended 17 research reports.

In connection with the research plan the team members were involved as investigators or co-investigators in 4 international projects, 12 CAČR projects, 22 FRVŠ projects, 9 MPO projects, 2 GAAV projects and projects for other institutions.

New Generation Electronic Communication Systems and Technologies (ELKOM)
(Investigator: Zbyněk Raida)

The research is centred on advanceed communication systems (optical, satellite, wireless and cable communications) and their components (analog and digital electronic circuits, aerials and microwave circuits, network components, signal processing). Attention is paid to problems relating to operation of communication systems such as electromagnetic compatibility of communication services and facilities, operation safety and security of information transfer, impact of communication facilities on living organisms or environmental awareness. Research of this extent can be implemented only in cooperation of several departments – Radioelectronics, Telecommunications, Biomedical Engineering and Theoretical and Experimental Electrical Engineering. The investigation team includes more than 70 academics, 80 full-time Ph.D. students and technical and administrative staff of 10.

The investigation team consists of 6 research groups:

1. New generation wireless and mobile wideband communication systems (Stanislav Hanus)

Analysis of radio spectrum utilization in various localities (Brno, centre of Paris) for cognitive radio applications was carried out. Different types of radio signals detectors were created in the MATLAB environment using software defined radios. A flexible architecture was designed and analyzed for a hybrid frequency synthesizer with switching integer and non-integer division for 800 MHz to 6 GH range. A set of Nyquist δ – filters for narrowband radio broadcasting in software defined radio was developed. Digital TV transmission distortions were simulated and measured according to standard DVB-T/H. An UMTS model was developed for simulation of investigated algorithms for network access control and their comparison. Research was focused on detection on radio communication signals based on cyclostationary characteristics of detected signals and a method of achievable outputs for determination of the worst possible turbulent attenuation. Alsodesigned was an optimal shape of laser beam intensity profile for optical wireless communication in turbulent atmospheric transmission environment.

2. Multimedia and hypermedia communication services and technologies (Vít Novotný): Modelled and implemented were algorithms for access points localization in Internet network. Precision and computing efficiency were compared. A mobile terminals application was designed for stream video reception and transmission. Original methods of multimedia watermarking were developed. The VoIP protocol safety was tested. Also developed were methods of classification and ´mining´of information from different types of data

19

files as well as original methods of acoustic data noise suppression and methods of parallel processing of real-time acoustic signals taking into account delay of single audio flow in traffic. Further designed were self-balancing hierarchical structures for data collection from a high number of end points (e.g. IPTV). VoIP internet exchanges were implemented with integration of existing distribution devices. A tester of partial components was designed.

3. High frequency and microwave structures of communication systems (Miroslav Kasal): An original method of analytical computation of fissure antennas emissions in time domain was designed a modified method of finite elements with adaptive time step selection (analysis of narrow pulses with long fading out). Multiphysical models of semiconductor lines with scattered amplification were implemented. Evolution and swarm-intelligence synthesis of substrates with electromagnetic band gap. Parabolic antenna emitters were implemented for experimental L band Moon reflection communication.

4. Advanced technologies of integrated communication systems (Vladislav Škorpil): An analytical method was developed for L3 handover Mobile IPv6 latency evaluation. A prototype of an application 180-line modular IP exchange was manufactured. A universal authentication framework was designed. The hierarchical transmission of signals in IPTV (Internet Protocol Television) systems with a high number of receivers. Power networks for PLC communication testing were modelled. Communication units for indicators of earth connections and short-cut currents by means of the GSM network were implemented, an artificial intelligence controlled network element was developed, a probability analysismethod for a new mechanism of quality assurance in WLAN network was designed. A user controlled QoS system expanding the difference service mechanism (DiffServ) was implemented.

5. Special electronic circuits and operating blocks for modern communication systems (Zdeněk Kolka): Meminductor and memcapacitor models for Spice Simulator were designed (world primacy). New analog elements with output current copies (Z Copy-Current Inverter Transconductance Amplifier), ZC-CG-CDBA (Z Copy-Controlled Gain-Current Differencing Buffered Amplifier), CFTA (Current Follower Transconductance Amplifier) and many new connections of frequency filters and oscillators. A new

active element DACA (Digitally Adjustable Current Amplifier) was designed and implemented in I3T80-BiCMOS 0.35 um technology. Also developed was a fully digital algorithm for recovery of symbol synchronization implemented in FPGA.

6. Digital methods of analysis, processing and transmission of multimedia signals and images (Ivo Provazník): A method for contactless scanning of electric effects of isolated animal heart with laser stabilization for suppression of movement artefacts was developed as well as a method for segmentattion of arterial blood bed on retina on the basis of adapted 2D directional filtration. Three-dimensional reconstruction of the arterial tree of lower limbs was performed, controlled reconstructions of ultrasonic images based on measured data and parallel computations. Efficient methods of detection and compensation of specific effects (stress, alcohol) in speech signals were developed.

In 2009 and 2010 all research teams published their results in 68 articles in Web of Science journals, nearly 250 articles in reviewed journals, 5 monographs and 800 papers presented at conferences. The research yielded 30 operating samples, 80 software products and one patent.

The investigation team cultivated contacts and research cooperation with European partners in the framework of three COST projects and two FP7 projects. Cooperation was extended with other European research institutions in the regional centre of applied research SIX (Centre for Sensoric, Information and Communication Technologies). The quality of research has been increasing by involvement in 2 projects of the Operational programme Education for Competitiveness.

All above steps have been taken to secure the viability of the research team in the period following completion of the present research plan (2012).

Resources, Accumulation and Optimization of Electric Energy Exploitation in Conditions of Permanently Sustainable Growth
(Investigator: Jiří Kazelle)

The research plan is focused on the following areas:

Optimization of utility characteristics of lead-acid accumulators, explanation of the mechanisms of

failures, modelling of currents over electrode surfaces.

Research of the properties of new gel polymer electrolytes, carbon electrodes, and electrocatalysts of lithium-ion batteries, fuel cells and super-capacitors, electrocatalysts for fuel cells and new-type nickel-zinc accumulator.

Study of material structure in the environmental scanning electron microscope, research of signal detection and optimization of monitoring.

Research of transport systems with alternative electric energy sources. Exploitation of electric power produced by small hydroelectric plants for charging of electric vehicles.

Artificial intelligence in electromechanical systems and electric drives. Identification and optimization of the parameters and design of electrical machines using artificial intelligence algorithms.

Up-to-date methods of electromechanical energy conversion and management. Application of the theory of chaos and fractals to describe non-linear dynamic systems with variable parameters.

Mathematical-physical modelling of energy transfer by radiation in thermal plasma.

Development of methods for allocation of electric energy losses due to dissipated sources, methods for localization of failures in the distribution network, and maintenance strategy optimization.

Research of low-potential sources of heat, thermoelectric converters and non-traditional methods of heat accumulation, reduction of power consumption in heating and lighting systems.

Research of methods for analysis of brightness conditions using digital photography.

Involved in the research plan were academics and Ph.D. students from departments of Electrotechnology, Power Electrical and Electronic Engineering, Power Electrical Engineering, Theoretical and Experimental Electrical Engineering, Languages and Mathematics. The investigation team involved 25 investigators in category D1, 5 professors, 15 associate professors and 4 lecturers, 12 associate professors and 43 engineers, 11 researchers, and technical staff of 46 including 27 Ph.D. students. There were 17 team members in category D3.

Funding amounted to 14, 859, 000 CZK.

The research plan covered four major areas. The major achievements in the sixth year are as follows:

1. Chemical sources of electric energy: Study of effects of conducting and non-conducting additives in negative active mass of lead accumulators in PSoC mode. Evaluation of longterm tests focused on effects of additive types and amounts, combination of effects due to pressure and additives. Optimization of a modified conductometry-method for measuring internal resistance componets in lead accumulator. Verification of the current pulse method applicability in real conditions to check the state of charge (SoC) in lead accumulators. Simulation of the distribution of current, internal resistance and passed charge in spiral electrode systems in lead accumulators, optimization of current flags. Research and development of materials for reduced combustibility lithium-ion accumulators, new high conductivity gel polymer electrolyte with a trimethylsilyl group in polymer molecule. Research of liquid electrolytes with a high ignition point i.e. increased ignition resistance, on the basis of sulpholan and its analogues, study of factors affecting conductivity and solidification point. In cooperation with BOCHEMIA stability of various modifications of $Ni(OH)_2$ for positive electrode including doping with other metals. Research and development of membranes and electrolytically formed catalytic layers for electrodes in electrolyzers for oxygen and hydrogen generation. In cooperation with Institute of Instrument Technology, Czech Academy of Sciences research on signal electron detection in microscopes working at high pressure conditions in the specimen chamber (VPSEM), service monitoring of the surface structure of supplied battery mass samples in VPSEM.

2. Optimization of electrochemical energy conversion: Designs of engines for automotive applications – engines with 60, 80, 90 and 95 mm outer diameter where the existing design was analyzed and innovations proposed for increased efficiency and simplified manufacturing technology, dc motors with diameters of 80 and 95 mm – analysis and optimization of magnetic circuit, small asynchronous motors – analysis of loss and efficiency of single-phase motors with an auxiliary phase and 350 - 500 W capacitor. Optimization of the shape of magnets for synchronous servomotors by artificial intelligence targeted at improved THD. Models of electrical machines with substitute magnetic circuits.

3. Optimization of energy conversion and exploitation in systems with ecological power sources:
An analysis of disturbing flickering of light sources due to interharmonics in supply voltage with one superimposed interharmonic component was carried out and an alternative time-domain flicker meter was designed with response in a wide range of interharmonic frequencies including high frequency interharmonics. A universal mathematical apparatus for digital processing of brightness maps was created, which would not be possible in conventional processing. Also created was a prototype of traffic signs tester based on digital photography analysis. A concept of active appliances was presented, capable of consumption control in network. Verification of the method of defect phase earthing in high-voltage network failures including analysis of effect on contact voltage magnitude. The basic relationships and methods of computing the structure and thermodynamic properties of a closed heterogeneous system in thermodynamic equilibrium at a constant pressure. Research on applications of local emissions of light for fast and reliable non-destructive detections of defects and testing the quality, reliability and service life of solar cells. Development of software for mathematical modelling of emission energy transport by the method of partial characteristics in different types of plasma.

4. Alternative ecological transport: Research on an optimal rotor frequency in asynchronous motor continued. Certain analytical relations derived earlier were further developed or simplified. Fast charger development for Ni-Cd 150V/100Ah traction accumulator continued. The output parameters are 160V/100A. The progressive concept with CoolMOS transistors silicon carbide diodes has been employed.

Research results achieved in 2010 were published in a scientific monograph, 7 articles in impact journals ISI, 15 articles in reviewed journals, 187 articles in conference proceedings. The team received 17 operating samples and 1 patent.

There were 4 habilitations of category D1 team members and 6 dissertations were defended by category D2 team members. Two significant world conferences were organized with research plan support.

Research plan investigators participated in 8 GAČR, 1 GAAV and 11 MPO projects. They were co-investigators of a research plan at the

Faculty of Mechanical Engineering, BUT and were involved in a 7 FP EU project.

In 2010 research plan team members started their involvement in the regional centre CVVOZE ´Centre of Research and Exploitation of Renewable Energy Sources´.

Intelligent Systems in Automation

(Investigator: Pavel Jura)

The research plan deals with up-to-date methods and tools making up the design system for automation of processes focused on methods of artificial intelligence utilization. Research is focused on up-to-date methods and procedures of data scanning and verification, optimization, process monitoring and diagnostics, modelling of systems and research on control algorithms using artificial intelligence. Emphasis is laid on new communication and internet technologies.

Involved in the research plan in 2010 were academics and Ph.D. students of the departments of Control, Measurement and Instrumentation and Mathematics, and the Department of Automation and Informatics of the Faculty of Mechanical Engineering. The investigating team included 5 professors, 9 associate professors, 13 lecturers and senior lecturers, technical and administrative staff of 3 and 14 Ph.D. students.

The research plan covered 5 study areas where the following results were achieved in 2010:
1. Smart control and identification algorithms: Development of toolboxes and implementation into PLC B&R and development of new adaptive control algorithms on the principles of artificial intelligence with short sampling period continued. Direct implementation of control algorithms from Simulink to the programmable automatic B&R was completed. The development will be continued in cooperation with the company B&R, which has shown great interest in this method.

Research on electric drives dealt with the development of sensorless control algorithms for synchronous engines with permanent magnets. Algorithms for robust state estimation were designed. Predictive and robust control of synchronous motor was investigated and new control structures with favourable properties verified by simulation experiments were designed. As a mathematical support, new algorithms were designed for singular continuous dynamic systems solutions, and integral unequalities were used to determine solution restrictions for Volterr integro-differential equations. Significant results were achieved in

stability studies of systems of linear delay differential equations of neutral type.

2. Control of complex systems: Development of advanced optimization algorithms based on artificial intelligence methods continued (cooperation with University of Vaasa, Dept. of Computer Science, Finland). Designed and tested were novel methods of automatic generation of control algorithms (regulation laws) based on evolution principles. The designed algorithms were parallelized using MCPU and GPU. The international conference MENDEL 2010 was organized with focus on soft-computing, smart control, fuzzy, simulation, artificial intelligence. The conference was included in the WoS (ISI Thomson) index. The research plan team obtained the Best Paper Award (World Congress on Engineering and Computer Science - ICSCA 2009, Berkeley, USA). Methods of automatic generation of control algorithms were designed and tested, and results published. New models of omnidirectional mobile robots control were designed. Several operating samples were completed (smart weight model, omnidirectional robot chassis, radar platform model).

3. Artificial intelligence and robotics: Research was carried out on autonomous self-localization and navigation of mobile robots. A unification system service robots control was created in the outer environment Cassandra. Five robots with different, mutually complementing properties for study of the posibility of cooperation in joint missions were designed. Work on a local reference network for testing the quality of self-localization and navigation of mobile robots was completed. The data was provided to the robotic community and was used by teams preparing for competition of autonomous conveyors Robotour. Research on non-conventional drives in robotics of pneumatic muscles and shape memory metals was carried out, with more emphasis on testing navigation sensors and systems than originally intended.

4. Communication networks and processing automatic systems: A measuring workplace was developed for measuring delays in Ethernet networks and was used for measuring parameters of active network elements (switches and routers). Measurements were centred on quantification of elements without delay and influence of element load and configuration (QoS) on the average magnitude and scattering of delay.The measurements supported modelling of active elements. Measurements on the switch HP ProCurve1800 were performed as well as measurments on routers CISCO 871, CISCO1812 and CISCO 2811 with the HWIC-2FE module. The influence of the routing HW architecture method was studied in routers (switching to L3 / routing), influence of QoS algorithms (FIFO, PQ, WFQ) and flow classification (DSCP code). Measurement results were used to form a hypothesis on inner element architecture, create models of elements using Network Calculus tools. The measurements helped to consider the real possibilities of using the routed Ethernet (IP, UDP, RToUDP) in real-time domain and finding configurations where delays and their scattering are minimal under the defined conditions. Owing to connection with 6th FP EU, the achieved results could be verified in an industrial application emulating control of logical-dynamical systems by means of an extensive distributed control system.

5. Methods and tools for automated measurement: Research continued on contactless vibrodiagnostics and localization of noise sources by means of acoustic holography through implementation of scanning microphone field with digital output MEMS microphones, development of algorithms and measurement methods for acoustic fields processing in the LabVIEW environment and their testing. Verified in practice was the usability of contactless methods in vibrodiagnostics and acoustic emission measurement in industrial applications (measurement of resonant frequency of pressure vessel, analysis of material particles size) and of interferometry for measurement of transfer along lines of vibrations due to pressure pulsations. Practical experiments were carried out on solar panels for photovoltaic power plants (diagnostics of silicon structure defects). In research on computer vision attention was paid in 2010 to the development of methods of fast and reliable quality control in commercial products such as the device for visual control of automotive air-conditioning units, which detects and verifies operation of individual panel elements and a system for visual defectoscopy and recognition of parts of automobile connectors. The group was also involved in development of transport systems, mainly driver support in vehicle interior, system for vigilance or fatique monitoring, mainly based on recognition of winking, its frequency, short- or long-time closing of eyes. The design of photogrammetric problems continued by development of an efficient multifunctio-

nal software environment for reconstruction of 3D shapes. It is an advantage that for a majority of applications we can use our own special hardware meeting high performance and reliability requirements

Research plan results were published in the form of a chapter in an international scientific monograph, in 12 articles in impact journals, 41 articles in scientific and professional journals, 23 international, in 75 papers presented at conferences, 11 international. The research team implemented 9 products (5 operating samples, 4 prototypes). One dissertation and 1 habilitation was defended. In connection with the research plan, the team members participated as investigators or co-investigators in other 2 projects of the EU Operational programme Research for Competitiveness, 1 project of the EU Operational Programme Research and Development, 2 projects of 7th FP EU, 6 GAČR projects, 3 MPO projecs and research projects for other institutions.

Research Centre of Applied Cybernetics
(Investigator: Petr Vavřín)

Research Center of Applied Cybernetics (CAK) was established at the Faculty of Electrical Engineering and Communication, Brno University of Technology in 1999 as a co-investigating workplace. The chief investigator is Vladimír Kučera, the Czech Technical University in Prague. Other co-investigators are VŠB-TU Ostrava, University of West Bohemia Plzeň, Tomáš Bata University Zlín, Institute of Information and Automation Theory, Institute of Information Technology, Academy of Sciences Prague, Čerticin, a.s., Prague, Cygni, s.r.o. Prague, UniControls a.s., Prague, Neovision s.r.o., Prague, Camea s.r.o. End users of the research results achieved in the Brno branch is the copany Freescale Polovodiče ČR, s.r.o. The activitities originally scheduled for 10 years were extended for 2010 and 2011. In the period 1999-2009 the Brno team achieved outstanding results and consequently the funding was increased. There have been some recent staff changes. Resesarch results in 2010 are as follows:

1. Automatic control algorithms
Prof. P. Vavřín, P. Blaha, P. Václavek, L. Veselý, P. Zbranek

The group has continued research on control algorithms for sensorless drives and developed two specific controllers.

AC drive predictive controller

An algorithm has been designed for predictive control of a synchronous motor with permanent magnets on the basis of prediction using a model of the drive and optimal control selection based on quadratic criterion. An excitation alternative for high speed control was implemented. The algorithm can also make use of state parameters estimates for predictive control, which minimizes use of sensors.

Robust AC drive controller

In the robust current controller the motor parameters are considered to be indefinite variables. In comparison with other approaches it does not neglect errors due to feedback linearization inaccuracy. The design makes use of error signal between the real feedback and linerization feedback, and considers it to be indefinite. This approach maintains the linearity of connection taking into account a system with multiple inputs and outputs. Then the part creating the flow can be described as a system with two inputs and two outputs. Current controller design is based on synthesis by D-K iterations. The controller was verified by simulation experiments.

2. Artificial intelligence and robotics
F. Šolc, L. Žalud, F. Burian, L. Kopečný

The group focused on:

A telepresence system for practical applications in service and rescue robotics and work in difficult terrain. A fully operational prototype was implemented for visual telepresence with special focus on the quality of transmitted visual information (3D image, high distinction, high image frequency). The prototype was laboratory tested.

Visual telepresence experiments. A number of experiments were carried out on the prototype and on applicable mobile robotic systems (Orpheus-X2, Orpheus-AC, Orpheus-A2) to verify the dependence of mission effectivity on the quality of achieved visual perception. Autonomous robots control.

A mathematical model of four-rotor helicopter was designed as well as a control algorithm. The algorithm was inspired by the state control theory. The algorithm was verified by simulation and experiments in a real helicopter. A mathematical model of a highly maneuverable wheel robot. This model was used to create a real prototype of the machine, which is suitable for manipulation and transport of objects in inner environment.

3. Computer Vision

24

I. Kalová., K. Horák, P. Honec

After the retirement of J. Honec the group is led by I. Kalová. Research and implementation of information and control systems for road transport. At international conferences the group presented a number of theoretical and practical results of their work. More details at:

http://www.uamt.feec.vutbr.cz/vision/RESULTS

4. Control systems;

F. Zezulka, P. Kučera, O. Hynčica

The group dealt with real-time control systems. The system Aitartos for automatic transfer of timed state automatics into real-time operation system was designed. Aitartos can be used to automatically transfer the UPPAAL created and verified formal control problem description to the API interface of the RTX operating system. Aitartos provides support for real-time inter-process communication by means of RT-TCP/IP stack. This way the original model can be operated on asymmetric of physically different architectures. Automatic implementation of control command model without human intervention significantly increases the control system reliability while the design time is decreased. A paper was presented at the Congress on Engineering and Computer Science, San Francisco.

The centre was funded through institutional sources and received 100,000 CZK as a gift from the company OSC Brno.

Research Centre of Quasioptical Systems and Terahertz Spectroscopy

Coordinator: High School of Chemistry and Technology (co-coordinator: Zbyněk Raida)

Research centre of quasioptical systems and terahertz spectroscopy (KVASTES) was established in March 2006 by the High School of Chemistry and Technology, J. Heyrovsky Institute of Academy of Sciences, Czech Technical University and Brno University of Technology. The centre is involved in basic research funded by the Ministry of Education, project No. LC06071. Research is focused on the structure and dynamics of molecules, relaxation processes in gases, and atmospheric response to electromagnetic waves. The Brno branch of the KVASTES center is involved in the development of numerical models of spectroscope components, their optimization and enhancement of parameters. Numerical modelling will be used to investigate interactions between electromagnetic field and elementary

particles. In 2010 the center´s activities were focused on completion of a numerical model of multireflection measuring cell of spectroscopic apparatus and methodology of computing the characteristics of transmission lines of atmospheric connections in the millimeter-waveband from gas spectra.

Research Centre ´Data, Algorithms, Decision-making´

Coordinator: Institute of Information and Automation Theory, Academy of Sciences Prague

Investigator: Jiří Jan

The Brno research team involving co-investigators R. Jiřík, R. Kolář and other investigators, mainly Ph.D. students, has been involved in processing and analysis of medical images of various types in medical diagnostics since 2005. The main areas of interest are processing of ultrasound tomography (USCT) images and reconstruction of 2D and 3D images, simulation of ultrasound field for accurate approximations, used in reconstruction of images, and also computing calibration of the measuring USCT system geometry. The research has been conducted in cooperation with KIT – Karlsruhe Institute of Technology (Helmoltz Gemeinde, Germany). Other areas of interest are processing and analysis of ophthalmological images from various imaging modalities aimed at detection and evaluation of parameters significant to facilitate and enhance medical diagnostics accuracy, glaucoma problems. This research has been conducted in cooperation with the opthalmological clinique and department of pattern recognition at University Erlangen (Germany) and the opthalmological clinique in Zlín. Since 2007 a new area of interest has been analysis of magnetic resonance images (fMRI) for the purposes of neurology research, in cooperation with the 1st neurological clinique of the Faculty Hospital in Brno and University of New Mexico, USA.

Results achieved in 2010:

1. Ophthalmological applications:

- the databasis of opthalmological images for testing the designed algorithms was expanded by retina images with manually segmented detail arterial tree, segmentation of arteries is included in the program of neural layer detection. An article was published on an advanced method of correcting nonhomogeneous retina illumination in fundus-camera images with objective measurement of neural layer thickness, a method of de-

tecting a layer of neural fibres by texture analysis was developed, algorithms for for OCT data fusion and fundus-camera images based on OCT 3D data artery images and for registering monomodal fundus images in time sequence by phase correlation.

2. a) Reconstruction of tomographic data images in (USCT):

- numerical design taking into account verification of a new form of regularization, parallelization of highly sophisticated algorithms on efficient parallel tools.

2. b) Ultrasound field simulation and its utilization for iterative enhancement of the USCT image:

- software for extensive ultrasound field simulation in realistic nonhomogeneous and anisotropic environment based on precise physical formulation.

2. c) Computing calibration of conversion geometry of the USCT system:

- real measurement processing and calibration based on phantom measurements.

3. (fMRI) image data processing for neuroscience applications.

- seeking new relevant approaches in fMRI data analysis, in close cooperation with the 1st Neurological Clinique of Faculty Hospital u sv. Anny Brno and University of New Mexico, verification and possible modification of multidimensional analysis methods (mainly ICA).

4. Advanced methods of 3D and 4D tomography data registration and fusion.

- innovation of modern image registration for specific medical applications in cooperation with Philips Medical Systems Nederland. 3D and 4D subtractive angiography respecting tissue deformation including unforeseen deformations of solid objects (bones) due to helical CT data acquisition, with difficult identification of relationships of time different data. All results have been published in reputed international journals and presented at international conferences.

Regional Research Centres

Work on two regional research centres was started in 2010. The centres will be financed by the Operational Programme Research and Development for Innovations (OP VaVpI).

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

The centre will cover research, development and innovation capacities involved in research on renewable energy sources. The team wil focus on chemical and photovoltaic energy sources, electromechanical, electrotechnology and power engineering issues, electrical drives for mobile robots and industrial electronics.

The planned research centre will start with three basic research programmes:

1. *Optimization and control of electromechanical energy conversion*

2. *Chemical and photovoltaic energy sources*

3. *Optimization of energy conversion and exploitation in systems with ecological power sources*

The project is not focused on research only, but also on close cooperation between tertiary education institution and application sector, and on acceleration of the transfer of new technologies

into industrial practice. The proposed applications include ecological transport systems, development of robots with ecological drives or innovation of cogeneration units for electric energy generation.

The project CVVOZE received support in the total amount of over 260 mil. CZK, over 221 mil.CZK from the European Union and 39 mil. CZK from the budget of the Czech Republic. The funds will be used to equip laboratories with top devices ad facilities (200 mil.), and the remaining funds will be used for research team support in the following 4 years.

Centre for Sensoric, Information and Communication Systems (SIX)
(investigator Zbyněk Raida)

Work on the Centre SIX started in August 2010. The Operational programme Research and Development for Innovations will provide 300 mil. CZK. The Centre is a joint project of departments of Radioelectronics, Telecommunications, Microelectronics and Physics. Every year these four departments work on projects totalling 150 mil. CZK, nearly 60% of research at the whole faculty. All all them have maintained close cooperation with industrial partners involved in light current

engineering. The involved departments share professional interests and the project SIX will promote tight cooperation.

The motto of SIX is ´the sixth sense for the communication systems of the future´?

The primary research is centred on generation, emission, propagation, reception and processing of communication signals in 71-76 GHz, 81-86 GHz and 92-95 GHz bands, to be intensively employed in the near future. Focused on this research is the Microwave Technology Programme headed by Miroslav Kasal.

Communication systems in new bands are in the the focus of attention owing to the large frequency spectrum width available. There are, however, issues connected with high wave attenuation, selection of modulating and coding techniques, equalization of signals or partial subsystems. New systems electronics communications are the subject of Wireless Technology programme headed by Stanislav Hanus.

The next step is selection of communication and control protocols, transmitted information security, development of appropriate network technologies. An attractive research area is convergence of communication and information technologies - the subject of the Converged Systems programme headed by Kamil Vrba.

The described characteristics of near-future communication systems will require further research on signal processing. A sufficiently large bandwidth will offer new possibilities for transmission of multi- and hypermedia signals. Attention will have to be paid to high-fidelity and high-distinction information presentation to users. human-machine interaction is gaining importance. The Multimedia Systems programme headed by Zdeněk Smékal will be focused on these issues.

The fifth project Sensoric Systems, headed by Radimír Vrba, will be centred on new generation sensors of chemical, biological, electrical and other parameters , wireless transmission of scanned characteristics, signal processing and evaluation. This programme is a multidisciplinary cross-section through the other four programmes.

Visit http://www.six.feec.vutbr.cz for more information on SIX. The websites available describe the research programmes of the Centre and research laboratories. We are preparing partner companies´ websites where the companies and the centre SIX will exchange topical information on public competitions for research orders, experience and data that the participating parties will be willing to share. The centre SIX is open to all those interested in partnership and research on sensoric, information and communication systems.

Habilitations and Appointments to Professorship

In 2010 one academic was appointed to professorship and eleven new associate professors were appointed:

Prof. Ing. Miloslav Filka, CSc.
Teleinformatics

Doc. Ing. Petr Drexler, Ph.D.
Theoretical Electrical Engineering

Doc. Ing. Petr Fiedler, Ph.D.
Technical Cybernetics

Doc. Ing. Tomáš Frýza, Ph.D.
Electronics and Communications

Doc. Ing. Jaroslav Kadlec, Ph.D.
Electrical and Electronic Technology

Doc. Ing. Jana Kolářová, Ph.D.
Biomedical Engineering

Doc. Ing. Radek Kuchta, Ph.D.
Electrical and Electronic Technology

Doc. Ing. Ilona Lázničková, Ph.D.
Power Electrical and Electronic Engineering

Doc. Ing. Petr Mastný, Ph.D.
Power Electrical and Electronic Engineering

Doc. Ing. Vlasta Sedláková, Ph.D.
Electrical and Electronic Technology

Doc. Ing. Miloslav Steinbauer, Ph.D.
Theoretical Electrical Engineering

Doc. Ing. Jiří Šebesta, Ph.D.
Electronics and Communications

Doctoral Programme

In academic year 2010/11 there are 406 students in the doctoral degree programme. Six of them enrolled in the study programme in English, and one international student receives government scholarship. Numbers of Ph.D. students in individual years of study over the past 5 years are in Table 4.

Table 5 shows numbers of doctoral programme graduates at FEEC departments over the last 5 years. The list of doctoral programme graduates in 2010 can be found on FEEC websites, links *Study, Doctoral study programme, Doctoral programme graduates.*

Table 4: Numbers of Ph.D. students from 2006 to 2010

Year	2006	2007	2008	2009	2010
1.	83	92	89	88	118
2.	44	72	84	80	76
3.	67	40	69	80	75
4.	48	43	20	60	64
5.	32	39	35	8	47
6.	29	27	35	18	7
7.	28	40	33	23	18
Total	331	353	365	357	406

Table 5: Numbers of Ph.D. students by departments from 2006 to 2010

	2006	2007	2008	2009	2010	total
UAMT	3	2	3	8	1	17
UBMI	0	2	0	6	0	8
UEEN	5	0	2	4	0	11
UETE	2	0	4	4	1	11
UFYZ	0	5	5	3	0	13
UMEL	4	6	4	11	0	25
UREL	10	7	9	12	7	45
UTEE	4	3	0	1	1	9
UTKO	10	6	9	10	3	38
UVEE	6	4	5	6	4	25
total	44	35	41	65	17	202

Student Creative Activities

The 16th STUDENT EEICT Conference and Competition was jointly organized by FEEC and FIT on 29 April 2010. 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. Registered for the competition were 282 papers - 59 Bachelor, 120 Master and 98 Ph.D. papers. In a special category there were five posters presented by students from four secondary schools. The competition was sponsored by Honeywell, ABB a Tyco.

The presented papers were defended and evaluated by 29 expert committees including represen-tatives of the sponsoring companies, academics and Student Club representatives. Eighty-seven top-level papers were awarded at the closing ceremony.

For more information on the competition see FEEC websites, links *Research, Student competition.*

External Relations and International Cooperation

International Cooperation

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

One of 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 a very good cooperation with the BUT Department of International Relations responsible for economic support and organization of international programmes, also the Lifelong Learning Programme (LLP)/Erasmus. As a result, 51 students could study abroad in 2010 in the extent of 167.5 months and 25 teachers were on lecture stays at the length of 29 weeks (Table 6). The extent of teacher and student mobility has stabilized. Reciprocally, the interest of international students in placements at FEEC has been increasing. Within the LLP programme, 72 students came for placements in the total extent of 278 months, which represents an increase by 14% in the number of students and 26% in the length of placements in comparison with 2009. Mobility figures for incoming and outgoing students in individual programmes for 2010 are in Table 7. Existing agreements in the Lifelong Learning Programme-Erasmus were renewed. On the whole, the Faculty has concluded 52 bilateral agreements. The list of universities cooperating with the FEEC on the basis of the Lifelong Learning Programme-Erasmus in academic year 2011/12 is in Table 9.

In 2010 the funds for long-term international study and research placements of students of all study programmes from the Mobility Development Programme of the Ministry of Education amounted to 550,000 CZK and 155,000 CZK was received from the BUT mobility fund. Within the framework of the Development Programme of the Ministry of Education there were 15 students on placements in the total length of 62.5 months.

Table 8 shows mobility trends in incoming and outgoing students for all mobility programmes over the past five years. The trend in incoming students is gradually increasing, the number of outgoing students is comparable with 2009. Placements of FEEC students reached 230 months, which represents a decrease by 4% as compared with the previous year, with a higher number of students. On the other hand, placements of international students at the FEEC reached 285 months, - a 21% increase in comparison with 2009.

The Faculty supports cooperation of individual departments and academics with international institutions based on interfaculty and LLP-Erasmus agreements as well as newly established contacts. In 2010 the amount of 46,000 CZK was provided in support of such activities. The remaining sum out of the originally planned 450,000 CZK was saved and used to cover expenses related with membership in international scientific organizations. International contacts made by departments and academics were supported by departments from operational programmes projects. These funds were used to cover travel expenses of academics from abroad coming to short lecture stays at FEEC.

The trend in funding over the past 6 years is shown in Graph 5.

Funds from operational programmes are not included as they were obtained and managed by departments outside faculty budget.

Table 6: Student and teacher placements at universities abroad based on Socrates-Erasmus (LLP) Erasmus programme from 2006 to 2010

Socrates (LLP)-Erasmus	2006	2007	2008	2009	2010
Students	25	39	42	45	51
Months	146	182	168	167	167,5
Lecture stays	37	24	30	28	25
Lecture keks	45	27	35	34	29

Table 7: Student placements at FEEC and abroad by programmes, 2010 – summary

Activity	Arrivals		Departures	
	Students	Months	Students	Months
Socrates(LLP)-Erasmus	72	278	51	167,5
Inter-university agreements	2	7	-	-
Development Programme of Ministry of Education	-	-	15	62,5
Other	-	-	1	1

Table 8: Student placements at FEEC and abroad in all mobility programmes from 2006 to 2010

		2006	2007	2008	2009	2010
Arrivals	Students	34	45	64	68	74
	Months	125	141	216	235	285
Departures	Students	45	68	68	62	67
	Months	221	264	248	238	230
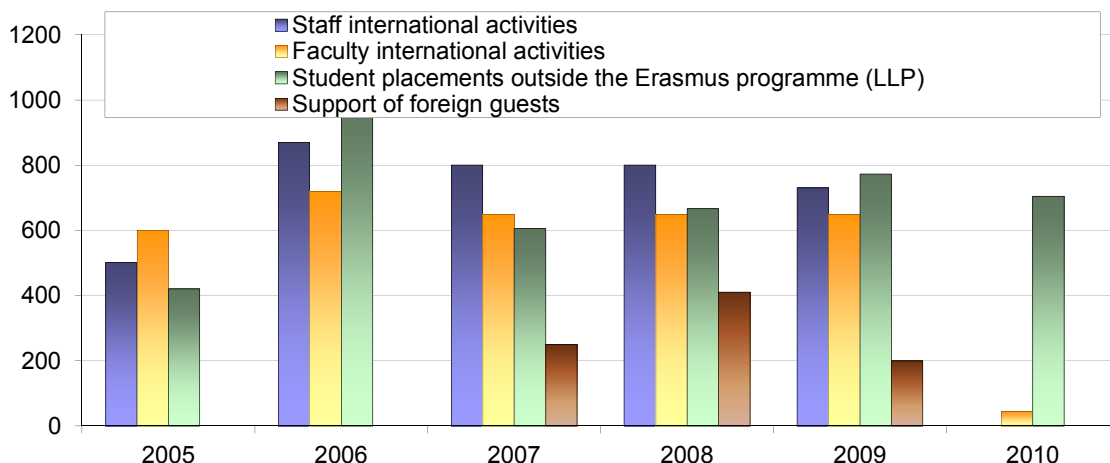
Graph 5: Funding of FEEC staff international activities, faculty international activities and student placements outside the Erasmus programme (LLP) from 2005 to 2010 (thous. CZK)

External Relations

Activities were focused on presentation of FEEC by giving to the public current and specific information on the study programmes and study areas offered at the faculty. Information was also given in the media on basic and applied research results and cooperation with industrial companies. On FEEC websites and Internet portals of BUT and other subjects information is given on research and education at FEEC departments and workplaces, on habilitations and appointments to professorship, on research projects, research and development grant projects of the Czech Science Foundation, Ministry of Trade and Industry. Ministry of Education and other projects including EU framework programmes. Faculty websites are in Czech and English.

As every year, the management of FEEC participated in the annual meeting of the Czech and Slovak faculties of electrical engineering and associated faculties held in Prague, 19 - 21 May 2010. The participants discussed the current situation at faculties of electrical engineering, their educational and research activities, participation in EU projects and coordination of projects, other international projects and cooperation with international institutions, research plans and Ministry of Education centres.

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 Czech Republic, a.s., ABB s.r.o., Veletrhy Brno, a.s., Siemens A.G., Honeywell, T-Mobile Czech Republic, a.s., ON Semiconductor Czech Republic, a.s., Rock-well/Allen Bradley, Škoda Volkswagen Mladá Boleslav, Motorola, AMI Semiconductor s.r.o., Celestica and other.

The cooperation intensified at the time of preparations 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 strengthened 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.

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. Some members of the Institute's staff are part-time teachers at FEEC, in Master and Ph.D. programmes. On the basis of an agreement between FEEC and Academy of Sciences education is provided to Ph.D. students in Academy's institutes.

Cooperation has been going on with other institutions as well. 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 2010/12

University	Country
Katholieke Hogeschool Limburg	Belgium
Технически университет-София	Bulgaria
Технически университет-София – Пловдив	Bulgaria
Aalborg Universitet	Denmark
Danmarks Tekniske Universitet Lyngby	Denmark
University of Eastern Finland	Finland
Tampereen teknillinen yliopisto	Finland
Aalto University	Finland
EPITA Paris	France
Groupe ESIEE Paris	France
Institut Catholique de Paris	France
Institut Polytechnique de Grenoble	France
Université Joseph Fourier – Polytechnique de l´Université Grenoble	France
ESIGELEC Rouen	France
Sekonda Universitá degli Studi di Napoli	Italy
Vilniaus Gedimino Technikos Universitetas	Lithuania
Hochschule Furtwangen – Furtwangen University of Applied Science	Germany
Hochschule Pforzheim – University of Applied Sciences Pforzheim	Germany
Fachhochschule Wiesbaden	Germany
Friedrich-Alexander-Universitat Erlangen	Germany
Hochschule für Technik, Wirtschaft und Kultur Leipzig	Germany
Technische Universität Dresden	Germany
Duale Hochschule Baden-Württemberg Lörrach	Germany
Universitat I Bergen	Norway
Politechnika Wroclawska	Poland
Universidade Católica Portuguesa – Escole Superior de Biotecnologia	Portugal
Instituto Politécnico de Lisboa – ISEL	Portugal

Instituto Politécnico do Porto	Portugal
Universidade do Porto	Portugal
Fachhochschule Oberösterreich	Austria
Technische Universität Wien	Austria
Universität für Gesundheitswissenschaften, Medizinische Informatik und Technik	Austria
TEI Κρήτης - Παράρτημα Χανίων	Greece
Žilinská univerzita, Elektrotechnická fakulta	Slovakia
Žilinská univerzita, Fakulta prírodných vied	Slovakia
Technická univerzita v Košiciach, Fakulta elektrotechniky a informatiky	Slovakia
Universidad de Cantabria	Spain
Universidad de Malaga	Spain
Modragon Unibertsitatea	Spain
Universitat Politécnica de Catalunya	Spain
Universidad Politécnica de Valencia	Spain
Universitat de Valéncia	Spain
Universidad de Zaragoza	Spain
Universitat Rovira i Virgili Tarragona	Spain
Högskolan I Halmstad	Sweden
Malmö högskola	Sweden
T.C. Dogus Universitesi	Turkey
Namik Kemal University	Turkey
Yeditepe University	Turkey
Zonguldak Karaelmas University	Turkey
Karadeniz Technical University	Turkey
University of Huddersfield	Great Britain

Academic Senate

In 2010 the members of Academic Senate of Faculty of Electrical Engineering and Communication were (membership in legislative committee – LK, pedagogical committee – PK, economic committee – EK, and represented department)

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

Academic Staff Chamber
Doc. Ing. Jiří Kozumplík, CSc., UBMI, EK, Chair
Doc. Ing. Petr Baxant, Ph.D, EK, UEEN
RNDr. Petr Fuchs, Ph.D., EK, UMAT
Ing. Ivana Jakubová, LK, UREL
Doc. Ing. Jiří Mišurec, CSc., EK, UTKO
PhDr. Ludmila Neuwirthová, Ph.D., PK, UJAZ
Ing. Radovan Novotný, Ph.D., LK, EK, UMEL
Ing. Helena Polsterová, CSc., PK, UETE
Doc. Ing. Miloslav Steinbauer, Ph.D., LK, UTEE
RNDr. Naděžda Uhdeová, Ph.D., EK, LK, UFYZ
Doc. Ing. Pavel Vorel, Ph.D., PK, UVEE

Student Chamber
Bc. Tomáš Szöllősi, PK, chair
Bc. Petr Bílek, LK, PK
Ing. Jan Dolenský, EK
Bc. Lubomír Friml, LK, PK
Bc. Pavel Hronek, LK, PK, EK
Ing. Marián Klampár, PK, EK
Lucia Spišiaková, LK

Academic Senate held 9 regular meetings and two irregular meetings, with an average attendance of 89%. Academic Senate dealt with legislative, economic and pedagogical issues.

Academic Senate dealt with proposals for Admission Procedure Regulations for all formats of study for academic year 2011/12 as well as amendments of internal FEEC regulations. The long-term intent of FEEC for the period 2011-2015 was discussed and approved. Academic Senate discussed and approved the economic report for 2010, and the proposal for distribution of funds for 2011 and allotment of education funds taking into account the changed economic situation.

Campus Development

The new faculty building at Technická 10 was completed in 2010 and in the summer the Dean´s Office and the remaining departments moved from their premises at Údolní 53. The two adjacent buildings Technická 8 and Technická 10 were interconnected. Upgrading of the technical equipment of lecture rooms, computer and information networks at Kolejní 4 and Technická 8 continued.

Construction and Reconstruction

While the key construction plan for 2090 was completion of the building Technická 10, in 2010 the priority was to prepare construction of the planned building Technická 12. One of the important tasks was to cope with the change of projection works supplier which ocurred between two stages of project documentation preparation for competition for construction supplier, and make sure that all requirements of end users are considered in construction documentation.

Preparation for Construction

The last activity connected with moving of faculty workplaces was the project of construction of a new FEEC building called Professor List Technological Park. This building will be situated north of Technická 12. At the very end of 2010 project documentation for supplier competition was completed. The construction will take 10 to 12 months and completion deadline will depend on supplier competition schedule.

Computer Networks and Information Systems

Priority was given to:

- upgrading of servers and adaptation of premises
- starting operation at Technické 10, centralization of network administration services
- networks backup
- innovation and administration of faculty extranet and intranet

Information Systems and Services

The economic system SAP and the central information system Apollo are used. Negotiations and analyses of the Apollo system modules and setting the faculty information system to function are in progress. The process was underway for the whole year of 2010 and continues in 2011.

Other

Equal Opportunities

The ´Consultancy and Information Gender Studies Centre´ continued its activities in 2010.

The Centre provides professional and personal consultancy, under the management of Department of Physics, to female students, and organizes information events for the public. The Centre´s activities are aimed at removing the barriers female students face when choosing careers in technical fields.

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

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

Contact: uhdeova@feec.vutbr.cz.

Institute of Signal and Image Processing

The Institute of Signal and Image Processing is an inter-department body for exchange of information and coordination of the work of departments involved in the processing and analysis of signals and images. The mission of the Institute is to present the activities and results achieved in the given area of interest to the national and international scientific community. The Institute groups Department of Control and Instrumentation, Department of Biomedical Engineering, Department of Radioelectronics and Department of Telecommunications.

The Institute participates in international and national organizations and institutions involved in signal and image processing, is involved in publishing, research and grant projects, organizes international conferences, local seminars and lectures.

Results, mainly information on publications, are published in annual reports of participating departments.

Institute Committee:

Coordinator

Prof. Ing. Jiří Jan, CSc. (UBMI)

Members

Prof. Ing. Miroslav Kasal, CSc. (UREL), \doc. Ing. Zdeněk Malec, CSc. (UAMT), Prof. Ing. Zdeněk Smékal, CSc. (UTKO), Prof. Ing. Vladimír Šebesta, CSc. (UREL), Ing. Robert Vích, DrSc., Dr.h.c. (Academy of Sciences)

Address:

ISIP (UBMI)

Kolejní 4, 61200 Brno

Tel: +420 541 149 540, -9 541

Fax: +420 541 149 542

E-mail: prasilova @feec.vutbr.cz

Institute of ExperimentalTechnology

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

Two projects were completed in 2010. Institute of Experimental Technology 1 within the framework of a global grant project of the South Moravian Region, Institute of Experimental Technology 2 - a project of the Operational Programme Research for Competitiveness.

IET1 is targeted at motivation of secondary school students to education in electrical engineering and improving conditions for education in electrical engineering and physics including support for ICT use in instruction. IET2 is focused on human resources training responding to the requirements of industrial companies.

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

Address:

IET (UTEE)

Kolejní 4, 612 00 Brno

Tel: +420 541 149 510

Fax: +420 541 149 512

E-mail: fialap@feec.vutbr.cz

Student Activities

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

The Student Chamber is part of the Academic Senate of FEEC and has seven voted members. The Student Chamber acts as an intermediary between faculty management and students, contributes to exchange of information covering the whole spectrum of study and faculty life, and to solutions of students´ problems. The Student Chamber supported the process of instruction quality assessment by students. Activities of the club Students for Students are focused on student leisure time. Its role is to enrich student life. Every other month the club issues the student magazine e-fekt (1200 copies), publishes the First-year Student Handbook, and organizes cultural, sports and entertainment events. Every student can apply for membership. In 2010 the students co-organized the traditional Representation ball of FEEC and FIT. They also co-organized the EEICT 2010 Student Conference and Competition. Volunteers helped with presentation of FEEC at the trade fair GAUDEAMUS 2010 and at Roadshow, visits to secondary schools to promote study at FEEC. On 28 September SPS organized the third amateur groups festival Music from FEEC. The winner was the

Brno group Cross the Line (student Vojtěch Fabích). Around 1000 fans attended the event. Sports-loving students took part in the race Run to 53. The task was to run the distance from the building Kolejní 4 to the nearby bus no. 53 stop and back as fast as possible. There were several categories – men, women, relays, and V.I.P relays, with over 40 participants and about 100 viewers. A new project perFEKT assistance was prepared for 1st year students to help them cope with study affairs, getting round the faculty and the city of Brno. In February the 5th anniversary of SPS was celebrated (an exhibition at Kolejní 4, Retro party, student films, fireworks). The celebrations culminated with a party attended by faculty management. SPS also organized a number of other events such as Startparty, BTBIO party, Trail of Courage, Kite Parade, Waste Harvest..

The ice-hockey match BUT vs MU took place in December, watched by 4000 viewers, mainly students of the two universities. Among the key organizers was FEEC student Tomáš Szöllősi. The team of BUT won the match 12:8. The BUT slogan was ´Even Masaryk supports BUT´

Department of Control, Instrumentation and Measurement

Prof. Ing. Pavel Jura, CSc.
Head

Kolejní 2906/4
61200 Brno 12
tel.: 541 141 154
fax: 541 141 123
E-mail: uamt@feec.vutbr.cz

Professors

Prof. Ing. Pavel Jura, CSc.
Prof. Ing. Petr Pivoňka, CSc.
Prof. Ing. František Šolc, CSc.
Prof. Ing. Petr Vavřín, DrSc.
Prof. Ing. František Zezulka, CSc.

Associate Professors

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

Lecturers

Ing. Miloslav Čejka, CSc., Ing. Marie Havlíková, Ph.D., Ing. Zdeněk Havránek, Ph.D., Ing. Radovan Holek, CSc., Ing. Petr Honzík, Ph.D., Ing. Stanislav Klusáček, 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

Ing. Tomáš Babinec, 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. Petr Fidler, Ing. Tomáš Florián, Ing. František Gogol, Ing. Tomáš Hynčica, Ing. Luděk Chomát, Ing. Miroslav Uher, Ing. Václav Kaczmarczyk, Ing. Martin Kopecký, Ing. Marek Kváš, Ing. Petr Malounek, Ing. Daniel Píši, Ing. Jan Pohl, Ing. Lukáš Pohl, Ing. Petr Polách, Ing. David Skula, Ing. Jaroslav Šembera, Ing. Michal Šír, Mgr. Martin Tůma, Ing. Miroslav Uher, Ing. Martin Vágner, Ing. Ivo Veselý, Ing. Libor Veselý, Ing. Miloš Veselý, Ing. Miroslav Vomela, Ing. Dušan Zámečník, Ing. Pavel Zbranek. Ing. Jan Beran, Ing. Miloš Čábel, Ing. Jolana Dvorská, Ing. Leoš Dvořák, Ing. Petr Hliněný, Ing. Ondřej Hynčica, Ing. Petr Kacz, Ing. Zdeněk Kaňa, Ing. Stanislav Klusáček, Ing. Tomáš Kopecký, Ing. Miroslav Krupa, Ing. Vlastimil Lorenc, Ing. Vojtěch Mikšánek, Ing. Vojtěch Němec, Ing. Petr Nepevný, Ing. Věra Nováková Zachovalová, Ing. Petr Petyovský, Ing. Václav Sáblík, Ing. Michal Schmidt, Ing. Pavel Střítecký, Ing. Václav Veleba.

Administrative and Techical Staff

Ing. Luděk Anděra, Ing. Jan Beran, Ing. František Burian, Bc. Daniel Haupt, Ing. Ondřej Hynčica, Bc. Karel Pavlata, Lenka Petrová, Ing. Petr Petyovský, Jan Vodička

Centre of Applied Cybernetics

Ing. Luděk Anděra, doc. Ing. Petr Blaha, Ph.D., Ing. František Burian, Bc. Miroslav Graf, Ing. Peter Honec, Ing. Karel Horák, Ph.D., Ing. Ondřej Hynčica, Ing. Ilona Kalová, Ph.D., Ing. Lukáš Kopečný, Ph.D., Ing. Pavel Kučera, Ph.D., Lenka Petrová, Ing. Jaroslav Šembera, Ing. Soběslav Valach, Ing. Libor Veselý, Ing. Miloš Veselý, Ing. Pavel Zbranek, doc. Ing. Luděk Žalud, Ph.D.

Main Interests

The department guarantees 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 industrial automation concentrates on real-time imbedded systems, wireless communication systems and industrial Ethernet with focus on operational safety and protection against internal errors, faults and attacks. Furthermore the group concentrates on fault-tolerant systems and research on 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, Škoda Auto, Rockwell Automation and other companies.

The group concerned with computer vision concentrates on applied research, and solutions related to orders from the industrial sector are used in instruction. Instruction was substantially supported by 3 FRVŠ grants and the European project ´Multimedia interactive didactic system´.

The group involved in automatic control continued development of smart algorithms for electric drives control, mainly prediction and robust control of dc electric drives. In this research the group cooperates with the company Freescale Semiconductor. The development and verification of conventional algorithms and adaptive, optimal controllers continued, based on artificial intelligence principles, on mathematical models of processes and real processes.

The group of measurement technology focused on electrical and electronic measurements, sensors of non-electrical characteristics, measurement and evaluation of non-electrical characteristics with focus on vibrodiagnostics, thermodiagnostics, acoustic emissions, flux measurements and noise measurements. In 2010 the group was involved in several projects for industrial partners (ABB, MEZSERVIS, SVCS), and the LabVIEW academy was established in cooperation with National Instruments.

The group of artificial intelligence and robotics has been involved in longterm research on service mobile robotics. The 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 in extreme conditions and automatic map-making. Instruction covers introduction into stationary and mobile robotics, and lectures dealing with above research issues.

Major Achievements

Outstanding achievements of the group of computer vision are commercial products, e.g. a visual system for control of panel elements for automotive air-conditioning system using the top development tool MvTec Halcon 9.0.

An outstanding publication is the conference paper on traffic signs detection and recognition awarded the Festo Prize for Young Researchers and Scientists at the DAAAM International Symposium. A significant achievement of the group of automatic control is completion of the extensive project of Operational Programme Education for Competitiveness ´Centre for advanced control and sensoric technology research´ focused on training of research and development workers. There were 26 seminars and courses with 521 trainees, including 266 university students. Algorithms for predictive and robust control of synchronous motors with permanent magnets were designed, presented at prestigious conferences and are prepared for implementation in practice.

The group of masurement technology was granted patent CZ301760 ´Detection of steel cord position on rubber conveyor belt in tyre manu-

42

facturing´ The patent is the result of cooperation with MEZ-Servis s.r.o. Following longterm cooperation with National Instruments (Austin, Texas, USA) and workplace certification we signed a contract to join the project LabVIEW Academy Program. The group of artificial intelligence and robotics developed a laboratory sample of a system for visual high distinction telepresence and combining data from CCD sensors and thermovision cameras. The group´s achievemeents were presented at exhibitions and promotion events, including MSV 2010 and Gaudeamus 2010. A prototype of miniature exploration robot Brontes was developed for use in inaccessible or difficult terrain.

Major Research Projects

Automation Intelligent Systems - MŠMT MSM0021630529
Investigator: Pavel Jura.

Auto Transport Safety - GAČR 102/09/1897
Investigator: Petr Honzík

Complex and Intelligent Management of Apartments Buildings - MPO FR-TI1/528
Investigator: Zdeněk Bradáč.

Collection of |New Products for Assuring of Expected Needs of Industrial Electronic- MPO FR-TI1/483
Investigator: Soběslav Valach

Electronic Systems for Ecological Consumption of Fuel and Biofuel at Filling Stations- MPO FR-TI1/526
Investigator: Zdeněk Bradáč

Implementation of State Automatics in Real-Time Operating Systems - GAČR 102/09/P205
Investigator: Pavel Kučera

Multimedia Interactive Didactic System- MŠMT CZ.1.07/2.2.00/07.0402
Investigator: Karel Horák

Research Centre of Advanced Control and Sensor Technologies – MŠMT CZ.1.07/2.3.00/09.0031
Investigator: Pavel Václavek

Research Centre of Applied Cybernetics - MŠMT 1M6840770004
Investigator: Vladimír Kučera, co-investigator: Petr Vavřín

Sensors and Intelligent Systems - GAČR 102/09/H082
Investigator: Petr Beneš

Synergy - Mobile Sensoric Systems and Networks-GAČR 102/09/H081
Co-investigator: František Zezulka

Selected Publications

BLAHA, P.; VÁCLAVEK, P. Robust Current Controller for PM Synchronous Motor. In Proceedings of the 2010 IEEE International Conference on Power and Energy. Kuala-Lumpur, Malaysia. 2010. p. 640 - 645. ISBN 978-1-4244-8945-9.

BERAN, J.; FIEDLER, P.; ZEZULKA, F. Virtual Automation Networks. IEEE industrial electronics magazine, 2010, roč. 4, č. 3, s. 20-27. ISSN: 1932- 4529.

HONZÍK, P.; KŘIVAN, L.; LOKAJ, P.; LÁBROVÁ, R.; NOVÁKOVÁ, Z.; FIŠER, B.; HONZÍKOVÁ, N. Logit and Fuzzy Models in Data Analysis: Estimation of Risk in Cardiac Patients. Physiological Research, 2010, roč. 59, č. Suppl. 1, s. 89-96. ISSN: 0862- 8408.

HORÁK, K.; KALOVÁ, I. Eyes Detection and Tracking for Monitoring Driver Vigilance. In The proceedings of the 33rd International Conference on Telecommunication and Signal Processing. H-1055 Budapest, Szent István krt. 7., Asszisztencia Szervezo Kft. 2010. p. 204 - 208. ISBN 978-963-88981-0-4.

HRABEC, J.; JURA, P.; ŠOLC, F.; HONZÍK, P. MODELLING AND CONTROL OF BI-STEERABLE WHEELED MOBILE ROBOT. Metalurgija - Journal for Theory and Practice in Metallurgy. 2010. 49(2). p. 278 - 282. ISSN 1334-2584.

KACZMARCZYK, V.; BRADÁČ, Z.; ŠÍR, M. Stochastic Timed Automata Simulator. In Proceedings of the 4th European Computing Conference. Bucharest, Romania: WSEAS.

VÁCLAVEK, P.; BLAHA, P. Model based High-performance PMSM Drive Control. In Proceedings of SICE Annual Conference 2010. Taipei, The Society of Instrument and Control Engineers. 2010. p. 227 - 232. ISBN 978-4-907764-35-7.

ZEZULKA, F.; FIEDLER, P.; BRADÁČ, Z.; ŠÍR, M. Trends in Automation - investigation in Network Control Systems and Sensor Networks. In 10th IFAC Workshop on Programmable Devices and Enmbedded Systems PDeS 2010. 1. Silesian University Gliwice, Poland: Silezian University Gliwice, s. 131-135

Bachelor Degree Programme

Computer Control (Petr Pivoňka)

Databases Systems (Radovan Holek)

Electronic Measurement Systems (Miloslav Čejka)

Measurement of Physical Quantities (Ludvík Bejček)

Measurement in Electroengineering (Miloslav Čejka)

Microprocessors (Tomáš Macho)

Modeling and Simulation (Pavel Václavek)

Modern Means in Automation (Václav Jirsík)

PCs in Intrumentation (Miloslav Čejka)

Practical Programming in C++ (Miloslav Richter)

Programmable Logic Controllers (František Zezulka)

Industrial Automation (František Zezulka)

Control Theory 1 (Petr Vavřín)

Control Theory 2 (Petr Vavřín)

Signals and Systems (Pavel Jura)

PC Systems (Jozef Honec)

Fibre Optics in Automatization (Ludvík Bejček)

Computer Science in Automation (Petr Pivoňka)

Fundamentals of Robotics (Luděk Žalud)

Master Degree Programme

Computer Vision Applications (Ilona Kalová)

Process Automation (František Zezulka)

Distributed Systems and Networks (Petr Fiedler)

Electronic Measurement Technics (Miloslav Čejka)

Embedded Systems for Industrial Control (Petr Fiedler)

Fuzzy Systems (Pavel Jura)

Smart and Semiconductor Sensors (Petr Beneš)

Intelligent Controlles (Petr Pivoňka)

Logical Systems (Radovan Holek)

Measurement in Nonelectrical Quantities (Ludvík Bejček)

Modeling and Identification (Petr Blaha)

Operating Systems and Networks (Tomáš Macho)

Real Time Operating Systems (Pavel Kučera)

Optimization of Controllers (Petr Pivoňka)

Optoelectrical Sensors (Ludvík Bejček)

Embedded Systems for Industrial Control (Zdeněk Bradáč)

Computer Vision (Karel Horák)

Robotics (Luděk Žalud)

Robust and Algebraic Control (Petr Blaha)

Data Acquistion, Analysis and Processing (Marie Havlíková)

Sensors of Nonelectrical Quantity (Ludvík Bejček)

Machine Learning (Petr Honzík)

Discrete Event Systems (Pavel Václavek)

Theory of Dynamic Systems (Petr Vavřín)

Artificial Intelligence (Václav Jirsík)

Doctoral Degree Programme

Selected Chaps from Measuring Techniques (Ludvík Bejček)

Selected Chaps from Automatic Control (Petr Pivoňka)

Laboratories

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

Laboratory of Computer Vision (instruction, research and development in image processing and computer vision, Ilona Kalová)

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

Laboratory of Drives Control (research and development of intelligent control of electrical drives, Pavel Václavek)

Laboratory of Intelligent Controllers (instruction in control algorithms and 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, Sensors of Non-Electrical Characteristics, Petr Beneš)

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

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

Laboratory of PC Subsystems (instruction, research and development of signal processor peripheries, Soběslav Valach)

 Laboratory of Pressure and Flux Measurement (pressure and flux measurements, Ludvík Bejček)

Laboratory of Process Automation (CAK laboratory, research and development of communication technology for industrial applications including wireless communication technology, 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 the company 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, Jakub Hrabec)

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

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

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

Department of Biomedical Engineering

Prof. Ing. Ivo Provazník, Ph.D.
Head

Kolejní 2906/4
61200 Brno 12
tel.: 541 149 541
fax: 541 149 542
E-mail: ubmi@feec.vutbr.cz

Professors

Prof. MUDr. Nataša Honzíková, CSc.
Prof. Ing. Jiří Jan, CSc.
Prof. Ing. Ivo Provazník, Ph.D.
Prof. MUDr. Jindřich Vomela, CSc.

Associate Professors

Doc. Ing. Aleš Drastich, CSc.
Doc. MUDr. Václav Chaloupka, 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.
Doc. RNDr. Ing. Jiří Šimurda, CSc.

Lecturers

RNDr. Mgr. Michal Bittner, Ph.D., Ph.D., Ing. Miroslav Dvořák, CSc., Ing. Petr Fedra, Ing. Karel Jehlička, CSc., Ing. Radovan Jiřík, Ph.D., Ing. Vratislav Harabiš, Ing. Jan Hrubeš, Ing. Milan Rychtárik, Ing. Jiří Sekora, Ing. Martin Vítek

Ph.D. Students

Ing. Layal Abo Khayal, Ing. Michal Bartoš, Ing. Martin Bereznanin, Ing. Karel Bubník, Ing. Petr Čech, Ing. Vratislav Čmiel, Ing. Jiří Dlouhý, Ing. Jiří Gazárek, Ing. Vratislav Harabiš, Ing. Martin Havlíček, Ing. Jan Hrubeš, Ing. Jiří Janeček, Ing. Oto Janoušek, Ing. Martin Klimek, Ing. Jiří Kratochvíla, Ing. Vladimíra Kubicová, Ing. Zdeněk Kuna, Ing. Martin Lamoš, Ing. Pavel Leinveber, Ing. Denisa Maděránková, Ing. Miloš Malínský, Ing. Martin Mézl, Ing. Jan Odstrčilík, Ing. Pawan Kumar Pathak, Ing. Roman Peter, Ing. Jiří Roleček, Ing. Marina Ronzhina, Ing. Milan Rychtárik, Ing. Jiří Sekora, Ing. Abduljalil Sireis, Ing. Vladimír Slávik, Ing. Lukáš Smital, Ing. Helena Škutková, Ing. Martin Švrček, Ing. Martin Valla, Ing. Martin Vítek, Ing. Petr Walek

Administrative and Technical Staff

Mgr. Dušan Hemzal, Ph.D., Miroslava Prášilová, DiS, Hana Rýznarová

Main Interests

The department provides tuition in basic subjects, mainly processing of signals and images, ecology, biomedical and ecological engineering and bioinformatics in the Bachelor and Master degree programmes. A number of new bioinformatics subjects emerged in connection with recent accreditation of new study programmes in bioinformatics.

The department is involved in basic and applied research of engineering principles in medicine, biology and ecology. The main areas of interest are digital processing and analysis of cardiological and medical images, especially ophthalmological and ultrasonographic data using contrasting substances, phylogenetic, evolution and proteomic data mainly on metallothionein protein and mitochondrial DNA

The department closely cooperates with the Ophthalmological Clinic of Friedrich-Alexander-University Erlangen, Forschungs-Zentrum Karlsruhe, University of Bergen, Medical Faculty of Masaryk University Brno, Faculty Hospital Brno-Bohunice, Philips Czech Republic, BLOCK

a.s, Knitting Technology Research Institute a.s., Mendel University Brno, Faculty Hospital U sv. Anny, Brno. Research carried out in the research centre D.A.R. focuses on processing of medical images. The Brno team is mainly concerned with reconstruction methods in 2D and 3D ultrasonic tomography and ophthalmology. – mainly retina images and 3D tomography laser scanner data.

Research activities are also carried out within the framework of the research plan with key investigator Zbyněk Raida from Department of Radioelectronics. Another important research support comes from national research grants of the Czech Science Foundation (modelling of the origin and analysis of cardiological electric signal, including development of a device for simultaneous optical and electrical recording of heart activity, research of nano-electro-biological tools for biochemical and molecular-biological study of eukaryotic cells), MPO TIP projects (equipment of barrier-free insulators) and TAČR ALFA (development of artificial arteries).

Major Achievements

In 2010 members of the department published dozens of articles and papers in scientific journals and at international conferences with favourable response within the scientific community. One such achievement is an article in journal Neuroimage with IF 5,739. The members of the department created authorized software products, operating samples, submitted 2 patent applications and 2 applications for utility samples.

Another outstanding achievement is participation in an extensive research project of Faculty hospital u sv. Anny ICRC (International Clinical Research Center Brno), Biomedical Engineering. The following teams from our department participate in the project: Experimental electrophysiology (Ivo Provazník), Rehabilitation techniques (Jana Kolářová) a Ultrasonic imaging (Radim Kolář).

The department organized the 20th international conference BIOSIGNAL, under the auspices of the European association EURASIP and the society IEEE – EMBS. Nearly 100 researchers from 15 countries (European countries, Japan, Australia, Israel, USA) attended the conference.

In 2010 new laboratories for genomic and proteomic analysis and optical imaging were completed. They are equipped with the latest apparatus (DNA sequenator, fluorescence camera, optical coherent photography, digital fundus camera) and are used for research and instruction.

Tuition started in the newly accredited follow-up Master programme Biomedical Engineering and Bioinformatics. The programme has been accredited by the Ministry of Education and Ministry of Health for education of specialists in biomedical engineering in compliance with the law on non-medical healthcare professions.

Major Research Projects

Information Technology in Biomedical Engineering – GAČR 102/09/H083
Investigator: Ivo Provazník

Optical Methods of Recording Electrical Potentials and Calcium Concentrations in the Heart by Laser Stabilisation – GAČR 102/07/1473
Investigator: Ivo Provazník

Patients Head Position Monitoring – GAČR 102/08/1373
Investigator: Jiří Rozman

Research Centre Data, Algorithms and Decision-Making – 1M6798555601
Co-investigator: Jiří Jan

Technology for Transplantology – MPO FR-TI2/596
Investigator: Ivo Provazník

Selected Publications

HÚSKA, D.; ADAM, V.; HUBÁLEK, J.; TRNKOVÁ, L.; ECKSCHLAGER, T.; STIBOROVÁ, M.; PROVAZNÍK, I.; KIZEK, R. Off-line coupling of automated pipetting system with square wave voltammetry as a tool for study of drug- DNA interaction. CHIMICA OGGI- CHEMISTRY TODAY, 2010, roč. 28, č. 5, s. 1-3. ISSN: 1973- 8250.

SOCHOR, J.; RYVOLOVÁ, M.; KRYŠTOFOVÁ, J.; SALAŠ, P.; HUBÁLEK, J.; ADAM, V.; TRNKOVÁ, L.; HAVEL, L.; BEKLOVÁ, M.; ZEHNÁLEK, J.; PROVAZNÍK, I.; KIZEK, R. Fully Automated Spectrometric Protocols for Determination of Antioxidant Activity: Advantages and Disadvantages. MOLECULES, 2010, roč. 2010, č. 15, s. 8618-8640. ISSN: 1420- 3049.

KOLÁŘOVÁ, J.; FIALOVÁ, K.; JANOUŠEK, O.; NOVÁKOVÁ, M.; PROVAZNÍK, I. Experimental methods for simultaneous measurement of action potentials and electrograms in isolated heart. Physiological Research, 2010, roč. 59, č. Suppl 1, s. S71 (S80 s.)ISSN: 0862- 8408.

HAVLÍČEK, M.; JAN, J.; BRÁZDIL, M.; CALHOUN, V. Dynamic Granger causality based on Kalman filter for evaluation of functional network connectivity in fMRI data. NeuroImage, 2010, roč. 53, č. 1, s. 65-77. ISSN: 1053- 8119.

JANOUŠEK, O.; KOLÁŘOVÁ, J.; NOVÁKOVÁ, M.; PROVAZNÍK, I. Three-Dimensional Electrogram in Spherical Coordinates: Application to Ischemia Analysis. Physiological Research, 2010, roč. 59, č. Suppl 1, s. S51 (S58 s.) ISSN: 0862- 8408.

KOLÁŘ, R.; JIŘÍK, R.; HARABIŠ, V.; MÉZL, M.; BARTOŠ, M. Advanced Methods for Perfusion Analysis in Echocardiography. Physiological Research, 2010, roč. 59, č. Suppl 1, s. S33 (S41 s.)ISSN: 0862- 8408.

SOCHOR, J.; ZÍTKA, O.; ŠKUTKOVÁ, H.; PAVLÍK, D.; BABULA, P.; KRŠKA, B.; HORNA, A.; ADAM, V.; PROVAZNÍK, I.; KIZEK, R. Content of phenolic compounds and antioxidant capacity in fruits of selected genotypes of apricot with resistance against Plum pox virus. MOLECULES, 2010, roč. 2010, č. 15, s. 6285-6305. ISSN: 1420- 3049.

JAN, J.; GAZÁREK, J.; KOLÁŘ, R.; ODSTRČILÍK, J.; KUBEČKA, L. FUSION BASED ANALYSIS OF OPHTHALMOLOGIC IMAGE DATA. Kybernetika, 2010, roč. 2010, č. 2434, s. 101-120. ISSN: 0023- 5954.

Bachelor Degree Programme

Algorithms and Progamming (Jana Kolářová)	Biochemistry (Eva Táborská)
Biological Signal Analysis (Jiří Kozumplík)	Bioinformatics (Ivo Provazník)
Bioelectric Phenomena (Jiří Šimurda)	Biostatistics (Ladislav Dušek)

Digital Signal Processing and Analysis (Jiří Jan)

Digital Signal and Image Processing (Jiří Jan)

Ecology in electrotechnical profession (Jiří Rozman)

Ecology in Healthcare (Jiří Rozman)

Medical Diagnostic Devices (Radim Kolář)

Models in Biology and Epidemiology (Radovan Jiřík)

Multimedia Signals and Data (Jiří Jan)

General Biophysics (Vojtěch Mornstein)

Pathological Physiology (Anna Vašků)

Computers and Programming 1 (Ivo Provazník)

Practics of Bioinformatics (Jana Kolářová)

Practics of Biomedical and Clinical Technology (Milan Chmelař)

Radiology and Nuclear Medicine (Vlastimil Válek)

Standardization in Medicine (Milan Chmelař)

Therapeutic and Prothetic Instruments (Jiří Rozman)

Artificial Intelligence in Medicine (Jiří Kozumplík)

Introduction to Biology of Man (František Horálek)

Introduction to Clinical Medicine (Miroslav Souček)

Introduction to Medical Informatics (Ivo Provazník)

Introduction to Molecular Biology and Genetics (Petr Dvořák)

Basics of Anatomy and Histology (Pavel Matonoha)

Basics of First Aid (Lukáš Dadák)

Health Ethics (Josef Kuře)

Health Legislation and Law (Jiří Rozman)

Medical Imaging Systems (Aleš Drastich)

Master Degree Programme

Analysis and Interpretation of Biological Data (Jiří Kozumplík)

Analysis of Signals and Images (Jiří Jan)

Biophysics (Jiří Šimurda)

Human Biology (František Horálek)

Bionics (Jiří Kozumplík)

Diagnostics of the Bio- and Ecosystems (Milan Chmelař)

Ecological Engineering (Jiří Rozman)

Traditional Medical and Ecological Imaging Systems (Aleš Drastich)

Clinical physiology (František Horálek)

Biological System Modelling (Radovan Jiřík)

Multirate Systems (Jiří Kozumplík)

Design and Operation of Complex Systems (Jiří Rozman)

Computer-Aided Medical Diagnostics (Ivo Provazník)

Special Devices for Healthcare and Ecology (Jiří Rozman)

Tomographic Imaging Systems (Aleš Drastich)

Introduction to Environmental Studies (Hana Librová)

Advanced Methods of Signal Processing (Jiří Jan)

Medical Information Systems (Miroslav Dvořák)

Healthcare (Jindřich Vomela)

Urgent Health Care (Vladimír Šrámek)

Advanced Methods in Biostatistics (Ladislav Dušek)

Medical Information Systems (Miroslav Dvořák)

Microscopic Imaging Technology (Radim Kolář)

Molecular Biology (René Kizek)

Advanced Analysis of Biological Signals (Jiří Kozumplík)

Doctoral Degree Programme

Selected Problems of Biomedical Engineering (Ivo Provazník)

Advanced Methods of Processing and Analysis of Signals and Images (Jiří Jan)

Laboratories

Laboratory of Biomedical Electronics (instruction in Practice of Medical Diagnostics Technique, research experiments and student projects, Jana Kolářová.)

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

Laboratory of Biophysics (Faraday cage, research in electrophysiology mainly of cells, Ivo Provazník)

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

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

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

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

Laboratory of Imaging Technology (instruction in Microscopy Imaging Technology, research experiments and student projects, Radim Kolář)

Laboratory of Medical Diagnostic Technology (instruction in Medical Diagnostic Technology, Diagnostics of Bio- and Ecosystems, Conventional Imaging Systems, Tomography Imaging Systems, Ecology in Electrical Engineering, research experiments and student projects, Radim Kolář)

Laboratory of Medical Informatics (instruction in Medical Information Systems – an up-to-date professional hospital information system is available, Computer Support of Medical Diagnostics, Ecological Information Systems, Modeling of Biological Systems, Radovan Jiřík)

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

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

Department of Power Electrical Engineering

Doc. Ing. Petr Toman, Ph.D.
Head

Technická 2848/8
61600 Brno 16
tel.: 541 149 231
fax: 541 149 246
E-mail: ueen@feec.vutbr.cz

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 Lázničková, Ph.D.
Doc.Ing. Petr Mastný, Ph.D.

Doc. Ing. Antonín Matoušek, CSc.
Doc. Ing. Jaroslava Orságová, Ph.D.
Doc. Ing. Jiří Raček, CSc.
Doc. Ing. Petr Toman, Ph.D.
Doc. RNDr. Oldřich Coufal, CSc.

Lecturers

Ing. Jan Macháček, Ph.D., Ing. Martin Paar, Ph.D.

Ph.D. Students

Ing. Almabrok Abdoalhade Almabrok, Ing. Tomáš Bartošík, Ing. Branislav Bátora, Ing. Martin Belatka, Ing. František Bernáth, Ing. Jaromír Bok, Ing. Miroslav Haluza, Ing. Nail Khisamutdinov, Ing. Michal Krbal, Ing. Petr Nevřela, Ing. Jan Novotný, Ing. Luděk Ondroušek, Ing. Tomáš Pavelka, Ing. Drahomír Pernica, Ing. Jan Pithart, Ing. Václav Prokop, Ing. Michal Ptáček, Ing. Lukáš Radil, Ing. Jan Škoda, Ing. Jan Šlezingr, Ing. Jaroslav Špaček, Ing. Martin Štefanka, Ing. David Topolánek, Ing. René Vápeník

Administrative and Technical Staff

Ing. Jan Gregor, CSc., Helena Karásková, František Matoušek, Ing. Josef Šenk, CSc., Ing. Filip Koval

Main Interests

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

Research is focused on electric energy production in conditions of permanently sustainable growth that is search for new ways of electric energy production from renewable sources and increasing operating efficiency of electric energy sources, utilization of hydrogen accumulation cycle in solar systems, optimization of loading small variable output power sources, optimization of the structures of sources for services in the conditions of liberalized market, technical and technological limits in inter-state energy exchange, analysis of major system failures and measures to be taken to avoid them, connection of wind-powered stations into the electrification system and design of systems for protection and implementation of systems for evaluation of outdoor and indoor illumination systems

The department cooperates with a number of companies, e.g. E.ON, ČEZ, ČEPS, a.s., ABB, s.r.o., EGÚ Brno, a.s., Teplárny Brno, a.s., Siemens, s.r.o. There has been close cooperation with the departments of power electrical engineering at all Czech and Slovak technical universities.

Major Achievements

In 2010 the staff members were involved in the research plan ´Sources, accumulation and optimization of electric energy exploitation in the conditions of permanently sustainable growth´, 2 GAČR projects, 1 NVP II project, 8 FRVŠ projects and 26 projects of cooperation with industry. Several staff members participated in preparation and start of research programme 3 ´Optimization of electric energy conversion and exploitation in systems with ecological energy sources´ of the research centre CVVOZE.

The department´s major results published in reputable scientific journals and in proceedings of national and international conferences are, for example, an algorithm of cost minimization in case of interrupted electric energy supply by means of electric network reconfiguration, design of complex methodology of measuring voltage fluctuations, up-to-date illumination control methods in smart electroinstallations, analysis of light sources resistance to short-term drop and voltage cut offs, flickermeter implementation in the LabView environment, development and implementation of new variable traffic signs, measuring technology for quality evaluation of imaging panels for traffic signs.

Cooperation with EGÚ Brno, a.s. centred on connecting photovoltaic and wind-powerd stations in the electrification system. Cooperation with Unicontrols-Tramex s.r.o. focused on the development of railway signal lamps. We also cooperated with ČEPS, a.s., Siemens, s.r.o., EGÚ HV Laboratory, a.s. a EG-Expert, s.r.o. and University of West Bohemia, Plzeň in the project ´ Increasing the Efficiency and Safety of the Electrification System´. Conducted within the framework of the project was an experiment with a series of failures in the real high-voltage network.

The department started work on the project ´ePower – Innovation of instruction in power engineering and power electrical engineering based on e-learning and practical traning´.

Major Research Projects

An Optimization of Operating Cooperating Alternative Electric Energy Sources – GAČR 102/09/P529
Investigator: Petr Mastný

Increasing the Reliability and Safety of Electric Network – 2A-2TP1/051
Investigator: Petr Toman

Research of Noise Fluctuations in Light Flux of Light Sources Caused by the Presence of Harmonic and Interharmonic Components in Power Supply Voltage – GAČR 102/08/P582
Investigator: Jiří Drápela

Selected Publications

COUFAL, O.; ŽIVNÝ, O. Composition and Thermodynamic Properties of Thermal Plasma with cCondensed Phases. European Physical Journal D, vol. 2010, no. 1, pp. 1-21. ISSN: 1434- 6060.

Bachelor Degree Programme

Electrical Power Distribution (Petr Toman)

Environmental Science in Electroenergetic (Antonín Matoušek)

Economy and Control (Jan Macháček)

Protection of Electrical Power Equipment (Petr Toman)

Computer Modelling and Simulations (Petr Baxant)

Design of Power and Data Networks (Jan Macháček)

Distribution Equipment (Jaroslava Orságová)

Machinery of Power Plants (Jiří Raček)

Technical Mechanics (Jiří Raček)

Energy Use (Jiří Drápela)

Electrical Power Generation (Petr Mastný)

High Voltage and Electric Apparatus (Vladimír Blažek)

Master Degree Programme

Electric Arc Application (Jan Gregor)

Diagnostics in Electricity Industry (Jiří Drápela)

Distribution and Industry Networks (Jaroslava Orságová)

Economy of Electrical Power Engineering (Jan Macháček)

Power Plants and Heating Power Stations (Jaroslava Orságová)

Substations and Lines (Jaroslava Orságová)

Electrical Heat Technology (Ilona Lázničková)

Power Energetic Equipments (Jiří Raček)

Information and Control Systems in Power Engineering (Petr Baxant)

Integrated Protection Systems (Petr Toman)

Nuclear Power Plant (Jiří Raček)

The Power Quality and EMC (Jiří Drápela)

Low Power Electrical Sources (Petr Mastný)

Unconventinal Conversions (Antonín Matoušek)

Lighting Systems (Petr Baxant)

Power Systems (Petr Baxant)

Design of Power and Data Networks (Jan Macháček)

Transient Phenomena (Vladimír Blažek)

Power Transmission Networks (Vladimír Blažek)

Power Systems Control (Petr Toman)

Lighting Technology (Petr Baxant)

Doctoral Degree Programme

Mathematical Modelling of Electrical Power Systems (Evžen Haluzík)

Selected Problems of Electricity Production (Antonín Matoušek)

Laboratories

Computer Laboratory (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)

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

Laboratory of Electrical Networks (instruction in Electric Power Distribution, Transmission Networks, Electrical Stations and Transmission Networks, Municipal and Industrial Networks, research projects, Vladimír Blažek)

Laboratory of Electric Power Generation (instruction in Electric Power Generation, Power and Heating Plants, Small Sources of Electric Power, diploma theses and research projects, Jaroslava Orságová)

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

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

Laboratory of Heating Technology (instruction in Electric Power Exploitation and Heating Technology, Jiří Drápela)

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

Power Plant Protection Laboratory (instruction in Systems Protection, Information and Control Systems in Electrical Power Engineering, Integrated Protection Systems, measurements in real networks, research, Jaroslava Orságová)

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

Department of Electrotechnology

Prof. Ing. Jiří Kazelle, CSc.
Head

Technická 3058/10
616 00 Brno 2
tel.: 541 146 148
fax: 541 146 147
E-mail: uete@feec.vutbr.cz

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

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

Lecturers
Ing. Martin Frk, Ph.D., Ing. Svatopluk Havlíček, CSc., Ing. Petr Křívík, Ph.D., Ing. Helena Polsterová, CSc., Ing. Zdenka Rozsívalová, Ing. Jiří Starý, Ph.D., Ing. Jiří Špinka

Ph.D. Students
Ing. Pavel Abraham, Ing. Radek Bilko, Ing. Jan Čapek, Ing. Ondřej Čech, Ing. Pavel Čudek, Ing. Jan Dolenský, Ing. Petr Dvořák, Ing. Eva Flodrová, Ing. Michal Jašek, Ing. Tibor Jirák, Ing. Tomáš Knotek, Ing. Miroslav Kunovjánek, Ing. Radek Lábus, Ing. Michal Macalík, Ing. Tomáš Máca, Ing. Jiří Neoral, Ing. Tomáš Nováček, Ing. Jan Rychnovský, Ing. Marek Solčanský, Ing. Petr Stejskal, Ing. Vít Svoboda, Ing. Petr Špičák, Ing. Aleš Veselý, Ing. Jiří Vognar, Ing. Jiří Vrbický, Ing. Pavel Tošer, Ing. Karel Tonar

Administrative and Technical Staff
Jarmila Bartošková, František Chudáček, Ing. Petr Kahle, František Kořínek, Věra Špičáková, Ing. Miroslav Zatloukal

Main interests

When the department moved into its new premises at Technická 10, laboratory and computer instruction in all full-time and part-time study subjects was prepared for the winter semester of academic year 2010/2011. Instruction in Materials and Technical Documentation was provided to all first-year Bachelor students in full-time and part-time formats of study in the Bachelor programme Electrical, Electronic, Communication and Control Technology. The department provided instruction in compulsory and optional subjects focused on electrotechnical materials, manufacturing processes and their control, printed circuit board and surface mount technology, diagnostics, testing and reliability of electrotechnical materials and processes, quality assurance, design systems and alternative sources of electric energy, in the Bachelor and the Master programme. Ten subjects in the specialization EVM in category free subjects were offered to students of other BUT faculties.

Research was centred on basic and applied research of electrochemical sources of electric energy (with focus on improving the characteristics of lead accumulators for use in hybrid electric vehicles or storage of energy from renewable sources), detection of signal electrons and methods of environmental scanning electron microscopy (purchase of an atomic force microscope – AFM funded by the project ´Centre of research and exploitation of renewable energy sources´), gel electrolytes and their utilization in lithium-ion batteries, electrocatalysts, ion exchangers and thin-film electrodes for electrochromic systems, lead-free soldering, quality assurance and reliability of soldered joints, degradation and diagnostics of dielectric systems. Research and development of reduced combustibility materials continued as well as research of solar cells with respect to local light emissions for fast and reliable non-destructive detection of defects and testing of quality, reliability and service life of solar cells.

Research of the mathematical-physical model of blood flow in arteries was carried out in cooperation with Institute of Instrument Technology, Czech Academy of Sciences, the team engaged in Magnetic resonance and bioinformatics. The department cooperates with a number of institutions - Technische Universität Wien, Universität Ulm - Zentrum für Sonnenenergie - und Wasserstoff-Forschung, École Polytechnique de Montréal, surface analysis workplace Nanolytics in Feldkirchen, Austria, company Becaert, Belgium, Institute of Instrument Technology, Institute of Anorganic Chemistry, Institute of Physical Chemistry and Institute of Macromolecular Chemistry of the Czech Academy of Sciences, Bochemie Bohumín, EPRONA Rokytnice nad Jizerou, Elmarco Liberec, Solartec Rožnov pod Radhoštěm, ERD Praha, ENERG-SERVIS Brno, ČeMeBo Blansko, Honeywell Brno, ALPS Electric Czech Sebranice. Within the framework of the programme KONTAKT the department cooperates with the institute INIFTA Universidad Nacionál de La Plata, Argentina and Università degli Studi di Palermo, Italy.

In 2011 research will be focused on the second stage of the research plan (2010-2011), and on GAČR, GAAV, FRVŠ projects and European research programmes and centres. The department will continue innovation and upgrading of the study area ´Microlelectronics and Technology´ in the Bachelor programme and ´Electrotechnical Manufacturing and Management´ in the Master programme, upgrading and extended use of laboratories and computer rooms, increasing the quality of instruction and self-study.

In September 2011 the department will organize the ´12th International Conference Advanced Batteries, Accumulators and Fuel Cells (A.B.A.F.-12) in Brno and coorganize the 32 conference ´Non-Conventional Electric Energy Sources´ in Černá Hora, Czech Republic.

Major Achievements

The department organized the 11th international conference ´Advanced Batteries, Accumulators and Fuel Cells – under the auspices of ECS and BUT Brno (A.B.A.F.- 11), (Marie Sedlaříková, Jiří Vondrák).

UETE also co-organized the 31th international conference ´Non-Conventional Sources of Electric Energy´ in Býkovice near Černá Hora, 8-10 September 2010, with the Czech Electrotechnical Society, group for chemical sources of electric energy (Petr Bača, Petr Křivík).

The department was represented at the 37th meeting of Czech and Slovak departments and institutes of electrotechnology – international conference ´Electrotechnology 2010´ organized by West Bohemia University Plzeň September 7-9, 2010 (Jiří Kazelle).

In June 2010 Ondřej Čech went for a study stay in the research centre INIFTA v La Plata and in the Centre for Atomic EnergyBariloche, Argentina. The cooperation project was focused on preparation of samples of composite cathode materials for LiFePO4 lithium-ion batteries.

Professor Arnaldo Visintin from La Plata National University was staying at UETE from 21 October to 6 November 2010 and took part in lithium-ion battery research centred on increased safety, measurements of nickel electrode characteristics for alcaline accumulators, and on 27 November 2010 gave a lecture on Ni-MH batteries, their operation in the Argentina satellite and INIFTA research results. La Plata National University was visited by Marie Sedlaříková and Miroslav Kunovjánek 25 November – 9 December. They made cooperation contacts at the university, the INIFTA (CONICET) research centre and the Centre for Atomic Energy Bariloche. In a lecture they gave information on UETE research and projects focused on materials for hydrogen generation electrolyzer. In 2010 the department was involved in the research plan ´Resources, Accumulation and Optimization of Electric Energy Exploitation in Conditions of Permanently Sustainable Growth´ and in the international project ´Investigation of the effect of mechanical pressure on the performance of negative lead accumulator electrodes during PSoC operation´ financed by the multinational consortium ALABC, 2 GAČR projects ´Relationship of Local Light Emissions with Stochastic Effects on PN Junctions of Solar Cells at Very Low Temperatures´ and ´ Increasing of Li-Ion batteries safety´, a GAAV project ´Characteristics of New Polymer Electrolytes and Contacting Methods for Carbon Electrode Mass´, an MPO project ´ Application of Modern Assembly Technologies and Materials in Electrical Engineering ´ and 6 FRVŠ projects ´Solar System Electrolyzer in Instruction´, ´Laboratory Innovation and Upgrading of the subject Material Structure and Properties´, ´Internet-Based Approach to Measuring Devices in Laboratory of Electrotechnical Materials´, ´Measuring Workplace for Study of Thin Film Corrosion Characteristics´, ´Extended Laboratory Instruction in Diagnostic Methods in Electrical Engineering´ and ´Cyclic Voltammetry Monitoring of Oxidation and Reduction Processes in Electrochemical Cells´.

Work continued on the standard project ´Novel Materials and Technologies for Electric Energy Sources´. In cooperation with the Department of Microelectronics UETE conducted the project ´Innovation and Upgrading of the Bachelor Degree Programme Microelectronics and Technology´ and the Master Degree Programme ´Microelectronics´ of the Operational programme ´Education for Competitiveness´.

Together with the University of West Bohemia in Plzeň the department cooperates in the European project ´Partnership in Electrical and Mechanical Engineering´ of the Operational Programme, Priority axis 7.2 ´Tertiary Education, Research, Development´. The department´s staff are also involved in the European project ´Centre of Research and Exploitation of Renewable Energy Sources - (CVVOZE)´, Operational Programme Research and Development, Priority Axis 2 – ´Regional Research and Development Centres´ and in research programme 2 - ´Chemical and Photovoltaic Energy Sources´.

An article dealing with new findings on the mechanism of carbon behaviour in negative active mass of lead accumulator was published in Journal of Power Sources. Results on monitoring the characteristics of the new scintillation secondary electron detector for microscopes operating in the high pressure specimen chamber (VP-SEM), developed in cooperation with Institute of Instrument Technology, Czech Academy of Sciences were published in Journal of Microscopy. Both of them are prestigious impact journals.

Major Research Projects

Application of Modern Assembly Technologies and Materials in Electrical Engineering – MPO FR TI1/072
Co-investigator: Jiří Starý

Characteristics of New Polymer Electrolytes and Contacting Methods for Carbon Electrode Mass– GAAV KJB208130902
Investigator: Michal Macalík

Increasing of Li-Ion Batteries Safety – GAČR P102/10/2091
Investigator: Marie Sedlaříková

Relationship of Local Light Emissions with Stochastic Effects on PN Junctions of Solar Cells at Very Low Temperatures – GAČR 102/09/0859
Co-investigator:Jiří Vaněk

Resources, Accumulation and Optimization of Electric Power Exploitation in Conditions of Permanently Sustainable Growth – SRČR MSM0021630516
Investigator: Jiří Kazelle

Significance of Carbon Additive in Negative Lead-Acid Battery Electrodes – ALABC C2.2 RU1870010
Co-investigator: Petr Bača

Selected Publications

ŠPIČÁK, P.; SEDLAŘÍKOVÁ, M.; ZATLOUKAL, M.; NOVÁK, V.; KAZELLE, J.; VONDRÁK, J.; JIRÁK, T. Preparation and properties of manganese dioxide studied by QCM. Journal of Solid State Electrochemistry, 2010, roč. 14, č. 12, s. 2139-2144. ISSN: 1432- 8488.

BARATH, P.; SEDLAŘÍKOVÁ, M.; VONDRÁK, J. Effect of carbon support on the kinetic behaviour of the metallic hydride electrode. Electrochimica Acta, 2009, roč. 54, č. 7, s. 2010-2117. ISSN: 0013- 4686.

SEDLAŘÍKOVÁ, M. Effect of carbon support on the kinetic behaviour of a metal hydride. Electrochimica Acta, 2009, roč. 54, č. 7, s. 2010-2017. ISSN: 0013- 4686.

JIRÁK, J.; NEDĚLA, V.; ČUDEK, P.; RUNŠTUK, J.; ČERNOCH, P. Scintillation SE detector for variable pressure scanning electron microscopes. Journal of Microscopy, 2010, č. 239, s. 233-238. ISSN: 0022-2720.

Bachelor Degree Programme

Diagnostics and Testing (Josef Jirák)

Electrotechnical Materials and Production Processes (Jiří Kazelle)

Materials and Technical Documentation (Josef Jirák)

Design Systems of Printed Circuit Boards (Petr Bača)

Printed Circuits and Surface Mount Technology (Jiří Starý)

Computer Projecting of Productions, Logistic and Ecology (Jiří Vaněk)

Computer -aided Technical and Management Works (Jiří Maxa)

Quality Management and Checking (Helena Polsterová)

Quality Management and Metrology (Helena Polsterová)

Special Diagnostics (Josef Jirák)

Reliability in Electrical Engineering (Helena Polsterová)

Master Degree Programme

Alternative Energy Sources (Jiří Vaněk)

Diagnostic Methods in Electroengineering (Josef Jirák)

Ecology in Manufacturing (Petr Bača)

Electroinsulation Systems (Helena Polsterová)

Climatotechnology in Electrical Engineering (Helena Polsterová)

Materials for Biomedical Applications (Marie Sedlaříková)

Mechanical Desktop (Jiří Maxa)

Interconnection and Assembly Technology (Jiří Starý)

Reenable Energy Sources (Petr Křivík)

Computers System for Projects (Vítězslav Novák)

Control and Data Administration (Jiří Maxa)

Reliability and Quality (Helena Polsterová)

Structure and Properties of Materials (Josef Jirák)

Technological Projecting and Logistic (Jiří Vaněk)

3D modeling (Jiří Maxa)

Production Processes (Jiří Kazelle)

Fundamentals of Reliability in Electrical Engineering (Helena Polsterová)

Doctoral Degree Programme

Electrotechnical Materials, Material Systems and Production Processes (Jiří Kazelle)

Selected Diagnostic Methods, Reliability and Quality (Josef Jirák)

Laboratories

Laboratory for Diagnostic of Photovoltaic Cell-Accumulator Battery Systems (testing of photovoltaic cell-accumulator battery systems in exactly state conditions, Jiří Vaněk)

Laboratory for Master Students (laboratory for research work of Master students, Petr Dvořák)

Laboratory of Alkaline Accumulators (research and development of alkaline accumulators, hydrogen management, storage of hydrogen in metalhydride tanks, electrolyzers, Martin Frk)

Laboratory of Electrical Diagnostic Methods (instruction in diagnostic methods in electrical engineering and climatotechnology, semestral projects, Bachelor and Master theses on measurement of very small currents and diagnostics of electro insulating fluids, Martin Frk)

Laboratory of Electrical Measurement (diagnostic analysis of properties of dielectric materials, material specimens are measured using usual measuring instruments, Helena Polsterová)

Laboratory of Electrode Materials I, III (preparation of specimens and electrode mass for Li-Ion, Ni-Cd and Ni-MH batteries, supercondensors, thin-film deposition by means of chemical methods, preparation of polymer gel electrolytes, Marie Sedlaříková)

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

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

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

Laboratory of Microscopy Techniques (research of detection systems of signal electrons, specimen observations using scanning electron microscope working under higher pressure in specimen chamber (VP-SEM), Josef Jirák, Pavel Čudek)

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

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

Laboratory of Printed Circuit, PROTOCAD and photoprocesses (laboratory production of printed circuit boards and micro sections, laboratory instruction in Printed Circuits and Surface Mount Technology and Interconnection and Assembly Technology, Jiří Starý)

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 I, II (research and development of new applications of lead-acid accumulators for hybride electromobils and as energy storages from renewable sources, Petr Bača)

Laboratory of Soldering (instruction in Interconnection and Assembly Technology, Jiří Starý)

Department of Physics

Doc. Ing. Lubomír Grmela, CSc.
Head

Technická 2848/8
61600 Brno 16
tel.: 541 143 391
fax: 541 143 133
E-mail: ufyz@feec.vutbr.cz

Professors

Prof. RNDr. Ing. Josef Šikula, DrSc.
Prof. RNDr. Pavel Tománek, CSc.

Associate Professors

Doc. RNDr. Milada Bartlová, Ph.D.
Doc. Ing. Lubomír Grmela, CSc.
Doc. RNDr. Pavel Hruška, CSc.
Doc. Ing. Pavel Koktavý, 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., RNDr. Eva Hradilová, Ing. Petr Sedlák, Ph.D., RNDr. Naděžda Uhdeová, Ph.D.

Ph.D. Students

Hamed Mohamed Abubaker MSc., Ing. Inas Faisel Abuetwirat, Mgr. Naděžda Bogatyreva, Ing. Miloš Chvátal, Ing. Jaroslav Kala, Ing. Alexandr Knápek, Ing. Martin Kopecký, Ing. Ondřej Krčál, Ing. Robert Macků, Ing. Petr Paračka, Ing. Jaromír Pelčák, RNDr. Zdeněk Sita, Ing. Ondřej Šik, Ing. Pavel Škarvada, Ing. Pavel Tofel, Ing. Tomáš Trčka

Administrative and Technical Staff

Ing. Alexey Andreev, Ph.D., Mgr. Naděžda Bogatyreva, Lenka Horká, Ing. Miloš Chvátal, Ing. Alexandr Knápek, Ing. Robert Macků, Ing. Jiří Majzner, Ph.D., Ing. Tomáš Palai-Dany, Ph.D., Ing. Petr Paračka, Miroslav Sadovský, Ing. Petr Sadovský, Ph.D., Ing. Ondřej Šik, Ing. Pavel Škarvada, Ing. Pavel Tofel, Ing. Tomáš Trčka, Ing. Alena Václavíková

Main Interests

The department provides tuition in basic courses of the Bachelor degree programme Physics 1 and Physics 2 (full-time and part-time formats of study), Physics for Information Technology, Physics 1 and Physics 2 for the programme Biomedical Technology and Bioinformatics, and in the Master degree programme in subjects Nanotechnology, Modern Physics, Solid Phase Physics and Non-Destructive Diagnostics of Materials and Semiconductors and Physics of Dielectrics. The subjects Junctions and Nanostructures and Spectroscopic Methods for Non-Destructive Diagnostics was offered in the doctoral study programme.

The tasks for Physical Practice and multimedia study materials were updated for instruction in the computer room and for student self-study. Laboratory tasks for Master study were innovated and upgraded within the framework of FRVŠ projects

Research is centred on basic and applied research of the physical parameters of semiconductor and dielectric materials and components, and recently on nanosensors The main areas of interest are noise spectroscopy, local characteristics with nanodistinction, measurement of nonlinearities, design of component quality and reliabi-

lity indicators for non-destructive assessment of each technological stage. Very good results were achieved in research of the characteristics of acoustic and electromagnetic emission sensors, local spectroscopy, topography, photoluminescence of semiconductor and photonic structures and dielectric relaxation spectroscopy of anorganic and organic materials. The department cooperated with European and Japanese laboratories in the field of noise spectroscopy and nanotechnology, extended cooperation with Augsburg University in research on dielectrics, with American universities in Orlando and Rapid City in metrology, and cooperated with leading Czech laboratories in the development and enhancement of the parameters of CdTe radiation detectors. Cooperation with industrial companies continued on the basis of three economic contracts.

Reserarch 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 SNOM and automatic meter Keithley were purchased.

Major Achievements

The regional centre VaV CZ.1.05/2.1.00/03.0072 ´Centre for Sensoric, Information and Communication Systems´ (SIX) was started in 2010 within the Operational programme Research and Development for Innovations as a joint initiative of FEEC departments of microelectronics, radioelectronics, telecommunications and physics. In the Department of Physics two laboratories are being built: Laboratory of Noise, Dielectric Spectroscopy and Electromagnetic Emission, Lubomír Grmela, and Laboratory of Nanometrology, Vladimír Holcman. The majority of the department´s staff participated in the research plan MSM 0021630503 – MIKROSYN, with co-investigator Lubomír Grmela. The project outcomes in 2010 are 73 articles, great many of them in impact journals and several invited lectures at scientific and professional international and national conferences, 1 patent application, 4 prototypes and 1 utility software.

The department was involved in 6 GAČR, 5 FRVŠ, 2 MPO, 1 INGO projects, and 1 BUT specific research grant, 2 innovation vouchers of South Moravian Innovation Centre.

The GAČR projects were focused on nonlinear defectoscopy of solids, electro-ultrasonic spectroscopy of composites and alloys on the basis of magnesium, irreversible processes in dielectrics and processes with impact on energy transport in arc charge with liquid stabilization. Study of local electrical and optical characteristics of optoelectronic systems.

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

The MPO TIP projects dealt with applications of laser technology in production of quartz crystal solar cells, in cooperation with Solartec s.r.o and research and development of progressive tools for improved quality of cast billet, wires and rods in cooperation with Třinec Iron and Steel Works

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

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

Research of solar panels and sensors for biophysics was supported by innovation vouchers of the South Moravian Innovation Centre.

The department received 2 projects on upgrading and popularization of physics from the Operational Programme Education for Competiveness: 2.3 CZ.1.07/2.3.00/09.0214 - IVEFEN ´Research teams 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 of Physics can offer new courses on nanoscience, nanometrology, nanomaterials and nanosensors.

We succeeded in presenting the new doctoral degree programme Physical Electronics and Nanotechnology to Master students, and consequently an increased number of students enrolled.

In 2010 Vlasta Sedláková defended her habilitation work ´Non-destructive testing of passive electronic components´, in the study area Electrical and Electronic Technology´.

Major Research Projects

Diagnostics of Defects in Materials Using Latest Defectoscopic Methods – GAČR GD102/09/H074
Investigator: Karel Liedermann

Fluctuation Processes in PN Junctions of Solar Cells – GAČR 102/10/2013
Investigator: Pavel Koktavý

Laser Technology Application in the Production Process of Quartz Crystal Solar Cells – MPO FR-TI1/305
Investigator: Pavel Koktavý

Local Optical and Electrical Characteristics of Opto-Electronic Structures with Nanometric Resolution – GAČR 102/08/1474
Investigator: Pavel Tománek

Low Frequency Noise in Submicron MOSFET and HEMT Structures – GAČR 102/08/0260
Investigator: Jan Pavelka

Research and Development Progressive Instruments for Innovation Surface Quality of Cast Billets, Bars and Wires – MPO FR-TI2/536
Investigator: Lubomír Grmela

Stochastic Effects in Semiconductor Structures MIS and MIM – GAČR 102/09/1920
Investigator: Josef Šikula

Selected Publications

HOLCMAN, V.; GRMELA, L.; LIEDERMANN, K. New Mixing Rules for Composite Polymer Materials. IEEJ Transactions on Electrical and Electronic Engineering, 2010, roč. 5, č. 4, s. 381-385. ISSN: 1931-4973.
PAVELKA, J.; ŠIKULA, J.; TACANO, M.; TOITA, M. Activation Energy of RTS Noise. Radioengineering, 2010, roč. 20, č. 1, s. 1-6. ISSN: 1210- 2512.
MACKŮ, R.; KOKTAVÝ, P. Analysis of fluctuation processes in forward- biased solar cells using noise spectroscopy. Physica status solidi (a), 2010, roč. 207, č. 10, s. 2387-2394. ISSN: 1862- 6319.
ŠKARVADA, P.; TOMÁNEK, P.; GRMELA, L.; SMITH, S. Microscale localization of low light emitting spots in reversed- biased silicon solar cells. SOLAR ENERGY MATERIALS AND SOLAR CELLS, 2010, roč. 94, č. 12, s. 2358-2361. ISSN: 0927- 0248.
ANDREEV, A.; GRMELA, L.; MORAVEC, P.; BOSMAN, G.; ŠIKULA, J. Investigation of excess 1/ f noise in CdTe single crystals. SEMICONDUCTOR SCIENCE AND TECHNOLOGY, 2010, roč. 2010(25), č. 5, s. 1-7. ISSN: 0268- 1242.

Bachelor Degree Programme

Physics 1 (Pavel Dobis)

Physics 2 (Milada Bartlová)

Physics for Informatics (Lubomír Grmela)

Seminar of Physics (Eva Hradilová)

Master Degree Programme

Solid State Physics (Lubomír Grmela)

Modern Physics (Karel Liedermann)

Physical Optics for Informatics (Pavel Hruška)

Nanotechnology (Pavel Tománek)

Non-destructive Diagnostics and Physics of Dieletrics (Karel Liedermann)

Doctoral Degree Programme

Junctions and Nanostructures (Pavel Tománek)

Spectroscopic Methods for Non-Destructive Diagnostics (Karel Liedermann)

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

Laboratory of Optical Nanometrology (contactless investigation of local optical and electrical characteristics of optoelectronic and photonic structures with horizontal superresolution by optical scanning near-field microscopy, Pavel Tománek)

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

Laboratory of Noise Dielectric Spectroscopy and Electromagnetic Emission (experimental and theoretical research of stochastic processes and carrier transport as basic for new advance technologies, nanosensorics, development of non-destructive diagnostics and modern methods of the lifetime estimation of electronic components and structures, Lubomír Grmela)

Department of Languages

PhDr. Milena Krhutová, Ph.D.
Head

Technická 3058/10
616 00 Brno
tel.: 541 146 040
fax: 541 146 349
E-mail: ujaz@feec.vutbr.cz

Lecturers

Mgr. Marie Bartošová, Mgr. Ladislav Baumgartner, PaedDr. Alena Baumgartnerová, Mgr. Petra Boková-Filová, PhDr. Marcela Borecká, Mgr. Přemysl Dohnal, M. A. Kenneth Froehling, Ing. Martin Jílek, Mgr. Miroslav Kotásek, Ph.D., PhDr. Milena Krhutová, Ph.D., Mgr. Petra Langerová, PhDr. Dagmar Malíková, Mgr. Jana Malíková-Kopecká, PhDr. Ludmila Neuwirthová, Ph.D., Mgr. Šárka Rujbrová, Mgr. Pavel Sedláček, PhDr. Milan Smutný, Ph.D., Mgr. Agata Walek

Administrative and Technical Staff

Miroslava Purová

Main Interests

The development of the concept of language tuition upgrading with focus on English for electrical engineering and Information technology, and other languages continued. For the project ´Specific Linguistic and Methodological Qualifications of English Language Teachers and Postgraduates at FEKT and FIT´ the syllabus for the course of English for Ph.D. students was innovated, new teaching materials elaborated and tuition for several groups of Ph.D. students was conducted. The other target group of the project – language teachers - were offered training in English as a language of profession and methodology of language teaching approached from the viewpoint of language users. Research continued on English as a professional language, and research results have been incorporated in teaching materials for language courses. Professio-

nal discourse analysis considered not only the pragmatic approach, but also the sociolinguistic approach studying the environment in which English is used, either as a national or foreign language. Research results were published in national and international journals and presented at conferences in France, Malta and Poland, and at international conferences organized by English languages departments of the Facualty of Arts and Pedagogical Faculty, Masaryk University in Brno.

The economic section of the department offered popular economy and psychology courses and Lifelong education pedagogy courses.

In 2010 the department moved to Technická 10 in the campus Pod Palackého vrchem.

Major Achievements

KRHUTOVÁ, M. Parameters of Professional Discourse, Lambert Academic Publishing, Germany, Great Britain, U.S.A., 2010, ISBN: 978-3-8383-6063-8

KRHUTOVÁ, M.; MALÍKOVÁ, D.; NEUWIRTHOVÁ, L.; SMUTNÝ, M. Metodika vyučování odbornému jazyku pro akademické pracovníky Ústavu jazyků a pro doktorandy z hlediska lingvistického a didaktického jako výstup k projektu OP VK CZ 1.07/2.3.00/09.0105 „Odborná jazyková kvalifikace učitelů angličtiny a doktorandů FEKT a FIT VUT“.

KRHUTOVÁ, M.; SEDLÁČEK, P. European Project in Language Education of Academics and Postgraduates. IJAS Provence Conference 2010, Aix-en-Provence, Francie, červen 2010.

BORECKÁ, M. Ense~nanza del Espa~nol a los Estudiantes de Ingeniería Técnica. 8. konference EXATEC - Europa Central y del Este na téma Business Strategy, 8.-9.října 2010, Praha.

FROEHLING, K. Political Party Fluctuations in Canadian Federal Elections since 1968: A Regional and Provincial Analysis. In Book of Abstracts, Diversification and Its Discontents: Dynamics of the Discipline. 9. mezinárodní konference anglických, amerických a kanadských studií, MU,

Brno, ČR, 4. – 6. únor 2010, s.95. ISBN 978-80-210-5118-8.

JÍLEK, M. Challenges in Teaching Non-Technical Subjects in a Technical Environment. IJAS, Aix-en-Provence, Francie, červen 2010.

NEUWIRTHOVÁ, L. European Language Education Criteria in Language for Academic Purposes at a Technically-Oriented University. In Ambiguity and the Search for Meaning. English and American Studies. Krakov, Polsko: Jagiellonian University Press, 2010, s. 231-244.

SEDLÁČEK, P. Urbanization in Europe and North America. IJAS Gozo Conference 2010, Malta.

SMUTNÝ, M. English Compounds First Constituents and Their semantic Changes in Translations. International Journal of Arts and Sciences, 2010, roč. 3, č. 16, s. 340-350. ISSN: 1944- 6934.

SMUTNÝ, M. Compounds in Translations. International Journal of Arts and Sciences, 2010, roč. 3, č. 10, s. 143-153. ISSN: 1944- 6934.

SMUTNÝ, M. English Compound Substantives and Their Czech Equivalents. In: Ambiguity and the Search for Meaning: English and American Studies at the Beginning of the 21st Century. Volume 2: Language and Culture. Jodlowiec, M. and Leśniewska, J. (eds). Jagiellonian University Press, Krakov, Polsko 2010, s. 173-184.

Major Research Projects

Specific Language Qualifications in English - CZ.1.07/2.3.00/09.0105,
Investigator: Milena Krhutová

Selected Publications

KRHUTOVÁ, M. Parameters of Professional Discourse, Lambert Academic Publishing, Germany, Great Britain, U.S.A., 2010, ISBN: 978-3-8383-6063-8

KRHUTOVÁ, M. The Influence of English on the Czech Specific Texts on Electrical Engineering in: Krčmová, M. (ed). Languages in the Integrating World, Lincom Europa, Germany, 2010, ISBN: 978-3-86290-200-2

Bachelor Degree Programme

Reading Skills (Marcela Borecká)

English for Bachelors- Pre-Intermediate 1 (Šárka Rujbrová)

English for Bachelors- Pre-Intermediate 2 (Marie Bartošová)

English for Bachelors- Intermediate 1 (Pavel Sedláček)

English for Bachelors- Intermediate 2 (Jaroslav Trávníček)

English for Europe (Přemysl Dohnal)

Professional Success (Martin Jílek)

Engineering Pedagogy and Didactics (Martin Jílek)

Culture of Speech and the Generation of Texts (Martin Jílek)

Professional English for Electrical Engineering and Computer Science (Ludmila Neuwirthová)

Laboratory Didactic (Martin Jílek)

Bookkeeping for Managers (Martin Jílek)

German for Lower-Intermediate (Ladislav Baumgartner)

German for Intermediate Students I. (Ladislav Baumgartner)

German for Beginners (Ladislav Baumgartner)

Business English (Dagmar Malíková)

Pedagogical Psychology (Martin Jílek)

Russian Pre-Intermediate (Alena Baumgartnerová)

Russian for Beginners (Alena Baumgartnerová)

Spanish for Lower-Intermediate Students (Marcela Borecká)

Spanish for Beginners (Marcela Borecká)

Master Degree Programme

Reading Skills (Marcela Borecká)

English for Europe (Přemysl Dohnal)

English for Upper-Intermediate Students (M. A. Kenneth Froehling)

English for Intermediate Students (Přemysl Dohnal)

Professional Success (Martin Jílek)

Culture of Speech and the Generation of Texts (Martin Jílek)

Professional English for Electrical Engineering and Computer Science (Ludmila Neuwirthová)

Bookkeeping for Managers (Martin Jílek)

German for Lower-Intermediate (Ladislav Baumgartner)

German for Intermediate Students I. (Ladislav Baumgartner)

German for Beginners (Ladislav Baumgartner)

Business English (Dagmar Malíková)

Russian Pre-Intermediate (Alena Baumgartnerová)

Russian for Beginners (Alena Baumgartnerová)

Spanish for Lower-Intermediate Students (Marcela Borecká)

Spanish for Beginners (Marcela Borecká)

Doctoral Degree Programme

English for Post-Graduates (Dagmar Malíková)

Department of Mathematics

Doc. RNDr. Zdeněk Šmarda, CSc.
Head

Technická 2848/8
61600 Brno 16
tel.: 541 143 130
fax: 541 143 392
E-mail: umat@feec.vutbr.cz

Professors
Prof. RNDr. Josef Diblík, DrSc.
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. Josef Zapletal, CSc.

Lecturers
Mgr. Helena Durnová, Ph.D., RNDr. Mgr. Břetislav Fajmon, Ph.D., 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. Vladislav Biba, Ing. Jaroslav Klimek, Mgr. Blanka Morávková, Mgr. Alena Ryvolová, Ing. Petr Skorkovský, Mgr. Hana Balcarová, Alena Chernikava, Ganna Konstantinivna Piddubna.

Administrative and Technical Staff
Eva Šimečková

Main Interests

Department of Mathematics is responsible for tuition in subjects in full-time and part-time Bachelor degree programme (Mathematics 1, Mathematics 2, Mathematics 3), in full-time and part-time Master degree programme (Modern Numerical Methods, Matrices and Tensors Calculus, Differential Equations in Electrical Engineering, Probability, Statistics and Operations Research), in two postgraduate courses (Discrete Processes in Electrical Engineering, Probability, Stochastic Processes, Operations Research) and in a number of courses for the Faculty of Information Technology.

Research was focused on several areas:

1. Studies of systems of differential equations with quadratic right-hand Aires. New cases were detected when zero solution is not stable. As a result of the Chetaev method modification new cones were found containing an unstable solution. Significant results were achieved in study of the stability of systems of linear delayed differential equations of neutral type, particularly on the exponential solution stability, derivation and estimates of solution standards and standards of derivation solution by exponentially decreasing functions.

2. Description of the properties of multistructures formed by preference relations in connection with associated bitopologies. Analysis of the Kripke type compatibility of transformations of sets of alternatives with cognitive and incomplete preferences. The utilized strong relation homomorphisms are motivated by p-morphisms used in Kripke semantics. The Choquet integral was used to analyze particular multicriterial problems .Study of fuzzy distinction and modelling modus ponens in the multivalued logic started.

3. De Groot dualization analogy for certain generalized topological structures, namely the so called pretopological systems containing certain properties of localic products and topological spaces including increased effectivity of topological algorithms for processing of images in electron holography.

Major Achievements

The department was involved in 3 GAČR, 1 ESF OPVK 1.3 and 5 FRVŠ projects. The staff participated in two research plans: MSM0021630503 - MSM0021630503 ´New Trends in Microelectronic Systems´ and MSM0012630529 - ´Intelligent Systems in Automation´. Within the framework of the projects we were able to work with internationally renowned scientists (Professor Braverman, USA, Professor Khusainov, Ukraina, Professor Zacher, Turkey, Professor Berezansky, Israel). Research was centred on study of systems of differential equations with quadratic right-hand sides. We detected new cases with unstable zero solution. Another research area was stability study of systems of linear delayed differential equations of neutral type. We also dealt with applications of integral and integro-differential inequalities for description of restrictions for integral perturbation functional equations. Also studied was construction of the quasiautomatics of linear differential operators and solutions of relevant differential equations for linearization of models in local approximation of either complicated models as adaptation tools for real technical processes modelling. Research outcomes were published in impact journals Discrete Dynamics in Nature and Society, Boundary Value Problems, Abstract and Applied Analysis, Advances in Difference Equations, Nonlinear Analysis Series A: Theory, Methods & Applications.

The department´s staff coorganized international conferences:

ICSC - Seventh International Conference on Soft Computing Applied in Computer and Economic Environments, 21 January 2010, Hodonín.

XXVIII International Colloquium on Educational Process Management, 20 May 2010, Brno.

Major Research Projects

Differential Equations and Dynamic Equations on Time Scales II – GAČR 201/07/0145
Investigator: Josef Diblík

Oscillatoris and Asymptotic Characteristics of Differential Equations - GAČR 201/08/0469
Investigator: Josef Diblík

Software for Europe – GAČR INE/07/E008
Investigator: Helena Durnová

Selected Publications

DIBLÍK, J.; BEREZANSKY, L.; BAŠTINEC, J.; ŠMARDA, Z. On the Critical Case in Oscillation for Differential Equations with a Single Delay and with Several Delays. Abstract and Applied Analysis, 2010, roč. 2010, č. Article ID 41789, s. 1-20. ISSN: 1085- 3375.

DIBLÍK, J.; ŠMARDA, Z.; KHUSAINOV, D.; GRYTSAY, I. Stability of Nonlinear Autonomous Quadratic Discrete Systems in the Critical Case. DISCRETE DYNAMICS IN NATURE AND SOCIETY, 2010, roč. 2010, č. Article ID 53908, s. 1-23. ISSN: 1026- 0226.

DIBLÍK, J.; BAŠTINEC, J.; ŠMARDA, Z. Existence of positive solutions of discrete linear equations with a single delay. JOURNAL OF DIFFERENCE EQUATIONS AND APPLICATIONS, 2010, roč. 16, č. 9, s. 1047-1056. ISSN: 1023- 6198.

NEUMAN, F. On a representation of linear differential equations. MATHEMATICAL AND COMPUTER MODELLING, 2010, roč. 52(2010), č. 1- 2, s. 355-360. ISSN: 0895- 7177.

DIBLÍK, J.; ŠMARDA, Z.; BEREZANSKY, L. Positive Solutions of a Second- Order Delay Differential Equations with a Damping Term. Computers and Mathematics with Applications, 2010, roč. 62, č. 2, s. 1332-1342. ISSN: 0898- 1221.

DURNOVÁ, H. Sovietization of Czechoslovak computing: rise and fall of the SAPO project. IEEE ANNALS OF THE HISTORY OF COMPUTING, 2010, roč. 32, č. 2, s. 21-31. ISSN: 1058- 6180.

DIBLÍK, J.; BAŠTINEC, J.; KHUSAINOV, D.; BAŠTINCOVÁ, A. Exponential stability and estimation of solutions of linear differential systems of neutral type with constant coefficients. Boundary Value Problems, 2010, roč. 2010, č. 1, s. 1-20. ISSN: 1687- 2762.

DIBLÍK, J.; KHUSAINOV, D.; RŮŽIČKOVÁ, M.; BOICHUK, A. Boundary Value Problems for Delay Differential Systems. Advances in Difference Equations, 2010, roč. 2010, č. 1, s. 1-20. ISSN: 1687- 1839.

DIBLÍK, J.; BEREZANSKY, L.; ZAFER, A. Recent trends in differential and difference equations. Advances in Difference Equations, 2010, roč. 2010, č. 1, s. 1-2. ISSN: 1687- 1839.

DIBLÍK, J.; ŠMARDA, Z.; BEREZANSKY, L. On connection between second-order delay differential equations and integro- differential equations with delay. Advances in Difference Equations, 2010, roč. 2010, č. 2010, s. 1-8. ISSN: 1687- 1839.

VÍTOVEC, J.; ŘEHÁK, P. Regular variation on measure chains. Nonlinear Analysis, Theory, Methods and Applications, 2010, roč. 72, č. 1, s. 439-448. ISSN: 0362- 546X.

DIBLÍK, J.; ŠMARDA, Z.; BAŠTINEC, J. Oscillation of solutions of a linear second-order discrete delayed equation. Advances in Difference Equations, 2010, roč. 2010, č. 2010, s. 1-11. ISSN: 1687- 1839.

ŠMARDA, Z. Singular Cauchy Initial Value Problem for Certain Classes of Integro- Differential Equations. Advances in Difference Equations, 2010, roč. 2010, č. 2010, s. 1-13. ISSN: 1687- 1839.

Bachelor Degree Programme

Mathematical Seminar (Petr Fuchs)

Mathematics 1 (Vlasta Krupková)

Mathematics 2 (Jan Chvalina)

Mathematics 3 (Břetislav Fajmon)

Selected Parts from Mathematics (Zdeněk Šmarda)

Master Degree Programme

Differential Equations in Electrical Engineering (Josef Diblík)

Matrices and Tensors Calculus (Martin Kovár)

Modern Numerical Methods (Jaromír Baštinec)

Probability, Statistics, Operations Research (Jaromír Baštinec)

Stochastic Processes (Zdeněk Šmarda)

Doctoral Degree Programme

Discrete Processes in Electrical Engineering (Josef Diblík)

Statistics, Stochastic Processes, Operations Research (Jaromír Baštinec)

Laboratories

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

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

74

Department of Microelectronics

Prof. Ing. Vladislav Musil, CSc.
Head

Technická 3058/10
616 00 Brno
tel.: 541 146 159
fax: 541 146 298
E-mail: umel@feec.vutbr.cz

Professors
Prof. Ing. Dalibor Biolek, CSc.
Prof. Ing. Jaroslav Boušek, CSc.
Prof. Ing. Jaromír Brzobohatý, CSc.
Prof. Ing. Vladislav Musil, CSc.
Prof. Ing. Radimír Vrba, CSc.

Associate Professors
Doc. Ing. Arnošt Bajer, CSc.
Doc. Ing. Lukáš Fujcik, Ph.D.
Doc. Ing. Jiří Háze, Ph.D.
Doc. Ing. Jaromír Hubálek, Ph.D.
Doc. Ing. Jaroslav Kadlec, Ph.D.
Doc. Ing. René Kizek, Ph.D.
Doc. Ing. Radek Kuchta, Ph.D.
Doc. Ing. Pavel Legát, CSc.
Doc. Ing. Ivan Szendiuch, CSc.
Doc. Ing. František Urban, CSc.

Lecturers
Ing. Martin Adámek, Ph.D., Ing. Daniel Bečvář, Ph.D., Ing. Edita Hejátková, RNDr. Michal Horák, CSc., Ing. et Ing. Fabián Khateb, Ph.D., Ph.D., 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. Josef Šandera, Ph.D., Ing. Pavel Šteffan, Ph.D.

Ph.D. Students
Ibrahim R. H. Ben Ayad, Ing. Marek Bohrn, Ing. Martin Buršík, Ing. Richard Ficek, Ing. Ondřej Frantík, Ing. Jiří Hladík, Ing. Radim Hrdý, Ing. David Jaroš, Ing. Nabhan Khatib, Ing. Vilém Kledrowetz, Ing. Ondřej Kokeš, Ing. Petr Kosina, Ing. Pavel Křenek, Ing. Martin Magát, Ing. Martin Macháček, Ing. Ladislav Macháň, Ing. Milan Matějka, Ing. Michal Nicák, Ing. Jiří Panáček, Ing. Jan Pekárek, Ing. Petr Pfeifer, Ing. Marián Pristach, Ing. Boleslav Psota, Ing. Jiří Pulec, Ing. Zdeněk Pytlíček, Ing. Michal Řezníček, Ing. Jiří Sedláček, Ing. Mahmoud Shaktour, Ing. Assaid Othman Sharoun, Ing. Ayad Khazal Shehab, Ing. David Smola, Ing. Daniel Široký, Ing. Vladimír Šulc, Ing. Olga Švecová, Ing. Jan Vaněk, Ing. Cyril Vaško, Ing. Jiří Vávra, Ing. Marina Vorozhtsova, Ing. Doaa Yahya, Ing. Petr Zapletal, Ing. Pavel Zavoral, Ing. Dušan Zošiak, Ing. Jaromír Žák

Administrative and Technical Staff
RNDr. Vojtěch Adam, Ph.D., Bc. Petr Bednář, Ing. Jan Břínek, Jarmila Fučíková, Petra Jedličková, Hana Jelínková, PhDr. Jarmila Jurášová, Ing. Zdeněk Kozáček, Ing. Petr Majzlík, Ph.D., Ing. Martin Magát, Mgr. Eva Martincová, Ph.D., RNDr. Michal Masařík, Ph.D., Ing. Břetislav Mikel, Ph.D., Bc. David Nejezchleb, Mgr. Michaela Pekarová, Ph.D., Ing. Robert Plaga, Ph.D., Vladislav Pliska, Mgr. Milan Pouch, Mgr. Markéta Ryvolová, Ph.D., Ing. Jiří Sochor, Ing. Marek Šimčák, Ph.D., Ing. Radek Vlach, Ph.D., Mgr. Ondřej Zítka

Main Interests

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

Research is centred on basic and applied research of integrated circuits, sensors and microelectronic technologies. The main areas of interest are design of switching current circuits and evaluation of signals from chemosensors and biosensors, mainly gases and pesticides, nanostructures (nanotubes, nanocolumns) using advanced nanotechnology, simulation and evaluation of the reliability of 3D linking systems.

The department closely cooperated (placements of students) with Technical University of Sofia, Bulgaria, KHBO Brugge, Belgium, with the company Autoflug Hamburg, Catalania University Rovira and Virgili in Tarragona in research, with the research laboratory IMEC-KHBO in Belgium, Yeditepe University Istanbul and King Mongkut's Institute of Technology North Bangkok.

In coopertion with King Mongkut's University of Technology North Bangkok, Yeditepe University Istanbul, University Delhí and Suan Sunandha Rajabhat University Sunandha Rajabhat oscillators were synthetized using newly developed active elements CDTA, ZC-CDTA a ZC-CG-CDBA. The department has maintained cooperation with Prof. Massimiliano Di Ventra from the Department of Physics, University of California, San Diego. Professor Di Ventra is recognized as the successor of Professor Chua in applications of mem-systems in artificial intelligence and nanotechnology.

In close cooperation with Pbt Rožnov p.R. a new methodology for cleaning in electronics has been devised in connection with production of modern cleaning equipment (with focus on cleaning after soldering and cleaning of templates). In cooperation with TU Wien, new types of flow sensors were implemented using the LTCC technology.

In cooperation with Joint Research Center, Institute for Energy, Petten, Holland the group led by J. Boušek tested the newly developed hydrogen sensors. Results were published in the International impact Journal of Hydrogen Energy. The group continued research of sputtered passivation and antireflection layers.

Major Achievements

In 2010 the members of the department were involved in 1 project of the 5th FP EU and in 3 projects of the 7th FP EU in programmes ARTEMIS JU and ENIAC JU, in 3 GAČR projects, 1 GAAV project, 1 project from the programme Nanotechnology for the Society, 12 FRVŠ projects, 4 projects of cooperation with industry (MPO) and 1 NPV II projects of the Ministry of Education.

In September 2010 the department organized the international conference 'Electronic Devices and Systems EDS2010' with participation of Czech and international experts. There were 96 papers on microelectronics and technology.

The group involved in microelectronic technologies, headed by Ivan Szendiuch, achieved significant international level results in research on lead-free solders focused on the lifetime and reliability of lead-free soldered connections, which were the subject of a GAČR project and are applied in practice. Research and development of cleaning methods with regard to environmental management continues in cooperation with manufacturing companies. Another research area is modelling of thermal stress in soldered connections and casing in ANSYS, including contacting and modelling of contacts of semiconductor chips, again in cooperation with the industrial sector. The first stage of work on a unique thermal balance sensor (MPO project) including protype testing on industrial applications was completed. A patent application was submitted on ´Dispensing Apparatus Arrangement for Selective Deposition of Pastes and Adhesives´. Results were presented at conferences published on Web of Science (ISI).

The group LabSensNano (Laboratory of Microsensors and Nanotechnologies) headed by Jaromír Hubálek has been involved in research and development of chemical sensors and biosensors for medical and environmental applications. They devised a unique method for fast detection of viruses, implementation in Lab on a chip, elabo-

rated a methodology for in-vivo imaging making use of quantum dots. They have developed a system for electrochemical mass-screening by means of sensor field and 8 channel device. The group registered a utility model for an automated device for deposition of nanostructures and submitted two patent applications, one for this device and method and the other for separation of biological substances in analysis. Research results were published in15 impact journals and presented at 4 conferences published on ISI WOS.

Professor D. Biolek led experimental studies on the development of models of the so called memsystems focused on memristors, memcapacitors and memconductors, development of non-conventional active elements for analog signal processing, development of electronically tunable oscillators in the current mode and frequency filters on the basis of non-conventional active elements. A number of responses were received in 2010, among them 66 citations on Web of Science (ISI). In research on non-conventional microelectronic active elements a number of new circuit principles were devised - ZC-CITA (Z-Copy Current Inverter Transconductance Amplifier), VD-DIBA (Voltage-Differencing Differential Input Buffered Amplifier), CFBTA (Current Follower Buffered Transconductance Amplifier), CIBTA (Current Inverter Buffered Transconductance Amplifier), CIBDITA (Current Inverter Buffered Differential Input Transconductance Amplifier) and ZC-CG-CDBA (Z Copy – Controlled Gain – Current Differencing Buffered Amplifier). An outstanding outcome is the article accepted for publication in International Journal on Circuit Theory and Applications, a journal with the highest impact factor, dealing with the theory of circuits.

Major Research Projects

An Intelligent Platform for Wireless Communication – MPO FI-IM4/034
Investigator: Radimír Vrba

Automated Digital Fuel System Design and Simulation Process - 030798 SmartFuel ADSP (FP6)
Investigator: Jaromír Brzobohatý

Development of Technology Procedures Characterization – GAČR 102/07/P493
Investigator: Radovan Novotný

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

Impedimetric Chemical Sensors with Nano-Mechanized Electrode Surface – GAAV ČR 1QS201710508
Investigator: Jaromír Hubálek

Intelligent Micro- and NanoStructures in Microsensors Implemented Using Nanotechnology – GAČR 102/09/1601
Investigator: Radimír Vrba

Memristive, Memcapacitive a Meminductive Systems: Basic Research, Modeling and Simulation – GAČR P102/10/1614
Investigator: Dalibor Biolek

Miniaturized Intelligent Systems and Nanostructured Electrodes for Chemical, Biological and Pharmaceutical Applications (NANIMEL) – GAČR 102/08/1546
Investigator: Jaromír Hubálek

Multifunction Composites with Excellent Properties Based on Anorganic Nanocomponents – MPO FT-TA3/027
Investigator: Radimír Vrba

New Trends in Microelectronic Systems and Nanotechnologies (MIKROSYN) – ČR MSM0021630503
Investigator: Radimír Vrba

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

Research and Development of Digitally Tunable Integrated Circuits Operating in Mixed Mode – 102/09/1628
Investigator: Radimír Vrba

Research of New Technologies for Bonding of Chips in Integrated Circuits and Development of a Measuring System for Reliability Analysis – MPO FT-TA3/013
Investigator: Ivan Szendiuch

Research of Novel Mechatronic Systems MEMS for Pressure Measurement – 2A-1TP1/143
Investigator: Radimír Vrba

Research of Technology for Monitoring Thermodynamic Balance by Balance Sensors and its Applications – MPO FT-TA4/115
Investigator: Ivan Szendiuch

Research of Universal and Complex Authentization and Authorization for Fixed and Mobile Computer Networks – MŠMT 2C08002
Investigator: Radimír Vrba

Signal Digitization Methods for Modern Sensors – GAČR 102/08/1116
Investigator: Radimír Vrba

Special Methods of Modelling and Simulation of Switched Circuits – GAČR 102/08/0784
Investigator: Dalibor Biolek

Selected Publications

DZIK, P.; VESELÝ, M.; CHOMOUCKÁ, J. Thin Layers of Photocatalytic TiO2 Prepared by Inkjet Printing of a Solgel Precursor. JOURNAL OF ADVANCED OXIDATION TECHNOLOGIES, 2010, roč. 13, č. 2, s. 172-183. ISSN: 1203- 8407.

BIOLEK, D.; BIOLEK, Z.; BIOLKOVÁ, V. SPICE modelling of memcapacitor. Electronics Letters, 2010, roč. 46, č. 7, s. 520-522. ISSN: 0013- 5194.

BIOLEK, D.; KESKIN, A.; BIOLKOVÁ, V. Grounded capacitor current mode single resistance- controlled oscillator using single modified current differencing transconductance amplifier. IET Circuits, Devices and Systems, 2010, roč. 4, č. 6, s. 496-502. ISSN: 1751- 858X.

URBAN, F.; KADLEC, J.; VLACH, R.; KUCHTA, R. Design of pressure sensor based on optical fiber Bragg grating lateral deformation. SENSORS, 2010, roč. 10, č. 12, s. 11212-11225. ISSN: 1424- 8220.

KRYŠTOFOVÁ, O.; SHESTIVSKA, V.; ZÍTKA, O.; HAVEL, L.; ZEHNÁLEK, J.; TRNKOVÁ, L.; HUBÁLEK, J.; ADAM, V.; KIZEK, R. Tolerance rostlin lnu k působení kademnatých iontů. LISTY CUKROVARNICKE A REPARSKE, 2010, roč. 126, č. 11, s. 411-411. ISSN: 1210- 3306.

ADAM, V.; HÚSKA, D.; HUBÁLEK, J.; KIZEK, R. Easy to use and rapid isolation and detection of a viral nucleic acid by using paramagnetic microparticles and carbon nanotubes-based green - printed electrodes. Microfluidics and Nanofluidics, 2010, roč. 8, č. 3, s. 329-339. ISSN: 1613- 4982.

FUJCIK, L.; PROKOP, R.; PRÁŠEK, J.; HUBÁLEK, J.; VRBA, R. New CMOS potentiostat as ASIC for several electrochemical microsensors construction. MICROELECTRONICS INTERNATIONAL, 2010, roč. 2010, č. volume 27 n. 3, s. 3-10. ISSN: 1356- 5362.

HÚSKA, D.; ADAM, V.; HAVEL, L.; ZEHNÁLEK, J.; HUBÁLEK, J.; KIZEK, R. Transkriptomika pro posouzení efektu těžkých kovů na rostliny. LISTY CUKROVARNICKE A REPARSKE, 2010, roč. 126, č. 11, s. 405-405. ISSN: 1210- 3306.

SOCHOR, J.; MAJZLÍK, P.; SALAŠ, P.; ADAM, V.; TRNKOVÁ, L.; HUBÁLEK, J.; KIZEK, R. Studium dostupnosti iontů těžkých kovů pomocí různých extrakčních postupů a elektrochemické detekce. LISTY CUKROVARNICKE A REPARSKE, 2010, roč. 126, č. 11, s. 414-415. ISSN: 1210- 3306.

ZÍTKA, O.; SOCHOR, J.; CERNEI, N.; ADAM, V.; ZEHNÁLEK, J.; HORNA, A.; HUBÁLEK, J.; TRNKOVÁ, L.; HAVEL, L.; KIZEK, R. Studium interakce kademnatých iontů s cysteinem. LISTY CUKROVARNICKE A REPARSKE, 2010, roč. 126, č. 11, s. 422-422. ISSN: 1210- 3306.

BOON-BRETT, L.; BOUSEK, J.; BLACK, G.; MORETTO, P.; CASTELLO, P.; HUBERT, T.; BANACH, U. Identifying performance gaps in hydrogen safety sensor technology for automotive and stationary applications. INTERNATIONAL JOURNAL OF HYDROGEN ENERGY, 2010,

BIOLEK, D.; BIOLKOVÁ, V. First-order voltage-mode all- pass filter employing one active element and one grounded capacitor. ANALOG INTEGRATED CIRCUITS AND SIGNAL PROCESSING, 2010, roč. 65, č. 1, s. 123-129. ISSN: 0925- 1030.

BIOLKOVÁ, V.; BIOLEK, D. Shadow filters for orthogonal modification of characteristic frequency and bandwidth. Electronics Letters, 2010, roč. 46, č. 10, s. 830-831. ISSN: 0013- 5194.

JAIKLA, W.; SIRIPRUCHYANUN, M.; BIOLEK, D.; BIOLKOVÁ, V. High Output-impedance Current-mode Multiphase Sinusoidal Oscillator Based on CDTA- allpass filters. INTERNATIONAL JOURNAL OF ELECTRONICS, 2010, roč. 97, č. 7, s. 811-826. ISSN: 0020- 7217.

VALSA, J.; BIOLEK, D.; BIOLEK, Z. An analogue model of the memristor. International Journal of Numerical Modelling: Electronic Networks, Devices and Fields., 2010, roč. 23, č. 1, s. 1-9. ISSN: 0894- 3370.

BIOLEK, D.; BAJER, J.; BIOLKOVÁ, V.; KOLKA, Z.; KUBÍČEK, M. Z Copy - Controlled Gain - Current Differencing Buffered Amplifier and its applications. International Journal of Circuit Theory and Applications, 2010, roč. 2010, č. 6, s. 222-235. ISSN: 0098- 9886.

KRYŠTOFOVÁ, O.; TRNKOVÁ, L.; ADAM, V.; ZEHNÁLEK, J.; HUBÁLEK, J.; BABULA, P.; KIZEK, R. Electrochemical Microsensors for the Detection of Cadmium (II) and Lead (II) Ions in Plants. SENSORS, 2010, roč. 10, č. 6, s. 5308-5328. ISSN: 1424- 8220.

BIOLEK, D.; BIOLEK, Z.; BIOLKOVÁ, V. PSPICE modeling of meminductor. ANALOG INTEGRATED CIRCUITS AND SIGNAL PROCESSING, 2010, roč. 64, č. 10, s. 1-9. ISSN: 0925- 1030.

CHOMOUCKÁ, J.; DRBOHLAVOVÁ, J.; HÚSKA, D.; ADAM, V.; KIZEK, R.; HUBÁLEK, J. Magnetic nanoparticles and targeted drug delivering. PHARMACOLOGICAL RESEARCH, 2010, roč. 62, č. 2, s. 144-149. ISSN: 1043- 6618.

MAJZLÍK, P.; PRÁŠEK, J.; TRNKOVÁ, L.; ZEHNÁLEK, J.; ADAM, V.; HAVEL, L.; HUBÁLEK, J.; KIZEK, R. Biosenzory pro detekci těžkých kovů. LISTY CUKROVARNICKE A REPARSKE, 2010, roč. 126, č. 11, s. 413-414. ISSN: 1210- 3306.

ADAM, V.; FABRIK, I.; KOHOUTKOVÁ, V.; BABULA, P.; HUBÁLEK, J.; VRBA, A.; TRNKOVÁ, L.; KIZEK, R. Automated Electrochemical Analyzer as a New Tool for Detection of Thiols. INTERNATIONAL JOURNAL OF ELECTROCHEMICAL SCIENCE, 2010, roč. 5, č. 4, s. 429-447. ISSN: 1452- 3981.

BIOLEK, D.; BIOLKOVÁ, V. All- pass filters employing differential OpAmps. ELECTRONICS WORLD, 2010, roč. 116, č. 1891, s. 44-45. ISSN: 1365- 4675.

BOON-BRETT, L.; BLACK, G.; MORETTO, P.; BOUSEK, J. A comparison of test methods for the measurement of hydrogen sensor response and recovery times. INTERNATIONAL JOURNAL OF HYDROGEN ENERGY, 2010, roč. 35 (2010), č. 14, s. 7652-7663. ISSN: 0360- 3199.

KHATEB, F.; VÁVRA, J.; BIOLEK, D. A Novel Current-Mode Full- Wave Rectifier Based on One CDTA and Two Diodes. Radioengineering, 2010, roč. 19, č. 3, s. 437-445. ISSN: 1210- 2512.

BIOLEK, D.; BIOLKOVÁ, V. Mutator for transforming memristor into memcapacitor. Electronics Letters, 2010, roč. 46, č. 21, s. 1428-1429. ISSN: 0013- 5194.

CHOMOUCKÁ, J.; DRBOHLAVOVÁ, J.; HUBÁLEK, J.; BABULA, P.; ADAM, V.; KIZEK, R. Toxicita nanočástic pro rostliny. LISTY CUKROVARNICKE A REPARSKE, 2010, roč. 126, č. 11, s. 400-401. ISSN: 1210- 3306.

BABULA, P.; OPATŘILOVÁ, R.; KOHOUTKOVÁ, V.; DAŇKOVÁ, I.; HUBÁLEK, J.; ZEHNÁLEK, J.; ADAM, V.; KIZEK, R. Možnosti histochemické a mikroskopické detekce mědi v rostlinných pletivech. LISTY CUKROVARNICKE A REPARSKE, 2010, roč. 126, č. 11, s. 395-395. ISSN: 1210- 3306.

ZÍTKA, O.; KRYŠTOFOVÁ, J.; CERNEI, N.; ADAM, V.; HUBÁLEK, J.; TRNKOVÁ, L.; BEKLOVÁ, M.; KIZEK, R. Vysoce účinná kapalinová chromatografie jako nástroj pro detekci fytochelatin syntázy. LISTY CUKROVARNICKE A REPARSKE, 2010, roč. 126, č. 11, s. 418-419. ISSN:

Bachelor Degree Programme

Analogue Electronic Circuits (Dalibor Biolek)

Diagnostics and Testing of Electronic Systems (Vladislav Musil)

Digital Circuits and Microprocessors (Radimír Vrba)

Electronic Devices (Jaroslav Boušek)

Electrovacuum Instruments and Cryogenic Technique (Jaroslav Boušek)

Microelectronic Practicals (Josef Šandera)

Microelectronics and Assembly Technology (Ivan Szendiuch)

Microsensors and Micromechanical Systems (Radimír Vrba)

Modelling and Computer Simulation (Dalibor Biolek)

Design and Technology of Electronic Instruments (Vladislav Musil)

Design of Analog Integrated Circuits (Daniel Bečvář)

VLSI Digital IC Design and VHDL (Lukáš Fujcik)

Optoelectronics and Optical Communications (František Urban)

Management Minimum (Pavel Legát)

Master Degree Programme

Analogue Integrated Circuits (Jiří Háze)

Applied Computer Technology (Radovan Novotný)

Digital Integrated Circuits (Pavel Štefan)

Integrated Optoelectronics (František Urban)

Design and Technology of Electronic Equipments (Vladislav Musil)

Methods of Analog Integrated Circuits Design (Vladislav Musil)

Methods of Digital Integrated Circuits Design (Vladislav Musil)

Microelectronics in English (Jaromír Brzobohatý)

Microelectronics Circuits (Daniel Bečvář)

Microelectronic Devices and Structures (Michal Horák)

Modelling and Simulation in Microelectronics (Dalibor Biolek)

New Technology for Microelectronic Circuits (Ivan Szendiuch)

Design of Electronic Instruments (Radimír Vrba)

New Circuit Principles for Integrated System Design (Jaromír Brzobohatý)

Management Minimum (Pavel Legát)

Quality Control (Radovan Novotný)

Technological Process Control (Radovan Novotný)

Theory of AD and DA Signal Conversion (Radimír Vrba)

Vacuum Technology (Jaroslav Boušek)

Electronic Components Production (Ivan Szendiuch)

Doctoral Degree Programme

Microelectronic Systems (Vladislav Musil)

Microelectronic Technologies (Jaromír Hubálek)

Laboratories

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

Design Laboratory of Electronic Devices and Systems (instruction in Digital Circuits and Microprocessors, Electronic Systems, student projects, Pavel Šteffan)

Laboratory of Electronic Components (instruction in Electronic Components, Arnošt Bajer, Jaroslav Boušek)

Laboratory of Design of Integrated Circuits (instruction in Design of analog integrated circuits and Design of digital integrated circuits,student projects, Roman Prokop)

Laboratory of Microsensors and Nanotechnologies (research laboratory of chemistry, chemical sensors, development of electronic devices, electron microscopy, Jaromír Hubálek)

Laboratory of Microelectronic Technology (instruction in Microelectronics and Assembly Technology, Modern Technology of Electronic Circuits and Systems, student projects, Ivan Szendiuch)

Laboratory of Microsensors (instruction in Microsensors and Micromechanical Systems, Jaromír Hubálek)

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

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

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

Department of Radioelectronics

Prof. Dr. Ing. Zbyněk Raida
Head

Purkyňova 464/118
61200 Brno 12
tel.: 541 149 105
fax: 541 149 244
E-mail: urel@feec.vutbr.cz

Professors

Prof. Ing. Lubomír Brančík, CSc.
Prof. Ing. Tomáš Dostál, DrSc.
Prof. Ing. Stanislav Hanus, CSc.
Prof. Ing. Miroslav Kasal, CSc.
Prof. Dr. Ing. Zdeněk Kolka
Prof. Dr. Ing. Zbyněk Raida
Prof. Ing. Václav Říčný, CSc.
Prof. Ing. Milan Sigmund, CSc.
Prof. Ing. Vladimír Šebesta, CSc.
Prof. Ing. Otakar Wilfert, CSc.

Associate Professors

Doc. Ing. Tomáš Frýza, Ph.D.
Doc. Ing. Jaromír Kolouch, CSc.
Doc. Ing. Tomáš Kratochvíl, Ph.D.,
Doc. Ing. Roman Maršálek, Ph.D.
Doc. Ing. Zdeněk Nováček, CSc.
Doc. Ing. Aleš Prokeš, Ph.D.
Doc. Ing. Jiří Šebesta, Ph.D.

Lecturers

Ing. Viera Biolková, Ing. Lucie Dordová, Ph.D., Ing. Jiří Dřínovský, Ph.D., Ing. Zbyněk Fedra, Ph.D., Ing. Ivana Jakubová, Ing. Michal Kubíček, Ph.D., Ing. Jaroslav Láčík, Ph.D., Ing. Zbyněk Lukeš, Ph.D., Ing. Václav Michálek, CSc., Ing. Jiří Petržela, Ph.D., Ing. Jan Prokopec, Ph.D., Ing. Martin Slanina, Ph.D. Ing. Tomáš Urbanec, Ph.D., Ing. Petr Vágner, Ph.D.

Ph.D. Students

Ing. Filip Adamec, Ing. Radek Balada, Ing. Ondřej Baran, Ing. Jan Beneš, Ing. Jiří Blumenstein, Ing. Libor Boleček, Ing. Jan Cigánek, Ing. Jan Diblík, Ing. Ivo Dufek, Ing. Martin Dušek, Ing. Jiří Dvořák, Ing. Radek Dvořák, Ing. Zdeněk Dvořák, Ing. Jiří Frydrych, Ing. Michal Fuchs, Ing. Tomáš Götthans, Ing. Zdeněk Hruboš, Ing. Petr Kadlec, Ing. Ondřej Kaller, Ing. Zdeněk Kincl, Ing. Lukáš Klozar, Ing. Vlastimil Koudelka, Ing. Tomáš Mikulášek, Ing. Jiří Miloš, Ing. Kamil Pítra, Ing. Ladislav Polák, Ing. Karel Povalač, Ing. Aleš Povalač, Ing. Václav Růžek, Ing. Jitka Svobodová, Ing. Vladimír Šeděnka, Ing. Břetislav Ševčík, Ing. Roman Šotner, Ing. Vladimír Šporik, Ing. Petr Šrámek, Ing. Petr Švábeník, Ing. Jiří Vorek, Ing. Petr Všetula, Ing. Martin Štumpf, Ing. David Wolanský, Ing. Jiří Zachar, Ing. Petr Zelinka, Ing. David Zeman

Administrative and Technical Staff

Ing. Martin Horák, Ph.D., Dr. Ing. Pavel Horský, Ing. Peter Kovács, Ph.D., Ing. Michal Pokorný, Ing. Jan Puskely, Ph.D., Ing. Jaroslav Rumánek, Ph.D., Dora Šebestová, Petra Šípová, Aleš Vanžura, Jaroslav Voráč

Main Interests

Research is focused on modern electronic circuits, signal processing, microwave circuits and antennas. Other areas of interest are mobile, satellite and optical communications, television technology, microprocessor technology and low-frequency electronics and electromagnetic compatibility.

Funding for research comes from two MŠMT research plans, 1 project from the Operational Programme Education for Competitiveness and a research centre. GAČR projects (6 standard, 6 postdoctoral and 2 doctoral grant programmes). The department was involved in 6 MPO projects.

The department´s staff participated in 2 European projects FP7 and 2 COST projects, they also cooperated in a contract for an international partner (Volkswagen) and nearly 10 contracts for Czech companies. The activities of the department in 2010 were supported by T-Mobile.

Research results are immediately incorporated in Bachelor, Master and Ph.D. study programmes. Upgrading of the educational process was funded through 13 FRVŠ projects. Education is also supported by partner companies (the competition Freescale Technology Application, Freescale Race Challenge, Radioelectronics seminars).

The department cooperates with a number of 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. The department´s staff are active members of the Czech Electrotechnical Society, and the department is a collective member of the international organization AMSAT.

Major Achievements

In 2010 the department started to build, together with departments of telecommunications, microelectronics and physics, the regional Centre of Applied Research SIX (Centre for Sensoric, Information and Communication Systems). The Centre has received nearly 3,000 mil. CZK from the Operational Programme Research and Development for Innovations.

The department expanded its activities in international research programmes. It had already been involved in two international activities COST (IC0603 Antenna Systems and Sensors for Information and Communication Technologies, IC0803 RF/Microwave Communication Subsystems for Emerging Wireless Technologies) and last year the department´s team joined the project IC0909 Wireless Networks for Mobile Objects.

In addition to the two FP7 projects (HIRF-SE, High Intensity Radiated Field – Synthetic Environment, 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 2010 the department continued cooperation with Volkswagen and Škoda Auto in research on special antennas, with T-Mobile Czech Republic in mobile network testing, and with a number of other companies. The department joined 3 projects within the programme Centrope Vouchers (cooperation of a university and a company from two different Central European countries. We continued our cooperation with Technische Universität Wien in research on mobile communications, with TU Delft in the development of analytical methods for time-domain modelling of impulse electromagnetic fields, with Aalto University in Helsinki in active semiconductor structures with spread amplification, with ESIEE Paris in signal processing in communications systems and with the University of Buckingham in development of methods of adaptive allocation of frequency spectrum.

Major Research Projects

Advanced Communication Systems and Technologies – FP7, 230126
Investigator: Zdeněk Kolka

Advanced Communication Techniques for an Atmospheric Optical Channel – GAČR 102/08/0851
Investigator: Zdeněk Kolka

Advanced Methods, Structures and Components of Electronic Wireless Communication – GAČR 102/08/H027
Investigator: Aleš Prokeš

Advanced Microwave Components for Satellite Communication Systems – GAČR GAP102/10/1853
Investigator: Miroslav Kasal

Advanced Microwave Structures on Non-Conventional Substrates – GAČR 102/07/0688
Investigator: Zbyněk Raida

Algorithms and Subsystems of Software Defined and Cognitive Radio with Multiple Carriers – GAČR 102/09/0776
Investigator: Roman Maršálek

Antenna set – MPO FR-TI2/039
Investigator: Zbyněk Raida

A Study of Optical Beams for Atmospheric Static and Mobile Communications – GAČR 102/09/0550
Investigator: Otakar Wilfert

Centre of Quasi-optic Systems and Terahertz Spectroskopy – MŠMT ČR LC06071
Investigator: Zbyněk Raida

Centre of Sensor, Information and Communication Systems (SIX) – MŠMT CZ.1.05/2.1.00/03.0072
Investigator: Zbyněk Raida

Communication Systems for Perspective Frequency Ranges – MŠMT CZ.1.07/2.3.00/09.0092
Investigator: Zbyněk Raida

High Intensity Radiated Fields – Synthetic Environment – FP7, 205294
Investigator: Zbyněk Raida

Modelling and Simulations – GAČR 102/08/H018
Investigator: Zbyněk Raida

Modern Helping Energy Unit for Aerial Applications – MPO FR-TI2/194
Investigator: Zdeněk Kolka

New Generation Electronic Communication Systems and Technologies (ELKOM) – MSM0021630513
Investigator: Zbyněk Raida

Novel methods of Multi-Objective Synthesis of Antennas on Special Substrates - OCO8027
Investigator: Zbyněk Raida

Research and Development of Control System and Regulation Terrestrial Airport Source – MPO FR-TI1/184
Investigator: Zdeněk Kolka

Research and Modeling of Advanced Methods of Image Quality Evaluation – GAČR P102/10/1320
Investigator: Tomáš Kratochvíl

Symbolic and Semisymbolic Methods for Power and Mechatronic Applications – GAČR GAP102/10/1665
Investigator: Zdeněk Kolka

Wireless Optical Measurement Methods and Systems for Mechanical Engieering – MPO FR-TI2/705
Investigator: Otakar Wilfert

Selected Publications

BARAN, O.; KASAL, M. Modeling of the phase noise in space communication systems. Radioengineering [IF = 0.312], 2010, roč. 19, č. 1, s. 141-148. ISSN: 1210-2512.

BARAN, O.; KASAL, M. Modeling of the simultaneous influence of the thermal noise and the phase noise in space communication systems. Radioengineering [IF = 0.312], 2010, roč. 19, č. 4, s. 618-626. ISSN: 1210-2512.

BLUMENSTEIN, J.; FEDRA, Z. The PAPR and simple PAPR reduction of the 2D spreading based communication systems. Radioengineering [IF = 0.312], 2010, roč. 2010, č. 19, s. 27-31.

BLUMENSTEIN, J.; ŠEBESTA, V.; FEDRA, Z. Performance of pilot aided channel estimation technique in 2D spreading based systems. Radioengineering [IF = 0.312], 2010, roč. 19, č. 4, s. 507-510. ISSN: 1210-2512.

BOBULA, M.; PROKEŠ, A.; DANĚK, K. Nyquist filters with alternative balance between time- and frequency- domain parameters. EURASIP Journal on Advances in Signal Processing [IF = 0.885], 2010, roč. 2010, č. 12, s. 1-11. ISSN: 1687-6172.

BRANČÍK, L. Utilization of NILTs in simulation of nonlinear systems described by Volterra series. Przeglad Elektrotechniczny [IF = 0.196], 2010, roč. 86, č. 1, s. 68-70. ISSN: 0033-2097.

DORDOVÁ, L.; WILFERT, O. Calculation and comparison of turbulence attenuation by different methods. Radioengineering [IF = 0.312], 2010, roč. 19, č. 1, s. 162-167. ISSN: 1210-2512.

FRÝZA, T. A complete video coding chain based on multi-dimensional discrete cosine transform. Radioengineering [IF: 0.312], 2010, roč. 19, č. 3, s. 421-428. ISSN: 1210-2512.

HENNIGER, H.; WILFERT, O. An introduction to free- space optical communication. Radioengineering [IF = 0.312], 2010, roč. 19, č. 2, s. 203-212. ISSN: 1210-2512.

KEJÍK, P.; HANUS, S. Comparison of fuzzy logic and genetic algorithm based admission control strategies for UMTS system. Radioengineering [IF = 0.312], 2010, roč. 19, č. 1, s. 6-10.

KEJÍK, P.; HANUS, S. Admission control techniques for UMTS system. Radioengineering [IF = 0.312], 2010, roč. 19, č. 3, s. 397-402. ISSN: 1210-2512.

KEJÍK, Z.; DŘÍNOVSKÝ, J.; RŮŽEK, V. Estimation of the EMI filter circuitry from the insertion loss characteristics. Radioengineering [IF = 0.312], 2010, roč. 19, č. 2, s. 313-319. ISSN: 1210-2512.

KOVÁCS, P.; RAIDA, Z. Global evolutionary algorithms in the dDesign of electromagnetic band gap structures with suppressed surface waves propagation. Radioengineering [IF = 0.312], 2010, roč. 19, č. 1, s. 122-128. ISSN: 1210-2512.

KOVÁČ, M.; KOLOUCH, J. Analysis for design and transformation of autosynchronous state machines. Radioengineering [IF = 0.312], 2010, roč. 19, č. 1, s. 99-104. ISSN: 1210-2512.

KUBÍČEK, M.; KOLKA, Z. Blind Oversampling data recovery with low hardware complexity. Radioengineering [IF = 0.312], 2010, roč. 2010, č. 1, s. 74-78. ISSN: 1210-2512.

LÁČÍK, J.; LAGER, I.; RAIDA, Z. Multicriteria optimization of antennas in time-domain. Radioengineering [IF = 0.312], 2010, roč. 19, č. 1, s. 105-110. ISSN: 1210-2512.

LÁČÍK, J. Filtering technique for stabilization of marching-on-in-time method. Radioengineering [IF = 0.312], 2010, roč. 19, č. 2, s. 290-298. ISSN: 1210-2512.

LUKEŠ, Z. Linearly tapered slotline antenna array for quasi-optical molecular spectroscopy. Microwave and Optical Technology Letters [IF = 0.631], 2010, roč. 52, č. 5, s. 1043-1046. ISSN: 0895-2477.

POKORNÝ, M.; RAIDA, Z. Transmission line on semiconductor substrate with distributed amplification. Radioengineering [IF = 0.312], 2010, roč. 19, č. 2, s. 307-312. ISSN: 1210-2512.

POLÁK, L.; KRATOCHVÍL, T. Simulation and measurement of the transmission distortions of the digital television DVB-T/H Part 3: transmission in fading channels. Radioengineering [IF = 0.312], 2010, roč. 19, č. 4, s. 703-711. ISSN: 1210-2512.

PUSKELY, J.; NOVÁČEK, Z. Exploiting of the compression methods for reconstruction of the antenna far-field using only amplitude near-field measurements. Radioengineering [IF = 0.312], 2010, roč. 19, č. 2, s. 299-306. ISSN: 1210-2512.

RUMÁNEK, J.; ŠEBESTA, J. New channel coding methods for satellite communication. Radioengineering [IF = 0.312], 2010, roč. 19, č. 1, s. 155-161. ISSN: 1210-2512.

ŠEBESTA, V. Estimating a spectral correlation function under the conditions of imperfect relation between signal frequencies and a sampling frequency. Radioengineering [IF = 0.312], 2010, roč. 19, č. 1, s. 1-5. ISSN: 1210-2512.

ŠEDĚNKA, V.; RAIDA, Z. Critical comparison of multi-objective optimization methods: genetic algorithms versus swarm intelligence. Radioengineering [IF = 0.312], 2010, roč. 19, č. 3, s. 369-377.

ŠOTNER, R.; JEŘÁBEK, J.; DOSTÁL, T.; VRBA, K. Multifunctional adjustable CM biquads based on distributed feedback VM prototype with OTA s. International Journal of Electronics [IF = 0.430], 2010, roč. 97, č. 7, s. 797-809. ISSN: 0020-7217.

ŠOTNER, R.; HRUBOŠ, Z.; SLEZÁK, J.; DOSTÁL, T. Simply adjustable sinusoidal oscillator based on negative three-port current conveyors. Radioengineering [IF = 0.312], 2010, roč. 19, č. 3, s. 446-453. ISSN: 1210-2512.

ŠTUKAVEC, R.; KRATOCHVÍL, T. Simulation and measurement of the transmission distortions of the digital television DVB-T/H. Part 1: modulator for digital terrestrial television. Radioengineering [IF = 0.312], 2010, roč. 19, č. 2, s. 338-346. ISSN: 1210-2512.

ŠTUKAVEC, R.; KRATOCHVÍL, T. Simulation and measurement of the transmission distortions of the digital television DVB-T/H Part 2: hierarchical modulation performance. Radioengineering [IF = 0.312], 2010, roč. 19, č. 3, s. 429-436. ISSN: 1210-2512.

ŠTUMPF, M.; DE HOOP, A.; LAGER, I. Pulsed electromagnetic field radiation from a narrow slot antenna with a dielectric layer. Radio Science [IF = 1.012], 2010, roč. 45, č. 10, s. 1-9. ISSN: 0048-6604.

TOŠOVSKÝ, P.; VALÚCH, D. Improvement of RF vector modulator performance by feed- forward based calibration. Radioengineering [IF = 0.312], 2010, roč. 19, č. 4, Part II, s. 627-632. ISSN: 1210-2512.

VÁGNER, P.; KASAL, M. A novel bandpass filter using a combination of open-loop defected ground structure and half-wavelength microstrip resonators. Radioengineering [IF = 0.312], 2010, roč. 19, č. 3, s. 392-396. ISSN: 1210-2512.

VALENTA, V.; SUAREZ PENALOZA, M.; BAUDOIN, G.; VILLEGAS, M.; MARŠÁLEK, R. Modified polar sigma-delta transmitter for multi-radio applications. EURASIP Journal on Wireless Communications and Networking [IF = 0.732], 2010, roč. 2010, č. 2010, s. 1-9. ISSN: 1687-1499.

VŠETULA, P.; RAIDA, Z. Sierpinski-based conical monopole antenna. Radioengineering [IF = 0.312], 2010, roč. 19, č. 4, s. 633-638. ISSN: 1210-2512.

ZELINKA, P.; SIGMUND, M. Hierarchical classification tree modeling of nonstationary noise for robust speech recognition. Information Technology and Kontrol [IF = 0.495], 2010, roč. 39, č. 3, s. 202-210. ISSN: 1392-124X.

Bachelor Degree Programme

Analog Electronic Circuits (Lubomír Brančík)

Analog Filter Design (Jiří Petržela)

Electromagnetic Compatibility (Jiří Dřínovský)

EM Waves, Antennas and Lines (Zbyněk Raida)

Electronic Practice (Ivana Jakubová)

Pulse and Digital Techniques (Tomáš Frýza)

Communication Systems (Aleš Prokeš)

Microprocessor Techniques and Embedded Systems (Tomáš Frýza)

Power Supply Systems (Michal Kubíček)

Low-frequency and Audio Electronics (Tomáš Kratochvíl)

Optical Communication Fundamentals and Optoelectronics (Otakar Wilfert)

Computers and Programming 2 (Jiří Šebesta)

CAD in Electronic Circuits (Zdeněk Kolka)

CAD in Communication Subsystems
(Petr Vágner)

Radio and Mobile Communication (Stanislav
Hanus)

Radio Receivers and Transmitters (Aleš Prokeš)

Signals and Systems (Milan Sigmund)

Modern Wireless Communication
(Martin Slanina)

HF and Microwave Techniques (Tomáš Urbanec)

HF Techniques and Antennas (Miroslav Kasal)

Fundamentals of TV Technology (Stanislav
Hanus)

Master Degree Programme

Advanced Radio Communication Systems
(Martin Slanina)

Software Radio
(Roman Maršálek)

Antennas and Applications (Zbyněk Lukeš)

CAD in HF and Microwave Techniques (Zbyněk
Raida)

Digital Television and Radio Systems (Tomáš
Kratochvíl)

Electronics in German (Milan Sigmund)

Photonics and Optical Communications
(Lucie Dordová)

Quantum and Laser Electronics (Otakar Wilfert)

Microcomputers for Instrumental Applications
(Zbyněk Fedra)

Microwave Integrated Techniques (Zbyněk
Lukeš)

Radio Links Design (Jaroslav Láčík)

Computer and Communication Networks (Zdeněk
Kolka)

Computer Systems and Applications
(Zbyněk Fedra)

Programmable Logic Devices
(Michal Kubíček)

Radioelectronic Measurement (Jiří Dřínovský)

Radars and Navigation Systems (Jiří Šebesta)

Radio Relay and Satellite Communication
(Miroslav Kasal)

Mobile Communication Systems (Jan Prokopec)

Electronic Circuits Theory (Jiří Petržela)

Wireless Communication Theory (Roman
Maršálek)

Video and Multimedia Technology (Martin
Slanina)

Doctoral Degree Programme

Modern Digital Wireless Communication (Milan
Sigmund)

Modern Electronic Circuit Design (Zdeněk Kolka)

Laboratories

Electronic Technology Laboratory (dry and wet techniques of printed circuit boards production, patterns production in the photographgic way, Aleš Vanžura)

Joint Laboratory of Mobile Communication (research and instruction in mobile wireless communications and systems, Stanislav Hanus, Jan Prokopec)

Laboratory for Student Research (laboratory for student projects, diploma and Bachelor projects, self-study, Jiří Šebesta)

Laboratory of Analog Electronic Circuits (instruction in analog technology, Ivana Jakubová)

Laboratory of Aerials and Electromagnetic Field (research and instruction in EM fields, antennas and design of radio links, Zdeněk Nováček)

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

Laboratory of Low-Frequency Applications (instruction in audiotechnique, lf electronics and feeding of electronic devices, Tomáš Kratochvíl)

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

Laboratory of Microwave Technology (research and instruction in microwave technology and special electronic components, Tomáš Urbanec)

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

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

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

Laboratory of TV and Video Technology (instruction in analog and digital TV and video technology and TV cable distribution system, Tomáš Kratochvíl)

PC Laboratories (two laboratories for computer-aided exercises in circuits, signals and systems of 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 station of experimental AMSAT satellites, Miroslav Kasal)

Department of Telecommunications

Prof. Ing. Kamil Vrba, CSc.
Head

Purkyňova 464/118
61200 Brno
tel.: 541 149 190
fax: 541 149 192
E-mail: utko@feec.vutbr.cz

Professors

Prof. Ing. Miloslav Filka, CSc.
Prof. Ing. Zdeněk Smékal, CSc.

Prof. Ing. Kamil Vrba, CSc.

Associate Professors

Doc. RNDr. Milan Berka, CSc.
Doc. Ing. Karel Burda, CSc.
Doc. Ing. Otto Dostál, CSc.
Doc. Ing. Dan Komosný, Ph.D.
Doc. Ing. Ivo Lattenberg, Ph.D.
Doc. Ing. Jiří Mišurec, CSc.,

Doc. Ing. Karol Molnár, Ph.D.
Doc. Ing. Vít Novotný, Ph.D.
Doc. Ing. Ivan Rampl, CSc.
Doc. Ing. Vladislav Škorpil, CSc.
Doc. Ing. Václav Zeman, Ph.D.

Lecturers

Ing. Miroslav Balík., Ph.D., Ing. Radim Burget, Ph.D., Ing. Petr Číka, Ph.D., Ing. Radim Číž, Ph.D., Ing. Pavel Hanák, Ing. Norbert Herencsár, Ph.D., Ing. Ivo Herman, CSc., Ing. Ladislav Káňa, Ing. David Kubánek, Ph.D., Ing. Anna Kubánková, Ph.D., Mgr. Pavel Rajmic, Ph.D., Ing. Kamil Říha, Ph.D., Ing. Jiří Schimmel, Ph.D., Ing. Milan Šimek, Ph.D., Ing. Petr Sysel, Ph.D., Ing. Pavel Šilhavý, Ph.D.

Ph.D. Students

IIng. Hicham Atassi, Ing. Radek Beneš, Ing. Petr Berka, Ing. Filip Buršík, Ing. Vít Daněček, Ing. Ivan Dirbák, Ing. Radek Doležel, Ing. Jiří Franek, Ing. Milan Grenar, Ing. Jan Hajný, Ing. Michal Haluza, Ing. Martin Heneš, Ing. Pavel Holešinský, Ing. Jiří Hošek, Ing. Jaroslav Hovorka, Ing. Marek Huczala, Ing. Tomáš Jelínek, Ing. Mojmír Jelínek, Ing. Jan Jeřábek, Ing. Jan Kacálek, Ing. Jan Karásek, Ing. Hasan Khaddour, Ing. Jiří Kouřil, Ing. Martin Koutný, Ing. Ondřej Krajsa, Ing. František Kyselý, Ing. Petra Lambertová, Ing. Jaromír Mačák, Ing. Tomáš Mácha, Ing. Jan Malý, Ing. Zdeněk Martinásek, Ing. Tomáš Matocha, Ing. Ivan Míča, Ing. Tomáš Miklánek, Ing. Petr Mlýnek, Ing. Patrik Morávek, Ing. Ondřej Morský, Ing. Jakub Müller, Ing. Ľuboš Nagy, Ing. Lukáš Palko, Ing. Tomáš Pelka, Ing. Václav Pfeifer, Ing. Michal Polívka, Ing. Zdeněk Průša, Ing. Radim Pust, Ing. Ondřej Rášo, Ing. Pavel Reichert, Ing. Lukáš Růčka, Ing. Vladimír Schindler, Ing. Michal Skořepa, Ing. Jiří Sobotka, Ing. Jan Sršeň, Ing. Peter Stančík, Ing. Jan Studený, Ing. Ondřej Šmirg, Ing. Jan Šporik, Ing. Vladimír Tejkal, Ing. Michal Trzos, Ing. Petr Vychodil, Ing. Michal Vymazal

Administrative and Technical Staff

Jitka Halousková, doc. MUDr. Václav Chaloupka, CSc., Jaroslav Klon, Mgr. Otakar Kříž, Magda Lounková, Bc. Jaroslav Meixner, MUDr. Svatopluk Nehyba, Pavel Novotný, Lukáš Pazdera,

Mgr. Lucie Pernicová, Zdeněk Procházka, Bohuslava Raidová, Jitka Šichová, MUDr. Iva Tomášková, Ing. Robert Vích, DrSc., Ing. Martin Vondra, Ph.D.

Main Interests

Department of Telecommunications develops the Bachelor programme study area Teleinformatics whose conception reflects the current convergence of communication and information technologies. Instruction provided in the department seeks balance between mobile and stationary communications, computer systems and networks, design of network applications in various programming languages. The students are instructed in design of analog and digital circuits, microprocessors and signal processors, and their applications. They can specialize in multimedia, i.e.digital processing of speech, music or images. There is a follow-up Master study programme Telecommunication and Information Technology and the doctoral study programme Teleinformatics. The department is successful in obtaining sufficient funding from various educational and research programmes. In 2010 the research and development teams in the department were involved in projects relating to basic and applied research in the total amount of nearly 55 million CZK. A research team is engaged in providing up-to-date multimedia services via mobile and wireless network. Some members of the team are involved in a MPO research and development programme. Close cooperation was established with GiTy a.s., DISK Multimedia s.r.o. WEST-COM s.r.o., ENJOY s.r.o., SEV Litovel, URE, Academy of Sciences, MEgA-Měřicí Energetické aparáty, ApS Brno s.r.o., Retia s.r.o. a Satturn Holešov s.r.o. The practical outcome of the research is the development of user-friendly videoconferencing systems, modular architecture for information and videoconferencing systems, development of a new generation IP communication system, transmission of telemetric data from domestic wastewater treatment plants, sewage plants, etc. The department completed the final stage of the international project European Tempus – Erasmus Mundus for implementation of the programme Teleinformatics in Syria.

The department´s staff are involved in establishment of the Centre for Sensoric, Information and Communication Systems.

Major Achievements

The main research interests of the department are converged communication and information systems focused on media informatics, and also electronic systems for medical technology. In 2010 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 telephone exchanges i-tel and special equipment for them.

Cryptographic protection of communication and information systems, data networks 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 operation in data networks. Design of advanced sophisticated telematic transport systems.

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), agriculture (soil retention monitoring, landslides).

Development of electronic devices for medical data transmission and medical data processing, development 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, data networks for data acquisition and control in industry (smart grids for waterworks, sewage plants, heating plants , transport).

Design and optimization of algorithms for digital processing of signals (digital filters, signal detection, harmonics analysis), implementation of algorithms for digital processing of signals in signal processors and microcontrollers DSP56300, MSC568300, TMS320C6400, TMS320C5500, Microchip PIC16, PIC18.

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

Design of optical networks and their employment in industrial applications, measurement and monitoring of optical networks.

Research and design of systems of speech and image processing, archivation of multimedia systems, evaluation of emotions in spech and in mimics.

Major Research Projects

Analysis and Enhancement of Noise Speech Signals and Images for Mutual Analysis of Verbal and Non-Verbal Communication – MŠMT OC08057
Investigator: Zdeněk Smékal

Applied Research and Development of Systems for Remote Measurement of the Quality of Electric Energy Supply – MPO FR-TI1/075
Investigator: Jiří Mišurec

A Training Centre for Increasing the Interest of Young People in Research Work in the Field of Information and Communication Technologies - CZ.1.07/2.3.00/09.0222
Investigator: David Kubánek

A System for Transmission of Signals for Multicast with One Data Source – GAČR 102/07/1012
Investigator: Dan Komosný

Automatic Classification of Digital Modulations - GAČR 102/09/P626
Investigator: Anna Kubánková

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

Decentralized Sewage Purification with a Telemetric Control System for Small Municipalities – MPO FT-TA5/012
Investigator: Kamil Vrba

Digital Processing and Transmission of Audio Signals in Modern Multimedia Systems – GAČR 102/07/P505
Investigator: Jiří Schimmel

Non-Linear Methods of Speech Enhancement – COST OC 28753
Investigator: Zdeněk Smékal

New Diagnostic Methods of the Measurement of Parameters of the Circulatory System Based on Infrared Recording of Blood Bed Images – MŠMT 2B06111
Investigator: Milan Chmelař

Multiple Use System of Digital Processing of Multimedia Signals – MPO FR-TI1/495
Investigator: Jiří Schimmel

Multitone Modulation Implemented through Overlapping Filter Bank – GAČR 102/09/1846
Investigator: Pavel Šilhavý

Research and Application of Time-Frequency Analysis Techniques for Speech Therapy – MPO FT/072
Investigator: Kamil Vrba

Research and Development of Internet Telephone Exchange – MPO FT-TA3/011
Investigator: Zdeněk Smékal

Research and Development of a System for Production Process Optimization – MPO FR-TI1/444
Investigator: Zdeněk Smékal

Research and Development of Two-Way Communication Technology for Citizens Warning System – MPO FT-TA3/001
Investigator: Kamil Vrba

Research and Testing of a System for Record and Long-Term Archivation of Multimedia Data with Intelligent Search – MPO FT-TA3/121
Investigator: Kamil Vrba

Research of Mechanisms for Availability of Increased Quality Services in New Generation Data Networks – GAČR 102/09/1130
Investigator: Karol Molnár

Research of the Impact of the Combination of Substances for Targeted Immunotherapy and Inhibition Effects of the Field of Pulse Vector Magnetic Potential on Tumours– MŠMT 2B08063
Investigator: Kamil Vrba

Spatial Acoustic Effects for Systems of Multi-Channel Multicast Digital Processing of Sound – MPO FT-TA3/010
Investigator: Kamil Vrba

Specific Imaging Techniques on the Basis of Magnetic Resonance and Ultrasound for the Study of Jaw Joints – GAČR 102/07/1086
Investigator: Zdeněk Smékal

Utilization of Active Current Elements in Linear and Non-Linear Applications – GAČR 102/07/P353
Investigator: David Kubánek

Selected Publications

REICHERT, P.; BROUČEK, J.; HLADKÝ, M. Optical Network Mapping for 40/100Gbit/ s Transmission System Deployment. In Research in Telecommunication Technologies 2010. Velké Losiny: VSB-Technical University of Ostrava, 2010. s. 222-227. ISBN: 978-80-248-2261- 7.

HERENCSÁR, N.; KOTON, J.; VRBA, K.; LATTENBERG, I. New voltage- mode universal filter and sinusoidal oscillator using only single DBTA. INTERNATIONAL JOURNAL OF ELECTRONICS, 2010, roč. 97, č. 4, s. 365-379. ISSN: 0020- 7217.

HAJNÝ, J. Anonymous Authentication for Smartcards. Radioengineering, 2010, roč. 19, č. 2, s. 363-368. ISSN: 1210- 2512.

KOTON, J.; HERENCSÁR, N.; VRBA, K. Minimal configuration precision full wave rectifier using current and voltage conveyors. IEICE Electronics Express, 2010, roč. 7, č. 12, s. 844-849. ISSN: 1349- 2543.

HERENCSÁR, N.; VRBA, K.; KOTON, J.; LAHIRI, A. Realisations of single-resistance-controlled quadrature oscillators using a generalised current follower transconductance amplifier and a unity-gain voltage- follower. INTERNATIONAL JOURNAL OF ELECTRONICS, 2010, roč. 97, č. 8, s. 897-906. ISSN: 0020- 7217.

JEŘÁBEK, J.; VRBA, K. SIMO type low-input and high-output impedance current-mode universal filter employing three universal current conveyors. AEU - International Journal of Electronics and Communications, 2010, roč. 64, č. 6, s. 588-593. ISSN: 1434- 8411.

KOTON, J.; HERENCSÁR, N.; VRBA, K. Single-input three-output variable Q and w0 filters using universal voltage conveyors. INTERNATIONAL JOURNAL OF ELECTRONICS, 2010, roč. 97, č. 5, s. 531-538. ISSN: 0020- 7217.

PUST, R.; BURDA, K. A new technique of frequency hopping with collision avoidance. Radioengineering, 2010, roč. 19, č. 4, s. 499-506. ISSN: 1210- 2512.

HERENCSÁR, N.; KOTON, J.; VRBA, K. Realization of Current-Mode KHN-Equivalent Biquad Using Current Follower Transconductance Amplifiers (CFTAs). IEICE TRANSACTIONS ON FUNDAMENTALS

OF ELECTRONICS COMMUNICATIONS AND COMPUTER SCIENCES, 2010, roč. 93, č. 10, s. 1816-1819. ISSN: 0916- 8508.

KOTON, J.; HERENCSÁR, N.; VRBA, K. KHN-equivalent voltage-mode filters using universal voltage conveyors. AEU - International Journal of Electronics and Communications, 2010, č. 2, s. 1-7. ISSN: 1434- 8411.

MORÁVEK, P.; KOMOSNÝ, D.; BURGET, R.; HANDL, T.; ŠVÉDA, J. Study and Performance of Localization Methods in IP Based Networks: Vivaldi Algorithm. JOURNAL OF NETWORK AND COMPUTER APPLICATIONS, 2010, roč. 34, č. 1, s. 1-17. ISSN: 1084- 8045.

Bachelor Degree Programme

Analog Technology (Kamil Vrba)

Signals and Systems Analysis (Zdeněk Smékal)

Network Architecture (Vít Novotný)

CISCO Academy I, II (Dan Komosný)

Digital Filters (Petr Sysel)

Digital Signal Processing (Jiří Mišurec)

Data Communication (Karel Němec)

Electroacoustics (Jiří Schimmel)

Hardware Computer Networks (Karol Molnár)

Communication Technology (Ivo Herman)

Design of Electronic Devices (Kamil Vrba)

Multimedia Services (Otto Dostál)

Practical Exercises in Information Networks (Karol Molnár)

Transmission Media (Miloslav Filka)

Accesses and Transports Networks (Vladislav Škorpil)

Network Operating Systems (Dan Komosný)

Studioengineering (Ladislav Káňa)

Terminal Equipments (Vít Novotný)

High-speed Communications Systems (Vladislav Škorpil)

Introduction to Computer Typography and Graphics (Pavel Rajmic)

Master Degree Programme

Information System Security (Karel Burda)

CISCO Academy I, II (Dan Komosný)

Digital Audio Signal Processing (Miroslav Balík)

Digital Signal Processing (Zdeněk Smékal)

Graphic and Multimedia Processors (Zdeněk Smékal)

Mobile Network Communication Systems (Vít Novotný)

Cryptography (Václav Zeman)

Modern Network Technologies (Karol Molnár)

Multimedia (Otto Dostál)

Projecting, Administration and Security of Computer Networks (Karel Burda)

Optical Networks (Miloslav Filka)

Parallel Computing Under Operating Systems (Ivo Herman)

Computers and Peripheral Devices (Miroslav Balík)

Computer-Supported Solution of Engineering Problems (Jiří Mišurec)

Modern Communication Technique (Jan Jeřábek)

Advanced Techniques of Image Processing (Kamil Říha)

Sensor Systems (Ivan Rampl)

Digital Signal Processors (Petr Sysel)

Services of Telecommunication Networks (Vladislav Škorpil)

Theoretical Informatics (Radim Burget)

Theory of Communication (Milan Berka)

Theory of Communication (Karel Burda)

Advanced Data Transmission Technology (Václav Zeman)

A/D and D/A Converters (Kamil Vrba)

Security Systems (Karel Burda)

Speech Processing (Zdeněk Smékal)

Doctoral Degree Programme

Applied Cryptography (Karel Burda)   Modern Network Technologies (Karol Molnár)

Laboratories

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

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

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

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

Laboratory of Converged Networks and Information Systems (converge of network technologies to united communications system including fixed, wireless and mobile technologies, support of communication services integrations for example VoIP, videoconferences and IPTV, research and development of VoIP components, QoS support, Pavel Šilhavý, Vít Novotný)

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

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 Digital Music Studio (research and instruction in synthesis, analysis, processing and reproduction of music signals including the 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 and testing of electroacoustic devices, anechoic room, Jiří Schimmel)

Laboratory of High-Rate Communication Systems (research and instruction in high-rate data transmission up to a minimal rate of 100 Gb/s, Vladislav Škorpil)

Laboratory of Modern Network Technologies (instruction in network technology, research of the management of switches and indicators, analysis of stationary and wireless local computer network, modelling of algorithms used in modern data networks, Karol Molnár)

Laboratory of Multimedia Services (design and multimedia communication services in-cluding digital processing of multimedia data - Petr Číka)

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

Laboratory of Optical Links (research and instruction in optical transmission, mechanical work with fibres, special measurements, Miloslav Filka)

Laboratory of Sensoric Networks (research and instruction in sensoric networks based on standards IEEE 802.15.4, analyze of Zigbee and 6lowPAN protocols, sensor units configurations, data transmissions and wireless network management, Milan Šimek)

Laboratory of Telecommunication Systems (instruction in Telecommunication Systems, research of error-free transmission of messages, modeling of anti-error code systems, Václav Zeman)

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

Research Laboratory of Signal Processors (research and development of 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)

Department of Theoretical and Experimental Electrical Engineering

Doc. Ing. Pavel Fiala, Ph.D.

Head

Kolejní 2906/4
61200 Brno 12
tel.: 541 149 511
fax: 541 149 512
E-mail: utee@feec.vutbr.cz

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. Milan Murina, CSc.
Doc. Ing. Jiří Rez, CSc.
Doc. Ing. Jiří Sedláček, CSc.
Doc. Ing. Miloslav Steinbauer, Ph.D.

Lecturers

Ing. Eva Kroutilová, Ph.D., Ing. Miroslav Veselý, Ing. Radek Kubásek, Ph.D.

Ph.D. Students

Ing. Mouin Al Khaddour, Ing. Martin Čáp, Ing. Martin Friedl, Ing. Lubomír Frohlich, Ing. Jan Hrozek, Ing. Tomáš Jirků, Ing. Radim Kadlec, Ing. Radim Kořínek, Ing. Tomáš Kříž, Ing. Petr Marcoň, Ing. Jan Mikulka, Ing. Dušan Nešpor, Ing. Ksenia Ostanina, Ing. Zdeněk Roubal, Ing. Zoltán Szabó

Administrative and Technical Staff

Ing. Tibor Bachorec, Ph.D., Eva Cupáková, Marie Hábová, Ing. Michal Hadinec, Ing. Tomáš Jirků, doc. Ing. Petr Koňas, Ph.D., Ing. Taťána Krajčírovičová, Veronika Raabová, Ing. Jan Rychnovský, Ph.D., Ing. Zoltán Szabó

Main Interests

Research was focused on wideband signal processing, noise spectroscopy, special applications of metamaterial structures in NMR, NMR image evaluation and electron microscopy in cooperation with Spacek Labs Santa Barbara, California. In cooperation with Honeywell s.r.o research started on numerical models of tests of VN and EMC electronic systems. Research continues on cryogenic devices and techniques for sample conservation. Cooperation in electron microscopy research was started with FEI and the Czech Academy of Sciences and focused on scanning biological material avoiding consequent damage or destruction of tissue. The department also cooperated with the French company 4MTEC in design and implementation of special cooling systems for electronic systems, methodology of comparing the quality and efficiency of cooling systems. There were joint projects with SIEMENS concerned with analysis of thermal ignition in electric motor stators, hygiene of work aimed at reducing vibrations due to tightening keys on assembly lines. We established contacts with the company DRAKA Kabely s r.o. and continued long-term cooperation with PROTOTYPA a.s. in research on special measuring methods for single processes. Together with the company TES s. r.o., we worked on detection and localisation of partial charges in electric power converters with liquid dielectrics We continued research, with Mendel University, on stimulation 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. We visited the TU Wien where a working meeting on MEMS was organized. Within the research plans we continued our research of heterogeneous structures for applications in a safety programme or in special electric power sources for nanomaterial engineering. In cooperation with Institute of Instrument Technology, Czech Academy of Sciences we continued research on numerical models of mass elementary parts.

Major Achievements

We published results of our research on wideband signals, noise spectroscopy (patent application on low-level measurement sensor design). Special applications of metamaterial structures in NMR and electron microscopy (patent application). Basic research results on numerical models and NMR diffusion materials and image evaluation and impedance tomography were presented as well as results on numerical models of scanning velocities of single processes. We also published results of cryogenic measurements for DNA samples conservation. We cooperated in the design and implementation of special cooling systems for electronic devices and completed unique systems for cooling and illumination of biological samples. We conducted joint projects with SIEMENS targeted at analysis of thermal ignition of electric motor stators, hygiene of work aimed at reduction of vibrations due to use of tigthening keys on assemby lines. Unique samples for vibrations control on assembly lines were completed and tested on unique systems and research results were compared with results achieved by special methods of single process measurement and tested in laboratory conditions for detection and localisation of partial charges in power converters with liquid dieelectrics. Research results on non-destructive measuring methods for scanning velocities of fluid flow in parts of plants and root systems were published. Research results were presented at reputed conferences Progress in Electromagnetics Research Symposium in China and USA organized by the World Electromagnetics Academy Cambridge USA. Research yielded a number of unique working samples: Development kit with ATmega16, Pneumatic tightener control by electromagnetic valve, Pneumatic tigthener control by pneumatic pressure/ current converter. A set of comparing cooling systems, Peltier element heating, thermal gradient cooling system, system for surface illumination by emitted spectrum, module for motor tigthening valve.

Major Research Projects

Measurement and Simulation of the Impact of Susceptibility and Conductivity in MR Tomography – GA AV ČR KJB208130603
Investigator: Miloslav Steinbauer

Research of New NMR Methods for Study of Porous Material Structure – GAČR GA102/07/0389
Investigator: Eva Gescheidtová

Study of the Properties of Metamaterials and Microwave Structures Using Noise Spectroscopy and Magnetic Resonance GAČR 102/09/0314
Investigator: Pavel Fiala

Institute of Experimental Technology 1 – MŠMT CZ.1.07/1.1.02/01.0029
Investigator: Pavel Kaláb

Research and Detection of Charge Activity Detection in Oil Power Transformers – MPO FR-TI1/001
Investigator: Pavel Fiala

Institute of Experimental Technology 2 – MŠMT CZ.1.07/2.2.00/07.0390
Investigator: Pavel Fiala

Diagnostics of Very Fast Objects for Safety Tests – MPO FR-TI1/368
Investigator: Pavel Fiala

Selected Publications

FIALA, P.; MACHÁČ, J.; POLÍVKA, J. Microwave noise field behaves like white light. Progress in Electromagnetics, 2010, č. 111, s. 311-330. ISSN: 1559- 8985.

KUBÁSEK, R.; BARTUŠEK, K.; FIALA, P. Determination of pre- emphasis constants for eddy current reduction. Measurement Science and Technology, 2010, č. 21, s. 1-9. ISSN: 0957- 0233.

JIRKŮ, T.; FIALA, P.; KLUGE, M. Magnetic resonant harvesters and power management circuit for magnetic resonant harvesters. Microsystem Technologies. 2010. 16(5). p. 677 - 690. ISSN 0946-7076.

Bachelor Degree Programme

Safe Electrical Engineering (Pavel Kaláb)

Seminar of Electrical Engineering (Miloslav Steinbauer)

Electrical Engineering 1 (Jiří Sedláček)

Electrical Engineering 2 (Jiří Sedláček)

Measurement in Electroengineering (Karel Bartušek)

The C++ Programming Language (Pavel Fiala)

Computer Modeling of Electrical Devices and Components (Pavel Fiala)

Master Degree Programme

Safe Electrical Engineering (Pavel Kaláb)

Electrical Installations (Pavel Kaláb)

Electromagnetic Field Modeling (Jarmila Dědková)

Doctoral Degree Programme

Numerical Computations with Partial Differential (Pavel Fiala)

Special Measuring Methods (Karel Bartušek)

Laboratories

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

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

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

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

Laboratory of Electrical Engineering and Electrical Installations (instruction in Seminar of Electrial Engineering, Electrical Installations, Petr Drexler)

Laboratory IET (instructions, Miloslav Steinbauer)

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

Research Laboratory of Electrical Circuits (research laboratory for Ph.D. students, Zoltán Szabó)

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

Research Laboratory of Light Technology (research laboratory of light technology, Eva Kroutilová)

Research Laboratory of Magnetic Measurement (research laboratory of magnetic measurement, Jiří Rez)

Laboratory of Prototypes Development (laboratory for semester and year projects and development of prototypes, Miloslav Steinbauer)

Research Laboratory of Pulse Sources and Microwave Devices (laboratory for research of pulse sources, low-noise measurement, shielded laboratory, anechoic laboratory, Pavel Fiala)

Department of Power Electrical and Electronic Engineering

Ing. Ondřej Vítek, Ph.D.
Head

Technická 8
61600 Brno
tel.: 541 142 736
fax: 541 142 464
E-mail: uvee@feec.vutbr.cz

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. Josef Koláčný, CSc.
Doc. Dr. Ing. Hana Kuchyňková
Doc. Ing. Josef Lapčík, CSc.
Doc. Ing. Čestmír Ondrůšek, CSc.
Doc. Dr. Ing. Miroslav Patočka,
Doc. Ing. Zdeněk Vávra, CSc.
Doc. Ing. František Veselka, CSc.
Doc. Ing. Pavel Vorel, Ph.D.

Lecturers

Ing. Petr Huták, Ph.D., Ing. Marcel Janda, Ph.D., Ing. Bohumil Klíma, Ph.D., Ing. Ondřej Vítek, Ph.D.

Ph.D. Students

Ing. Mustafa Osman Elrayah Aboelhassan,Ing. Josef Běloušek, Ing. Radoslav Cipín, Ing. Ramia Deeb, Ing. Lukáš Dostál, Ing. Jiří Dušek, Ing. Petr Grmela, Ing. Jan Hejkrlík, Ing. Rostislav Huzlík, Ing. Jindřich Hvězda, Ing. Jaroslav Chlup, Ing. Petr Chmelíček, Ing. Josef Kadlec, Ing. Jan Knobloch, Ing. Jiří Kurfürst, Ing. Jan Kuzdas, Ing. Martin Mach, Ing. Zbyněk Makki, Ing. Petr Michailidis, Ing. Aleš Mikulčík, Ing. Vladimír Minárik, Ing. Mohammed Hussain Mohammed, Ziad Nouman, Ing. Jan Novotný, Ing. Jan Otýpka, Ing. Ivo Pazdera, Ing. Martin Pochyla, Mousa Sattouf, Ing. Miroslav Skalka, Ing. Jan Tůma, Ing. Eva Vítková, BA., Ing. Jiří Vondruš

Administrative and Technical Staff

Ing. Dalibor Červinka Ph.D., Ing. Zdeněk Feiler, Ph.D., Ing. Petr Procházka, Ph.D., Zdeněk Liška, 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 area Power Electrical Engineering and Power Electronics in the follow-up Master programme. Besides theoretical subjects, instruction is provided in basic disciplines such as theory and construction of electrical machines and devices, and also 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 the focus of attention is power electronics including DC/DC pulse transducers (switching sources), DC/AC alternators, rectifiers etc. Another area of interest is 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 the main areas of interest are electrical machines, power electronics, electrical drives and devices. Research is mainly concerned with low-voltage machines used in automotive industry, synchronous machines with permanent magnets, asynchronous and DC machines. The department´s staff have experience in development of special machines such as startergenerators, controlled magnetic bearings, levitation systems. Research was focused on energy exploitation for electric arc extinction in low- and high-voltage devices. Another areas of interest were power converters of extreme parameters, optimal regulation of electric 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. TU Gliwice, TU Delft, TU Žilina, MU Brno, TU Pskov, TU Omsk, and industrial companies and institutions - Siemens AG – Corporate Technology, JSC Electrocontact (Kineshma-RF), Siemens Elektromotory Drásov, OEZ Letohrad, APS Světlá nad Sázavou, ATAS Náchod, EMP Slavkov u Brna, JULI Motorenwerk Moravany, VUES Brno a.s., IVEP Brno, ŠLP Křtiny a.s. and other.

Major Achievements

Siemens - Werner von Siemens Excellence Award 2010 in the category the best diploma thesis elaborated in cooperation with a specific industrial company of the Siemens Group. The award in 2010 was received by our department´s student Jaroslav Chlup (Model of cooling medium flow in a synchronous machine).

Award of the ČEZ foundation for higher education institutions: category Electric machines, systems The top three awards were received by our students.

1. Kurfürst Jiří, (Optimization algorithm SOMA applied on the vibration power generator).

2. Pochyla Martin, (Influence of Essential Dimensions of Rotor Geometry on Reluctance Torque Generation).

3. Knobloch Jan, (Simulation Model of the Couple of Linear Motors).

Within the framework of the FRVŠ project no. 2196/2010 the Laboratory of dynamic properties of electric machines was set up. There are six instruction workplaces for loading and measurement of electric machines with focus on transition process analysis. The Laboratory of digital control was upgraded.

In cooperation with the school forestry enterprise Křtiny the department developed a control unit for hydrostatic forest mining Larix H3-650. The project was the subject of an economic contract. The department´s staff participated in the EU project E3CAR focused on operation of electromobiles. In cooperation with the company Eprona, a. s. work was started on the Ministry of Industry and Trade project TIP MPO no. SR-TI2/024 ´Consortium for research, development and production of water cooled sources WHCLV with medium frequency intercircuit´. The project focused on the development of novel types of high-output current switching sources for galvanic coating. In FEEC exposition at the International Trade Fair of Mechanical Engineering in Brno our department presented innovated sT components of the gliding contact for electrical machines and a measuring device for contactless measurement of electric machine commutator lamellae.

Major Research Projects

Analysis and Modelling of the Properties of Low-Voltage Electrical Machines – GAČR 102/09/1875
Investigator: Vítězslav Hájek

An Innovation of a Series of DC Motors with Permanent Magnets - MPO FR-TI1/067
Investigator: Vítězslav Hájek

Diagnostics of Defects in Asynchronous Engines Based on an Analysis of the External Magnetic Field and Stator Currents – GAČR 102/08/P562
Investigator: Ondřej Vítek

Direct Drive for Material Handling Truck – MPO FT-TA3/120
Investigator: Vítězslav Hájek

Gas Generators – MPO FR-TI1/068
Investigator: Čestmír Ondrůšek

Intelligent Diagnostics of Electrical Machines – GAČR 102/08/1118
Investigator: Čestmír Ondrůšek

Research and Development of Technology for Testing of Protection Materials, Development of Methods and Procedures for Depreciation of Weapons – MPO FT-TA4/011
Investigator: Čestmír Ondrůšek

Research and Development of a Series of DC Motors 12,24V – MPO FR-TI1/069
Investigator: Vítězslav Hájek

Research and Development of a Servomotor with High Efficiency Permanent Magnets – MPO FR-TI1/082
Investigator: Čestmír Ondrůšek

Research and Development of New Alternative Materials for Evaluation of Pushful and Hurt Effect of Ammunition, Research and Development of a Universal Conclusion of Ballistic Meters with a High Degree of Utility Parameters for a Range of up to a Calibre of 12,7 mm 23 – MPO FT-TA5/014
Investigator: Čestmír Ondrůšek

Special Cast Motors for Water Pumps – MPO FR-TI1/017
Investigator: Vítězslav Hájek

Selected Publications

AUBRECHT, V.; BARTLOVÁ, M.; COUFAL, O. Radiative emission from air thermal plasmas with vapour of Cu or W. Journal of Physics D: Applied Physics, 2010, roč. 43, č. 43, s. 1-11. ISSN: 0022- 3727.

JENIŠTA, J.; TAKANA, H.; NYSHIYAMA, H.; BARTLOVÁ, M.; AUBRECHT, V.; HRABOVSKÝ, M. Parametric study of hybrid argon- water stabilized arc under subsonic and supersonic regimes. High Temperature Material Processes: An International Journal, 2010, roč. 14, č. 1, s. 63-76. ISSN: 1093-3611.

Bachelor Degree Programme

Automobile Electric and Electronic Systems (Vítězslav Hájek)

Electrical Drives (Josef Koláčný)

Electrical Machines (Čestmír Ondrůšek)

Computer Science in High Power Engineering (Vladimír Aubrecht)

Electrotechnical Inspection and Supervision (František Veselka)

Microprocessor Technics for Drives (Bohumil Klíma)

Design of Electrical Drives (Jiří Skalický)

Computational Vizualization and Animation (Hana Kuchyňková)

Computer Aided Design (Hana Kuchyňková)

Computer Methods in High Power Engineering (Radek Vlach)

Control Electronics (Miroslav Patočka)

Control Theory (Petr Huták)

Power Electronics (Jaromír Vrba)

Master Degree Programme

Adaptive and Optimal Control of Drives (Jiří Skalický)

Electromechanical System Dynamics (Čestmír Ondrůšek)

Electromechanical Systems (Čestmír Ondrůšek)

Electric Equipments for Motor Vehicles (Vítězslav Hájek)

Electrical Microdrives (Josef Koláčný)

Electrical Controlled Drives (Jiří Skalický)

Plasma Physics and Diagnostics (Vladimír Aubrecht)

Laboratory of Electrical Machines and Apparatuses (Marcel Janda)

Laboratory of Electric Drives (Josef Koláčný)

Microcomputer Control of Electrical Drives (Bohumil Klíma)

Micromachines (Vítězslav Hájek)

Design of Electrical Drives (Miroslav Patočka)

Power Converter Design (Miroslav Patočka)

Computer Modelling in Power Electrical Engineering (Hana Kuchyňková)

Project Management of Innovation (Bohuslav Bušov)

Industrial Electronics (Pavel Vorel)

Control Elements in Electrical Drives (Pavel Vorel)

Control of Dynamic Systems (Petr Huták)

Special Technology (František Veselka)

Electric Machines and Apparatus Design (Zdeněk Vávra)

AC Drives (Bohumil Klíma)

Power Converter Technique (Miroslav Patočka)

Doctoral Degree Programme

Topical Issues of Electrical Machines and Apparatus (Čestmír Ondrůšek)

Selected Problems from Power Electronics and Electrical Drives (Jiří Skalický)

Laboratories

High-Voltage Laboratory (research of high-voltage switching effects, Zdeněk Vávra))

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

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

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

Laboratory of Electrical Apparatus (research of switching devices, Jiří Valenta)

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

Laboratory of Electrical Drives (research of nonlinear dynamic systems with changed parameters, Dalibor Červinka)

Laboratory of Electrical Machines (research of commutation of electrical machines, measurement of medium-power outputs, magnetic bearings, automated measurements, Čestmír Ondrůšek)

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

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

Laboratory of Mechatronics (Čestmír Ondrůšek)

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

Laboratory of Power Engineering Electronics (research of DC/DC transformers, alternators and low-voltage brushless drives, Pavel Vorel)

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

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