

ANNUAL REPORT 2009

**FACULTY OF ELECTRICAL ENGINEERING
AND COMMUNICATION**

BRNO UNIVERSITY OF TECHNOLOGY

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Introduction

History

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

some departments became parts of the newly 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, and subsequently transformed into Electrotechnical Faculty, over 22,000 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 2009

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

In 2009 the Dean, Prof. Radimír Vrba served his second term in office, from 1 February 2006, together with four vice-deans and the faculty bursar: Prof. Jarmila Dědková (Vice-Dean for Bachelor programme, Acting Vice-Dean), Prof. Stanislav Hanus (Vice-Dean for Master programme), Prof. Ivo Provazník (Vice-Dean for External Relations and International Affairs), Prof. Vladimír Aubrecht (Vice-Dean for Research and Postgraduate Study), Miloslav Morda (Faculty Bursar). At the end of 2009 there were 229 teachers (professors, associate professors, lectu-

rs and other research and pedagogical staff) and 3,876 students in all forms of state-supported programmes. Moreover, education was provided to 325 students of the Faculty of Information Technology, 45 students of the Faculty of Mechanical Engineering and 20 students of the Faculty of Management. On the other hand, the Faculty purchased tuition for 21 students from the Faculty of Management and for 12 students from the Faculty of Information Technology. As a result the total number of students taught at the Faculty is 4,266. In 2009 education was provided in study programmes Electrical Engineering, Electronics, Communication and Control Technology (EECR) accredited in 2001 and Biomedical Technology and Bioinformatics (BTBIO-A) accredited for structured form of study in 2007 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 2009 there were 597 students who completed their studies in the Bachelor degree programme, 483 Master programme graduates and 41 doctoral students completed their postgraduate studies. There were 1,163 students coming to the Faculty, 729 stu-

dents entered the first year of the follow-up Master programme, and 96 graduates entered the doctoral programme. Tuition in English was provided to 11 international students paying their fees. Six academics were habilitated and appointed associate professors with the title Docent. There was one appointment to professorship.

Events and Activities

- meeting of the former deans in memoriam of Prof. Jiří Brauner, one of the first deans of FEEC on the occasion of his 104th birthday
- celebration of the 50th anniversary of FEEC in the City Theatre of Brno on 1 October 2009
- opening of the third year of the Bachelor programme BTBIO-A Biomedical Technology and Bioinformatics
- new and innovated electronic texts in Czech and English and multimedia aids for tuition in the Bachelor and Master programmes
- 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 2009, January and February 2010), visits by students and teachers to secondary schools
- presentation of new study programmes at the trade fair of higher and lifelong education Gaudamus 2009, 20 -23 October 2009, 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 Prague, 27-29 May 2009
- publication of the faculty yearbook 2008/09
- development of programmes leading to habilitations and procedures to professorship
- Student EEICT 2009 Conference and Competition organized in cooperation with the Faculty of Information Technology and sponsored by ABB, Honeywell, Tyco and other companies, with 65 Bachelor papers, 80 Master papers, 95 doctoral papers and 4 papers by secondary-school students
- the Longlife Learning Programme-Erasmus and other European programmes
- transfer of the faculty information system and faculty websites to IS Apollo
- construction of new FEEC premises in the campus Pod Palackého vrchem Technická 10 and construction plans for Technická 12
- continuation of three research plans commenced in 2005 (scheduled 2005-2009 or 2011), chief investigators Prof. Jiří Kazelle, Prof. Zbyněk Raida who substituted the late Prof. Jiří Svačina, Prof. Radimír Vrba, and another research plan commenced in 2007, chief investigator Prof. Pavel Jura
- activities of the Chairman of Academic Senate Vlasta Krupková in her capacity as a member of the Higher Education Council
- activities of the members of Academic Senate, mainly the Chairman Miloslav Steinbauer, focused on the development and economic interests of FEEC
- activities of Advisor for Equal Opportunities Naděžda Uhdeová supported by the development programme of the Ministry of Education of the Czech Republic focused on analysis of the cause

of the very low interest of girls in studies at FEEC, 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 is also a source of additional income for qualified teachers with language skills
- traditional 42nd faculty ball at the Voroněž hotel

Achievements

In 2009 economic results of FEEC were very good. The trend in wages and material supply was again favourable, 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.

Radimír Vrba
Dean

Faculty of Electrical Engineering and Communication

Dean

Prof. Ing. Radimír Vrba, CSc.

Vice-Deans

Prof. Ing. Jarmila Dědková, CSc.

Acting Dean, 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

Prof. Ing. Ivo Provazník, Ph.D.

Vice-Dean for External Relations and International Affairs

Chairman of Academic Senate

Ing. Miloslav Steinbauer, Ph.D.

Faculty Secretary

Ing. Miloslav Morda

Student Advisor to the Dean

Tomáš Szöllösi

Advisor for Equal Opportunities

RNDr. Naděžda Uhdeová, Ph.D.

Trade Unions Representative

Prof. Ing. Vítězslav Hájek, CSc.

Departments

Department of Control and Instrumentation
Department of Biomedical Engineering
Department of Electric Power Engineering
Department of Electrotechnology
Department of Languages
Department of Mathematics
Department of Microelectronics

Department of Physics
Department of Power Electrical and Electronic Engineering
Department of Radioelectronics
Department of Telecommunications
Department of Theoretical and Experimental Electrical Engineering

Scientific Board

Internal members

Prof. RNDr. Vladimír Aubrecht, CSc.
Prof. Ing. Lubomír Brančík, CSc.
(since September 2009)
Prof. Ing. Jarmila Dědková, CSc.
Prof. Ing. Eva Gescheidtová, CSc.
Doc. Ing. Luboš Grmela, CSc.
Prof. Ing. Stanislav Hanus, CSc.
Prof. Ing. Tomáš Hruška, CSc.
Prof. RNDr. Jan Chvalina, DrSc.
Prof. Ing. Jiří Jan, CSc.
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.
Prof. Ing. Jiří Svačina, CSc. (until August 2009)
Doc. Ing. Petr Toman, Ph.D.
Prof. Ing. Radimír Vrba, CSc.

External Members

Doc. Ing. Ladislav Dušek, CSc.
RNDr. Luděk Frank, DrSc.
Prof. Ing. Miroslav Husák, CSc.
Doc. Ing. Jiří Masopust, CSc.
Ing. Jiří Potěšil

Prof. Ing. Aleš Richter, CSc.
Ing. Ivan Skalka
Ing. Robert Vích, DrSc.
Ing. Rostislav Vinkler
Ing. Jiří Winkler, CSc.

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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

Doctoral Degree Programme Electrical, Electronic, Communication and Control 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

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 format of study covers the study area Biomedical Technology and Bioinformatics (A-BTB). 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 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, including 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, institutions 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 students themselves and takes place outside the periods of tuition (mainly during the summer holidays) during their Bachelor studies.

The top limit approved by Academic Senate for admission to full-time study in academic year 2009/10 was 250. Entrance examination took place on 9 June 2009. 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 2 or higher were exempt from the examination. The maximum number of points to be achieved in each subject was 50 and the pass was 12 points for each subject. All applicants who passed entrance examination and all those exempt from the examination were admitted.

In 2009 FEEC received 188 paid applications for admission to BTBIO-A, 139 applicants were admitted and 104 registered for study at FEEC. There were 231 students in the BTBIO-A programme in 2009.

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 2009, 1698 full-time students enrolled in the Bachelor programme EECR-B. Studies were completed by 557 full-time students, 102 of them in the study area Automation and Measurement Technology (B-AMT), 148 in Electronics and Communications (B-EST), 78 in Microelectronics and Technology (B-MET), 82 in Power Electrical

and Electronic Engineering (B-SEE) and 147 in Teleinformatics (B-TLI).

In the part-time Bachelor programme EECR-BK there were 283 students in 2009, 150 in the first year, 60 in the second year and 72 in the third year. Part-time study was completed by 40 students, 14 of them in Automation and Measurement Technology (BK-AMT), 9 in Electronics and Communications (BK-EST), 6 in Power Electrical and Electronic Engineering (BK-SEE) and 11 in Teleinformatics (BK-TLI).

Admission procedure is a priority of the Faculty. It took place on 9 June 2009. Applications for full-

time and part-time formats of study were accepted. There was a written entrance test in a combination of 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 secondary-school study average 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 entrance examination or were exempt from the examination were admitted. A place at FEEC was offered to applicants for study at FIT who were not admitted for capacity reasons. In 2009 there were 1,497 applicants, 1,218 of them for full-time study and 279 for part-time study. Finally, 1024 students were admitted, 816 to full-time study and 208 to part-time study format, a total of 874 students enrolled, 681 full-time and 193 part-time students. The statistics show an increasing 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. Interest of applicants in individual

study areas is evaluated at the end of the first semester after presentations of study areas. Statistics from academic years 2004/05 to 2009/10 are in Table 1.

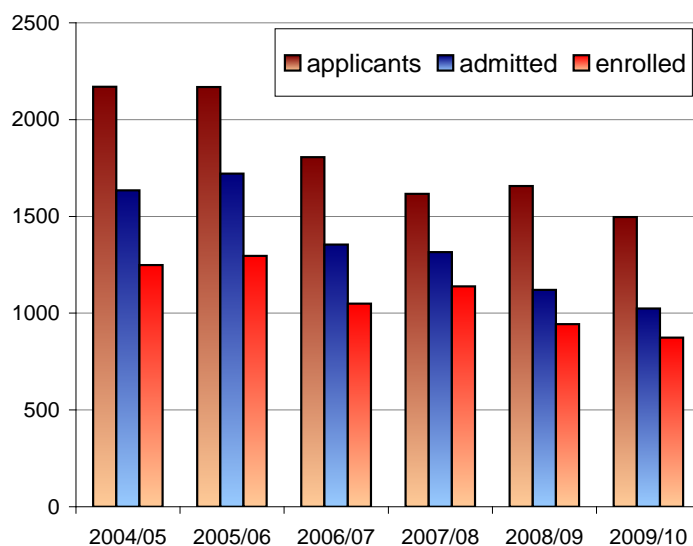
The level of incoming students has been monitored for many years. An important factor is the percentage of admitted students who have taken the school-leaving examination in mathematics or physics, see Graph 2. Contrary to the previous year, the number of applicants who had taken the school-leaving examination in mathematics has decreased. 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 technical secondary schools have decreased in favour of applicants coming from technical training centres.

Preparatory courses were offered by the Departments of Mathematics and Physics to assist applicants preparing for entrance examination and help them adapt to university study. In 2009 the course in mathematics was completed by 156 applicants and the course in physics by 30 applicants.

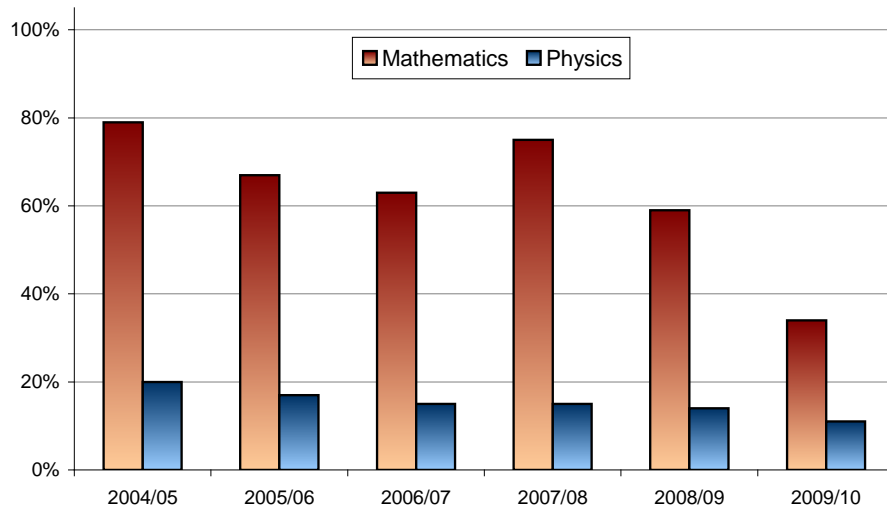
Information on study programmes and qualifications such as Certificate of Electrotechnical Qualification, Certificate of Pedagogical Practice, Microsoft Certificate, Cisco Certificate are regularly presented in the media, on Open Door Days, visits of teachers and students to secondary schools, at the 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)

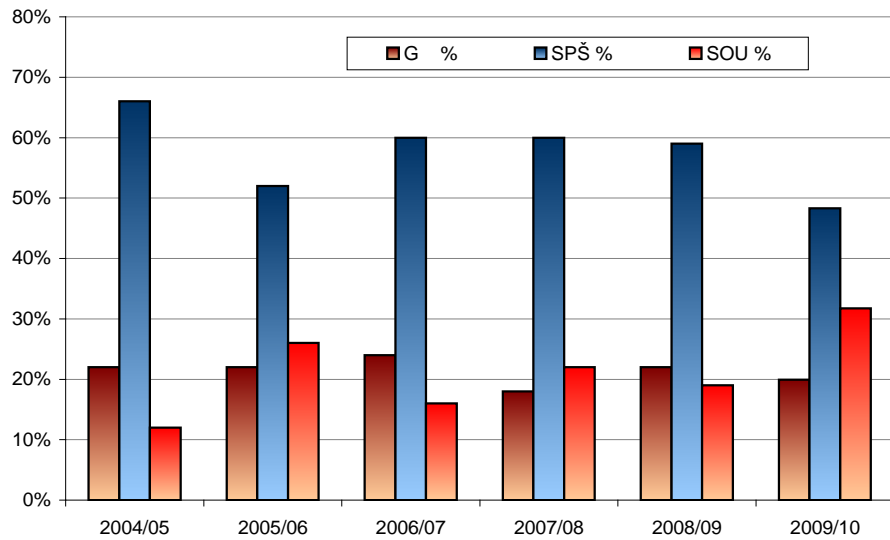
Acade- mic year		<i>B-AMT</i>	<i>B-EST</i>	<i>B-MET</i>	<i>B-SEE</i>	<i>B-TLI</i>	<i>not gi- ven</i>	<i>Total</i>
2004/05	number	155	243	77	96	362	119	1052
	%	16,6	26,0	8,3	10,3	38,8		
2005/06	number	153	241	74	120	331	119	1038
	%	16,6	26,2	8,1	13,1	36,0		
2006/07	number	139	172	68	95	221	89	784
	%	20,0	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		



Graph 1: Applicants, admitted and enrolled in full-time and part-time format of EECR-B in academic years 2004/05 to 2009/10



Graph2: Percentages of applicants who have taken school-leaving examination in mathematics or physics



Graph3: Percentages of students coming from different types of schools
(G – secondary schools, SPŠ – secondary technical schools, SOU – training centres)

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 2009 there were 1,135 full-time students in the in the follow-up Master programme EECR-M, 564 in the first year and 571 in the second year. And there were 164 part-time students, 101 in the first year and 63 in the second year of study.

In 2009 the full-time programmes were completed by 455 students, 29 of them in the study area Biomedical and Ecological Engineering (M-BEI), 29 in the study area Power Electrical Engineering (M-EEN), 70 in the study area Electronics and Communications (M-EST), 38 in Electrotechnical Manufacturing and Management (M-EVM), 74 in Cybernetics, Automation and Measurement (M-KAM), 31 in Microelectronics (M-MEL), 21 in Power Electrical and Electronic Engineering (M-SVE) and 163 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 833, 693 applied for admission in the full-time programme (EECR-M) and 140 to the part-time programme (EECR-ML). The maximum numbers of admissi-

ons approved by Academic Senate were 950 and 450.

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 26 June 2009 nearly all applicants enrolled. The second term of entrance examination 8 July 2009 and the Committee meeting on 26 July 2009 were cancelled.

The total number of admitted was 729, 622 in full-time study and 107 in part-time study. All admitted students were registered for study areas they had selected. Numbers of applicants and admitted by study areas are in Table 2, 709 of them enrolled, 604 in full-time and 105 in part-time study.

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 2009 there were 66 students in the lifelong education programme

In 2009 there were five international students paying their fees, three of them in the three-year 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 2009. 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)

<i>Study area</i>	<i>Numbers of applicants</i>	<i>Numbers of admitted</i>	<i>Study area</i>	<i>Numbers of applicants</i>	<i>Numbers of admitted</i>
M-BEI	75	64	ML-BEI	11	9
M-EEN	55	48	ML-EEN	15	11
M-EST	112	102	ML-EST	19	13
M-EVM	92	80	ML-EVM	12	9
M-KAM	91	82	ML-KAM	22	16
M-MEL	46	40	ML-MEL	10	9
M-SVE	32	31	ML-SVE	11	9
M-TIT	190	175	ML-TIT	40	31

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 2009 regular assessment of the quality of teaching 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.

All the texts are accessible to students on faculty websites.

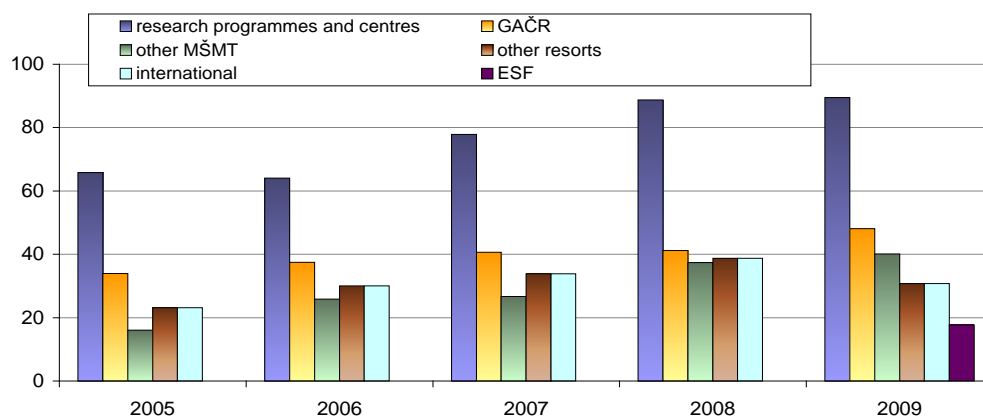
Science, Research and Doctoral Study

Creative Activities, Science and Research

Growth in research continued in 2009, in both the funding and quality of research results. As compared with the previous year, the funding obtained for research and development (graph 4) increased by approximately 5%. The major sources were four research plans followed by the Czech Science Foundation projects (GAČR), Ministry of Education projects (MŠMT) and pro-

jects conducted in cooperation with industrial companies as well as projects supported from European structural funds (ESF).

Original scientific and research results were published in two international monographs and in 55 articles in impact journals. FEEC had three international and eight national patents.



Graph 4: Research and development funds at FEEC in million CZK, 2005 - 2009

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 of microelectronic 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 semiconductor structures, their diagnostics and develop-

ment of implementation technology. Involved in the research plan in 2009 were members of academic staff 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 39 investigators in category D1, 35 in category D2 and 7 in category D3 -16 professors, 15 associate professors, 25 senior lecturers, 2 lecturers and technical and administrative staff of 29 and 38 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 sub-micron technologies*: The first version of an integrated circuit for digitization of signals with impedance behaviour of electrodes. The second version of an integrated circuit and μ -potentiostat was designed as an integrated circuit of a two-channel potentiostat. This circuit was implemented as an ASIC circuit in the CMOS07 technology. Based on experience gained in designing the previous two-channel version and the subsequent measurement, the original 14-channel version micropotentiostat IMAM chip was modified. A library of behavioural models for the PSpice program was created as part of the dissertation 'Modular Approach Design of Modern Analog Elements in CMOS Technology'.

2. *Modelling and simulation of integrated circuits*: Work continued on simulation of signal transmission and analysis of signal sensitivity to multiple-conductor transmission structures with emphasis on the development of computer algorithms for solutions in the time domain (methods of state variables, FDTD methods). Work started on application of the Volterra series theory in solutions of weak non-linear systems using the omnidirectional numerical inversion Laplace transformations. Algorithms for singular dynamic systems were designed. Interaction of electromagnetic radiation with the so called artificial dielectrics was studied. Attention was paid to numerical modelling of nanometer structures, and analytical and numerical models were compared. Mathematical models of continuous and discrete processes were studied as well as their applications to nanostructures and electronic circuits.

3. *Microsystems and nanosystems*: Microconductometer was redesigned, the first version of an integrated impedance spectroscopy was designed using the sigma-delta bandpass converter. The reconfigurable integrated circuit RE-POMO32 containing polymorphous gates was designed to integrate the logic of application with environment signals. A new version of an integrated system for measuring chemo- and biosensors. Also designed was a novel device for verification of application and integration of measuring methods for integrated system circuits in measuring the response of electrochemical sensors. The coexistence of wireless communication technology ZigBee and the IEEE 802.15.4 stan-

dard was tested within comparative technologies, namely WiFi and Bluetooth. The research also involved thick-film sensors for detection of heavy metals using carbon nanotubes (CNT) for operating electrodes. Work focused on complex testing of security hydrogen sensors. A device in the form of a distribution system was designed containing different modules with sensors transferring data along a serial line to the superior system. Various passivation layers were investigated for solar systems based on sputtering of composite materials to prevent degradation of solar cells by slowing down their ageing.

4. *Advanced microelectronic and nanoelectronic technologies*: Research focused on structures of lead-free soldered joints decisive for reliability and lifetime. A number of experiments with soldering pastes were conducted. The quality of soldered connections is affected by wetting of soldered surfaces. Development of new non-vacuum technologies is another area of interest dealing with sleeving and implementation of embedded and 3D structures. A device for writing (print) of masks was developed and is operated by a CAD program. A relatively unknown and undefined area is the choice of the type of sleeves for each particular application in the whole range of options. The changed attitude resulted in new requirements for sleeving of electronic systems. An extensive analysis was conducted, and rules for the choice of sleeves for individual applications were clearly given. Interconnecting of electronic modules through SMD components CWC was verified. Implementation of a display module and its connection to the printed circuit board by means of the SMVPH method was tested. Reliability is emphasized and EU legislation observed.

5. *Modern diagnostics of materials and components*: The theory of the mechanism of impact ionization for PN junctions was elaborated, the method designed and the coefficient of impact ionization evaluated. The continuity equation for stationary current passage in the case of carrier generation through impact ionization. The distribution of conductivity electrons and holes in the junction was defined and the space charge generated through impact ionization described. Experimental measurements of temperature dependence of local PN junction breakdowns were conducted as well as their identification and determination of the parameters of channels generated in this way. On the basis of C-U measurements the dependence of the maximal intensity of

electric field at the moment of a breakdown was determined, and a model of the origin of defects resulting in breakdowns was compiled. The characteristics of the basic types of EME sensors were compared. For laboratory measurements, a capacity sensor was selected. The impact of interferences in electromagnetic and acoustic fields on the recorded electric signal was studied, and elimination methods were devised. Suitable low-noise amplifiers were selected. A device for detection, recording and evaluation of EME and AE signals was designed and implemented. This device can be used to study the origin and development of fissures, for statistical evaluation of signal parameters and localization of originating fissures. Slow diffusion of ions in oxygen layers was studied, its sources were identified and the mechanisms of origin were described including mathematical description of individual time constants. The characteristics of photonic components was completed as well as prolonged display lifetime prediction. Research of quantum structures in semiconductors by near-field microscopy. Work continued on the methods of narrowing the width of semiconductor laser line by means of Bragg grids. The methodology of local measurement of optical and electrical characteristics on electrical and photonic components was elaborated.

Research results achieved in 2009 were published in 8 monographs, 68 articles in international journals, 184 papers at international and national conferences. There were 14 dissertations, 4 habilitation procedures and 1 procedure leading to appointment to professorship were commenced. The research team defended 12 research reports.

In connection with the research plan the team members were involved as investigators or co-investigators in 3 international projects, 17 CAČR projects, 20 FRVŠ projects, 14 MPO projects, 4 GAAV projects and projects for other institutions.

New Generation Electronic Communication Systems and Technologies (ELKOM)

(Investigator Zbyněk Raida)

The research plan is concerned with advance-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 80 academics, 80 full-time Ph.D. students and a technical and administrative staff of 20.

The investigation team consists of 6 research groups:

1. New generation wireless and mobile wide-band communication systems (Stanislav Hanus)
2. Multimedia and hypermedia communication services and technologies (Vít Novotný)
3. High frequency and microwave structures of communication systems (Miroslav Kasal)
4. Advanced technologies of integrated communication systems (Vladislav Škorpil)
5. Special electronic circuits and operating blocks for modern communication systems (Zdeněk Kolka)
6. Digital methods of analysis, processing and transmission of multimedia signals and images (Ivo Provazník)

In 2009 the investigation team published their research results in 25 articles in Web of Science journals, in 5 monographs and other approximately 400 publications. The team completed nearly 20 implementations for cooperating companies (prototypes, operating samples, software) and was awarded 1 patent.

The investigation team cultivated contacts and research cooperation with European partners in the framework of three COST projects and two FP7 projects. Extended was cooperation with other European research institutions in the region through preparation of the Central European Centre of Excellence CEITEC. The quality of research has been increasing by involvement in 2 projects of the Operational programme Education for Competitiveness.

All described steps have been taken to secure the viability of the research team in the period following completion of the present research plan.

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 the surfaces of electrodes.

Research of the properties of new gel polymer electrolytes, carbon electrodes, and electrocatalysts of lithium-ion batteries, fuel cells and supercapacitors.

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 electric machines using genetic algorithms and simulated annealing.

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 radiation transport of power 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 contained 25 investigators in category D1, 4 professors, 13 associate professors and 8 senior lecturers. There were 54 investigators in category D2, 3 professors, 5 associate professors and 46 engineers, 14 researchers, and technical staff of 40, including 23 Ph.D. students. In category D3, there were 12 investigators.

The funding amounted to 14,722,000 CZK. The research plan covered four major areas. The major achievements during the fifth year are as follows.

1. Chemical sources of electric energy: Bifunctional electrocatalysts for positive electrodes in fuel cells were improved, and research of electrocatalysts for negative electrodes continued. Material for positive electrodes in lithium-ion accumulators on the basis of LiCoO_2 with alkaline metal dopants was developed. An increase in electric conductivity of gels containing lithium salts and nanoparticles Al_2O_3 was identified and quantitatively determined. Systems for increased security of batteries, mainly on the Li basis, using new types of resolution were verified. Also verified was the system of measuring electrode materials without a carrier mesh in special cells. This resulted in higher accuracy and reproducibility of measurement. Quartz microbalance was used to identify the phenomenon of ion penetration into intercalation electrodes. Capacity of carbon electrodes in supercapacitors with nanoparticles was studied, using liquid and gel electrolytes. Relevant mobility values for sodium ions in gels for chemical sources and accumulators were found. In cooperation with an industrial company the system of measurement and evaluation of electrode materials on the Ni basis was verified with regard to increased capacity and lifetime in cycling. For numerical model calibration available results of analyses on a similar model were used. Owing to conducted experiments degradation mechanisms in lead accumulators working in the PSoC mode for hybrid vehicles were partially explained. It was verified that particles of additives can act as nuclear centres for crystallization of lead sulphate or can limit the growth of lead sulphate crystals by filling large pores of negative active mass. The theory was disproved that additives contribute to increasing the overall conductivity of negative active mass. A new theory of electrocatalytic effects of carbon in negative electrodes and the effect of thrust on the lead accumulator electrode system. Mathematical simulation of current, internal resistance and

charge distribution helped to find an optimal distribution of current flags in plates of lead accumulators.

2. Optimization of electrochemical energy conversion: Computation, constructions and production of prototypes of high-speed motors were finished. To increase the efficiency of asynchronous generators theoretical research and computations were conducted to identify the cause of loaded magnetic circuit oversaturation. Design and optimization of a synchronous motor for hybrid electric traction. Analysis of the saturation effect of magnetic circuit on oscillations of the moment of asynchronous traction motor. Research of non-invasive diagnostics of asynchronous machines. Optimization of automotive alternator for difficult conditions by means of the finite element method. Analysis of the design and development of software for optimization of auto starters with permanent magnets. development of an electronically commutated starter for combustion engines. Research and development of non-invasive diagnostics in electric machines. Computations and construction of special synchronous electric machines with permanent magnets. These are machines with radial and axial magnetic field for ecological transport, for both electric and hybrid drives. Optimization of these machines by methods of artificial intelligence is underway. Also in progress is the development of methods for measuring magnetic, mechanical and thermal parameters of the rotating parts of electrical machines. An operating sample was made. An operating sample of a microgenerator with electric power management for wireless measurement of electrical and mechanical parameters in mobile devices was completed. Computer simulations and special measurements relating to the theory of bifurcation and chaos were conducted, and papers prepared for publication.

3. Optimization of energy conversion and exploitation in systems with ecological power sources: Design of a cogeneration unit with the Stirling engine was completed and a laboratory model was used for optimization of a lamellae regenerator. An analysis of the properties of the cogeneration cycle with a gas turbine was conducted as compared with a gas engine. An experiment in a real high-voltage network was conducted to verify the effect of a particular type of interference on current passage, and on the functionality of the method of affected phase grounding on in-

creasing network safety. A detailed analysis of overvoltage in cables inserted in outdoor lines and a methodology for location of overvoltage arresters were worked out. An algorithm for optimization of clustered distribution network including minimization of losses and minimization of penalties for interrupted power supply. A detailed analysis of the distortion of time courses of typical fast effects in electric network was conducted in accordance with the measured amplitude and phase characteristics of the previously designed novel concept CR divider, and based on this analysis was the design of an antialiasing filter for an input of a digital measuring device. A novel construction of a flickermeter was designed taking into account the characteristics of new types of light sources. A methodology for determination of free network capacity in CR was designed for connecting new sources, predominantly renewable energy sources. A study for wind-power exploitation on the territory of CR was worked out. Software for analysis of brightness in digital photography was completed. For thermal plasma modelling, computations of the radiation characteristics of air plasma and sulphur fluoride at temperatures up to 30 000 K were carried out.

4. Alternative ecological transport: Long-term testing of the Li-ion traction accumulator 28 V/40 Ah was conducted on a single-track vehicle with asynchronous engine. The impact of the final charge voltage and of complete discharge as well as the impact of the method of charging were verified. An electric vehicle with asynchronous engine – an electromobile with low-output drive supplied from fuel cells and an Li-Fe-Po accumulator was developed. Research and development of a switching source for charging a small 43 V/30 A electromobile was commenced. Research, development and verification of an operating sample of an intelligent mains charger with a 43 V/30 A switching source with the function START for charging automotive lead batteries. Research and development of the three-phase mains 160 V/100 A charger with a switching source for charging the electromobile Peugeot 106 Electric. Research, development and testing of an operating sample of transducer for the Direct-drive 24 V/300 A. Development and testing of a control algorithm for a traction asynchronous engine with control optimized to the maximum efficiency in a wide range of moments and revolutions.

Research results achieved in 2009 were published in two scientific monographs, 8 articles in impact journals ISI, 16 articles in reviewed journals, 182 papers in proceedings, and 5 prototypes and 26 operating samples were created.

There were 2 habilitations and 11 members of the team in category D2 defended their dissertations.

With support of the research plan the investigators and co-investigators organized 2 world conferences.

The members of the research team participated in 5 GAČR projects, 1 GAAV project, 2 FRVŠ projects and 6 MPO projects. They cooperated in a research project of the Faculty of Mechanical Engineering, Brno University of Technology and in a FP6 project.

Intelligent Systems in Automation

(Investigator Pavel Jura)

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

Involved in the research plan in 2009 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 2009:

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 (see publications).

The further development will be continued in cooperation with the company B&R, which has shown great interest in this method.

Research of electric drives dealt with the development of sensorless control algorithms for synchronous engines with permanent magnets. Designed and verified was an algorithm of estimation of rotor position with guaranteed stability.

Adaptive control of synchronous engines was dealt with, which resulted in the design of an adaptive control algorithm based on on-line identification of drive parameters and their application in parametrization of a controller for the final transition step.

Mathematical support focused on the conditions of exponential stability of neutral linear continuous differential systems and discrete hybrid system feedback, and algorithms were designed for solution of singular problems represented by Eden-Fowler differential equations describing the behaviour of thermionic currents.

Differential operators were used to construct discrete dynamic systems (quasi automatics), and using the theory of iterations new characteristics of a conventional dynamic system were identified in the complex creating Mandelbrot and Julia sets.

2. Control of complex systems: The designed advanced optimization algorithms based on artificial intelligence methods were tested (cooperation with Nottingham University). Computations of optimized controllers based on evolution principles were conducted.

Designed and implemented was a unique system of weighting based on smart drive units. Within the framework of implementation of the prototype of radar platform (loading 300 kg) its electric part and control system were developed.

An international conference MENDEL 2009 (indexed in ISI Thomson - Web of Science) was organized with focus on soft-computing, fuzzy, simulation, artificial intelligence.

3. Artificial intelligence and robotics: This research group focused on study of the parameters of telepresence systems.

A completely new high-resolution system for visual telepresence Cassandra was designed. In the future, owing to this system, optimization of the parameters of telepresence will be enabled according to the required width of the communication channel and the required quality of recep-

tion. Development started of a testing device for scanning head movements as their parameters have a decisive effect of the quality of telepresence.

On 26 September 2009 the research group organized the event Robot Day 2009 and the competition Robotour 2009. Both events were very well received.

4. Communication networks and systems of processing automation:

In 2009 primary research dealing with securing real time in decentralized systems based on the communication standard Ethernet. In the focus of research were extensive decentralized control systems based on the Ethernet communication standard and high reliability, safety and robustness of Networked Control Systems. Modelling of extensive communication systems centred on formal methods of describing communication structures, routers, switches and other network infrastructure. To secure the safety, reliability and QoS in extensive networks reserved private networks were studied

Another major research area is the localization and monitoring of the position and mobility of communication stations in wireless communication network. Monitoring of the position of communication stations in the wireless communication network were studied on the basis of Kalman filtering, Bayesian filtering and extended Particle filtering. In studies of intravilan infrastructure algorithms for improved localization of wireless stations for navigations of handicapped people in inhabited areas were examined.

In research and development of wireless communications priority was given to reliability and security of systems including sensoric networks. In the focus of attention was resistance of wireless communications against external interferences and cyberattacks in industrial wireless communication systems. Encoding and implementation of algorithms for highly specific functions of communication networks were studied with regard to hardware implementation of algorithms into FPGA with the possibility of partial reconfiguration of fields and full on-line reconfiguration.

5. Methods and tools for automated measurement:

Development of methods for contactless measurement of vibrations using acoustic holography, namely some new methods to be used in closed space where the measured data are usually af-

ected by noise from other sources of sound. Designed and implemented was a matrix microphone field with digital MEMS sensors and processing of output digital data in gate field on the PXI- RIO platform. Implementation of new algorithms for acoustic holography in the gate field was started for real-time measurement and visualization of noise sources and vibratons.

A newly acquired infracamera was used to make experiments and measurements for thermodynamics of materials.

The EMAT contactless sensor in the signal source mode was verified and conformity with the simulation model was proved. Construction of a reference wideband sensor of new original concept started.

Designed and implemented was a measuring system with a generator of vibrations and precise control of the shape of deflection and acceleration in the examined frequency range, which could be applicable in special tests of sensors and service life tests.

In computer vision research, contactless measuring methods were used to tackle inspection and transport tasks e.g. the system for continuous evaluation of unweaven fabrics by means of line cameras, or the transport system for detection of motorcades and vehicles with derived parameters implemented in the interface Google API. For transport camera systems the method of assistance recognition of traffic signs is being developed as well as an algorithm for early identification of driver fatigue by contactless methods. The high level of research and development of inspection camera systems such as automatic counting of ground stones, detection of faults in transparent materials and complex automated analysis of SMD components has been maintained. The team had a number of national and international publications, 2 utility samples, and was awarded by academy for implementaion of smart computer vision systems.

Research results in 2009 were published in the form of chapters in 4 international scientific publications, in 30 articles in national and international (15) journals, 80 papers in conference proceedings (29 international). In the framework of the research plan the investigating team implemented 18 products (6 operating samples, 2 prototypes, and 9 SW products and introduced 1 production project). One dissertation and 2habilitations were defended. In 2009 the investi-

gating team received 25 responses (17 international).

In connection with the research plan the team members participated as investigators or co-investigators in another 3 international research and development projects, 5 GAČR projects, 1 MPO project and more than 10 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 Prof. Vladimír Kučera at 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, Academy of Sciences Prague, a.s., Praha, Neovision s.r.o., Praha, Camea s.r.o., Brno, UNIS, s.r.o. Brno, Siemens Automobilové systémy s.r.o., Frenštát pod Radhoštěm. The end users of research results achieved in the Brno branch are Freescale Polovodiče ČR, s.r.o. and Dasfos, s.r.o.

The leader of the co-investigating team at the Faculty of Electrical Engineering and Communication is Prof. Petr Vavřín from the Department of Control, Measurement and Instrumentation.

There are four research groups in Brno:

1. Automatic control algorithms

Prof. P. Vavřín, P. Blaha, P. Václavek, L. Veselý, P. Zbránek

The group has been involved in longterm research and exploitation of models – namely state reconstructors – for sensorless feedback control of asynchronous motors.

Attention was paid to sensorless and adaptive control of synchronous motors with permanent magnets.

Theoretical analysis of monitoring the state of a synchronous motor. Results were applied in the design of a sensorless position control system for a synchronous motor with guaranteed stability.

Also designed was a method of synchronous motor adaptive control based on on-line identification of parameters and subsequent parametrization of controllers for the finite transition process.

Achieved results were verified by experiment and presented at international conferences (2009 IEEE International Conference on Electrical Machines and Systems, 2009 IEEE Symposium on Industrial Electronics and Applications) and published in the journal DAAAM International Scientific Book.

2. Artificial intelligence and robotics;

F. Šolc, CSc., L. Žalud, Ph.D., F. Burian, L. Kopečný

Development of the rescue robotic system OR-PHEUS-AM continued. Investigation of smaller rescue robotic systems was targeted at examination of current possibilities of control of a group of heterogeneous robots. The basic conception was devised of a completely new system for control of a group of easily reconfigurable robots. Also the communication infrastructure of robotic systems was adapted to control a group of robots. All robots are now interconnected by a unified network and use the same or similar protocols.

Ing. Lukáš Kopečný defended his dissertation 'McGibbon's pneumatic muscle – touch interface modelling and application' and received the Ph.D. degree. Research results were presented at the International Conference on Military Technologies (ICMT) 2009 and at other events.

3. Computer Vision;

J. Honec, I. Kalová., K.I Horák, P. Honec,

The group dealt with research of inspection and traffic camera systems. A new, mainly assistance system for real-time recognition of traffic signs was developed and work started on instantaneous detection of driver fatigue. Cooperation with ESRF (European Synchrotron Radiation Facility) in the project of construction of a point atomic force microscope was extended. Precise algorithms were designed for identification of persons based on bipedal locomotion, and fast algorithms for analysis for dynamic sequences. Progress has been achieved in research of the fast computing cards COMBO based on FPGA Xilinx for transfer and processing of large volumes of image data with the possibility to reconfigure the circuit content during operation. Research results were presented at national and international conferences (DAAAM, MENDEL, ARTEP), published in articles (DAAAM Scientific Book, Výrobné inženýrstvo), on the grounds of protection of intellectual property two outcomes were recorded as utility samples at UPV Č. At the end of the year

the research group was awarded by Engineering Academy for the project Intelligent systems of computer vision in technical practice.

4. Control systems;

F. Zezulka, P. Kučera, O. Hynčica

This research group achieved the following results:

1. The longterm development and tests of the breakout prediction system became a standard part of the production process in Třinecké železářny and resulted in a verified technological process.

2. The fundamental SW layers for automatic implementation of real-time state automatics up to 32-bit real-time operation systems were developed. Thus implementation of the formally described and verified control problem on the target platform will be enabled without man-made interferences. The output is authorized SW and presentation at the international conference WM-SCI2009.

Research Centre of Applied Cybernetics has been achieving outstanding results and therefore an application for extended granting of funds for the period 2010-2011 was submitted. The final report was accepted and positively evaluated by the Ministry of Education, and funding of the centre's activities was extended for 2010 and 2011. In regard to the highly appreciated results funding for 2010 was increased. The co-investigating workplace at the Department of Control, Instrumentation and Measurement will receive funds increased from 6500 thous. CZK to 7408 thousand CZK.

Research Center of Quasioptical Systems and Terahertz Spectroscopy

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

Research center of quasioptical systems and terahertz spectroscopy (KVAŠTES) 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 center is involved in basic research funded by the Ministry of Education, project No. LC06071.

The center is focused on basic research of the structure and dynamics of molecules, relaxation processes in gases, and atmospheric response to electromagnetic waves. Research involves the

wide frequency band, ranging from centimeter to millimeter and submillimeter waves.

The Brno branch of the KVAŠTES center is involved in the development of numerical models of spectroscopy components and their optimization to enhance its parameters. Numerical modelling will be used to investigate interactions between electromagnetic field and elementary particles.

In 2009 the center's activities were focused on completion of the 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, Brno group 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 and their exploitation 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 the Forschungszentrum Karlsruhe (Helmoltz Gemeinde, Germany). Other areas of interest are processing and analysis of ophthalmological images from various imaging modalities aimed at detection and evaluation of the parameters significant for diagnostics to facilitate and enhance accuracy of medical diagnostics. This branch of research has progressed in cooperation with the ophthalmological clinique and department of pattern recognition at University Erlangen (Germany) and the ophthalmological clinique in Zlín. Since 2007 a new area of interest has been the 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. Methodologically, the research is concerned with applications of a wide range of methods for processing, reconstruction and analysis of images, which are original or original modifications of

methods adapted to data characteristics and specific medical needs.

In 2009 the research was based on previous results relating to methodology and biomedical applications. It was focused on reconstruction of transmission ultrasound tomography (USCT) images, namely methods of reconstruction of attenuation images and fast images (the so called restoration of the parametric field of ultrasonic velocity) in three-dimensional USCT based on simulated and real measuring data, in cooperation with FZ Karlsruhe. A new modification of the method of synthetic sharpening with a realistic 3D measurement geometry was developed and implemented. Research also involved the development and implementation of methods for solution of relating extensive systems of equations (including nonlinear equations and newly formulated regularization) in an efficient parallel computational environment. Further development of the new methodology of computational calibration of the USCT system in the so called blocking version with focus of superresolution in time at detection of the instant of impulse arrival. A dissertation dealing with this research (A.Filipík) was defended. Ultrasound simulation in the measuring system generalized by being elaborated for the 3D solution of the wave equation brought new results concerned with the magnitude of the simulated volume. The procedures were verified by specific simulations involving millions of equations, with gradually decreasing rate of approximation (including space variables of attenuation and velocity of propagation (by sections constant in freely definable areas) in harmonic excitation mode. Consequently there was a noticeable shift of the field time development simulations based on a synthesis of partial quasistatic harmonic

results. Devised and offered for publication in an international journal was an original method of regularized reconstruction of velocity images in ultrasound computational tomography (USCT). Development of the experimental method of synthetic sharpening in realistic geometry and efficiency assessment of this approach continued.

Research was also focused on advanced methods of fusion and processing of ophthalmological retina images: assessment of detection of retina neural layer on the basis of multimodal images as compared with the advanced, but costly OCT method. In cooperation with the ophthalmological clinique of University Erlangen an interactive system of multimodal fitting and analysis of retina images was tested and made accessible to ophthalmologists on internet, website OPHTALMO. Designed and verified were the techniques of narrowing or eliminating the layer of neurons on retina to quantify damage caused by glaucoma, by way of combination of a number of texture analysis methods, and detection of the retina vascular system by modified 2D filtering was enhanced.

An analysis of brain magnetic resonance images (fMRI) in cooperation with the 1st neurological clinique of the Faculty Hospital Brno-Bohunice. The major methods of measured data processing were studied and implemented relating to simulation and other measuring data (fusion of complex data). The significant original results were obtained in assessment of brain connectivity based on the so called Granger causality.

All results were published at international level – mostly in papers at international conferences, and four manuscripts were offered for publication in international journals.

Habilitations and Appointments to Professorship

In 2009 one member of the FEEC academic staff was granted the title of profesor and six new associate professors were appointed:

Prof. Ing. Eva Gescheidtová, CSc.
Theoretical Electrical Engineering

Doc. Ing. Vítězslav Novák, Ph.D.
Electrical and Electronic Technology

Doc. Ing. Jiří Háze, Ph.D.
Electrical and Electronic Technology

Doc. Ing. Radim Kolář, Ph.D.
Biomedical Engineering

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

Doc. Ing. Dan Komosný, Ph.D.
Teleinformatics

Doc. Ing. Jaroslava Orságová, Ph.D.
Power Electrical and Electronic Engineering

Doctoral Programme

In academic year 2009/10 there are 357 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 indi-

vidual years of study over the past 5 years are in Table 4.

The list of doctoral programme graduates in 2009 can be found on FEEC websites, links Study, Doctoral study programme, Doctoral programme graduates.

Table 4: Numbers of Ph.D. students from 2005 to 2009

<i>year</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>
1.	49	83	92	89	88
2.	71	44	72	84	80
3.	72	67	40	69	80
4.	44	48	43	20	60
5.	33	32	39	35	8
6.	24	29	27	35	18
7.	24	28	40	33	23
total	317	331	353	365	357

Table 5: Numbers of Ph.D. students by departments from 2005 to 2009

	<i>2005</i>	<i>2006</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>	<i>total</i>
UAMT	3	3	2	3	8	19
UBMI	2	0	2	0	6	10
UEEN	1	5	0	2	4	12
UETE	3	2	0	4	4	13
UFYZ	1	0	5	5	3	14
UMEL	8	4	6	4	11	33
UREL	9	10	7	9	12	47
UTEE	2	4	3	0	1	10
UTKO	4	10	6	9	10	39
UVEE	4	6	4	5	6	25
total	37	44	35	41	65	

Student Creative Activities

The 15th STUDENT EEICT Conference and Competition was jointly organized by FEEC and FIT on 23 April EEICT 2009. The abbreviation stands for the English words Electrical Engineer-

ing, Information and Communication Technology indicating the priority areas of research and education at the two faculties Registered for the competition were 240 papers - 65 Bachelor, 80

Master and 95 Ph.D. papers. In a special category there were four posters presented by students from two secondary schools. The main sponsors of the competition were the companies Honeywell, ABB a Tyco.

The presented papers were defended and evaluated by expert committees including represen-

tatives of the sponsoring companies, academics and Student Union representatives. Seventy-five top or outstanding 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 increasing the prestige of 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 Longlife Learning Programme (LLP)/Erasmus. As a result, 45 students could study abroad in 2009 in the extent of 167 months and 25 teachers were on lecture stays at the length of 34 weeks (Table 6). Teacher and student mobility remains on the five-year average.

Reciprocally, the interest of international students in placements at FEEC has been increasing. Within the LLP programme, 63 students came for placements in the total extent of 220 months, which represents an increase by 34% in the number of students and 34% in the length of placements in comparison with 2008. Mobility figures for incoming and outgoing students in individual programmes for 2009 are in Table 7.

Existing agreements in the Longlife Learning Programme-Erasmus were renewed. On the whole, the Faculty has concluded 44 bilateral agreements. A list of universities cooperating with the FEEC on the basis of the Longlife Learning Programme-Erasmus for academic year 2009/10 is in Table 9.

In 2009 the funding for longterm 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 another 132,000 CZK was received from the BUT mobility fund. The Faculty contributed by the amount of 91,000 CZK from the scholarship fund. Within the framework of the Development Programme of the Ministry of Education there were 15 students on placements in the total length of 64 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 2008. Placements of FEEC students amounted to 238 months, which represents a decrease by 4% as compared with the previous year, with the same number of students. On the other hand, placements of international students at the FEEC reached 220 months, - a 2% increase in comparison with 2008.

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 2009 the amount of 650,000 CZK was provided in support of such activities. And another 730,000 CZK was provided to support international activities at the FEEC.

Funds were also obtained from the development programme of the Ministry of Education 'Systematic support for work of international academics at FEEC BUT'. These funds were used to cover the travel expenses of academics from abroad coming to short lecture stays at FEEC.

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

Table 6: Student and teacher placements at universities abroad within the Socrates-Erasmus a Longlife Learning Programme-Erasmus from 2005 to 2009

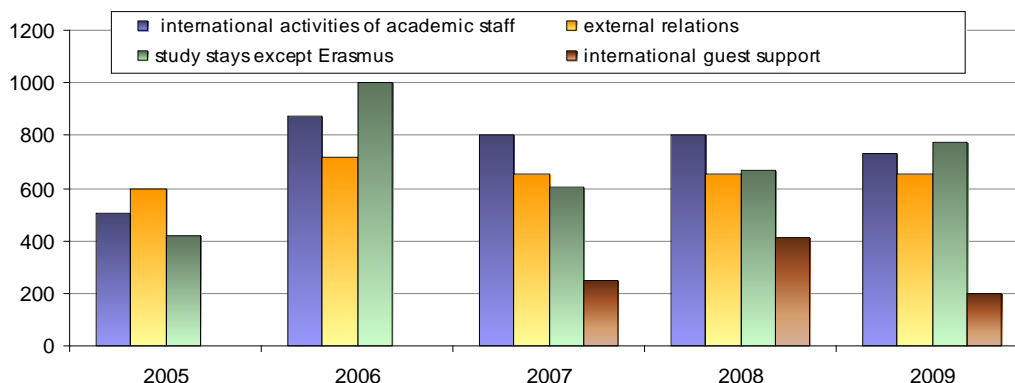
Programme Socrates (LLP)- Erasmus	2005	2006	2007	2008	2009
Numbers of students	45	25	39	42	45
Numbers of months	161	146	182	168	167
Numbers of lecture stays	26	37	24	30	28
Numbers of lecture weeks	30	45	27	35	34

Table 7: Student placements at FEEC and abroad by programmes, 2009 – summary

Activity	Arrivals		Departures	
	Students	Months	Students	Months
Socrates(LLP)-Erasmus	63	220	45	167
Inter-university agreements	5	15	-	-
Development Programme of Ministry of Education	-	-	15	64
Other	-	-	2	7

Table 8: Student placements at FEEC and abroad in all mobility programmes from 2005 to 2009

		2005	2006	2007	2008	2009
Arrivals	Students	36	34	45	64	68
	Months	113	125	141	216	235
Departures	Students	59	45	68	68	62
	Months	203	221	264	248	238



Graph 5: Funding of FEEC staff international activities, faculty international activities and student placements outside the Erasmus programme (LLP) from 2005 to 2009 in thousand 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 in 2009 held in Prague, 13 - 15 May. The meeting dealt with transformation of the study programmes of Czech universities based on the Bologna Declaration and with accreditation of new study programmes. Also discussed were EU research projects, coordination of projects, cooperation in research plans and centres of Ministry of Education, and cooperation with foreign universities.

Close contacts have been maintained with industrial companies in the Brno region and in other places in 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.

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 Ph.D. students are provided education at 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 2010/11

University	Country
Katholieke Hogeschool Limburg	Belgium
Технически университет-София	Bulgaria
Технически университет-София – Пловдив	Bulgaria
Aalborg Universitet	Denmark
Danmarks Tekniske Universitet Lyngby	Denmark
Kuopion yliopisto	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 Università degli Studi di Napoli	Italy
Hochschule Furtwangen – Furtwangen University of Applied Science	Germany
Hochschule Pforzheim – University of Applied Sciences Pforzheim	Germany
Fachhochschule Wiesbaden	Germany
Friedrich-Alexander-Universität Erlangen	Germany
Hochschule für Technik, Wirtschaft und Kultur Leipzig	Germany
Technische Universität Dresden	Germany
Duale Hochschule Baden-Württemberg Lörrach	Germany
Universidade Católica Portuguesa – Escola Superior de Biotecnologia	Portugal
Instituto Politécnico de Lisboa – ISEL	Portugal
Instituto Politécnico do Porto	Portugal
Fachhochschule Oberösterreich	Austria
Technische Universität Sien	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 Politècnica de Catalunya	Spain
Universidad Politécnica de Valencia	Spain
Universitat de València	Spain
Universidad de Zaragoza	Spain
Universitat Rovira i Virgili Tarragona	Spain
Högskolan i Halmstad	Sweden
Malmö högskola	Sweden
Boğaziçi Üniversitesi	Turkey
Namik Kemal University	Turkey
University of Huddersfield	Great Britain

Academic Senate

In 2009 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

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

Academic Staff Chamber

doc. Ing. Jiří Kozumplík, CSc., UBMI, EK, chair

doc. Ing. Petr Baxant, Ph.D, EK, UEEEN

Ing. Petr Fiedler, Ph.D., LK, PK, EK, UAMT

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, UMEL

Ing. Helena Polsterová, CSc., PK, UETE

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

RNDr. Naděžda Uhdeová, Ph.D., EK, UFYZ

doc. Ing. Pavel Vorel, Ph.D., PK, UVEE

Student Chamber

Bc. Tomáš Szöllösi, PK, chair

Bc. Petr Bílek, LK, PK

Ing. Jan Dolenský, EK

Bc. Pavel Hronek, LK, PK, EK

Bc. Marián Klampár, PK, EK

Bc. Libor Svoboda, LK

Kateřina Vašková, PK

Academic Senate held 9 regular meetings and one irregular meeting, with an average attendance of 85%. 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 2010/11 as well as amendments of internal FEEC regulations. Academic Senate discussed and approved the economic report for 2009, and the proposal for distribution of funds for 2010 and allotment of educational funds.

On 27 May 2009 the pedagogical committee arranged a meeting of representatives of departments to discuss the issue of basic subjects (mathematics, physics, electrotechnology) intercon-

nection and mainly the continuity of basic and specialized subjects.

At a meeting summoned for 24 June 2009 Academic Senate discussed the resolution to the currently prepared project CEITEC submitted in the framework of Operational Programme, Research and development ESF, Priority Axis 1.

On 15 December 2009 elections of a candidate for nomination of the Dean of FEEC for the term of office February 2010 - January 2014 were held. Of the two proposed candidates Prof. Jarmila Dědková received 14 votes, the second candidate Prof. Ivo Provozník received 2 votes.

Discussions at the meetings were always constructive as the proposals were first sent to all members and departments for comments.

Campus Development

Reconstruction of the building Technická 8 was commenced by revision and rewiring on the 3rd floor. This building was also interconnected with the adjacent newly constructed Technická 10, which meant that access to Technická 8 was temporarily limited.

Upgrading of the technical equipment of lecture rooms, computer and information networks at Kolejní 4 and Technická 8 continued.

Construction and Reconstruction

The key construction plan for 2009 was progress in construction of building Technická 10 to be completed in the middle of 2010. Completion of this building will, after nearly 20 years, solve many dislocation problems and also interconnect Technická 8 and 10 by lift.

The postponed work on building Technická 8 was started in 2009. Thermal insulation and a new suspended facade, which was also made on the new building Technická 10 were completed.

Planned Reconstruction

In the second half of 2009 preparatory works for construction of another building – Technická 12

were conducted. At the end of the year the project for Priority Axis 4 of OP Research and Development from which part of funding will be received was completed as well as project documentation for competition for construction supplier.

Computer Networks and Information Systems

Priority was given to:

- upgrading of servers and adaptation of premises
- support of the network of Gb information and communication technologies
- 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 Apollo system modules and setting to function of the used faculty information system are in progress. The process was underway for the whole year of 2009 and continues in 2010.

Other

Equal Opportunities

The 'Consultancy and Information Gender Studies Centre' continued its activities in 2009.

The Centre provides professional and personal consultancy, under the management of Department of Physics, to female students, and organizes information events for the public aimed at removing the barriers female students face when choosing careers in technical fields. Support to the training of women for jobs where they would use information and communication technologies is fully in agreement with the policy of equal opportunities for men and women, one of the priori-

ties of the European Union. The Centre concentrates on promotion of study opportunities for handicapped students, activities supporting integration of handicapped students in full-time and part-time study at FEEC, contacts with selected secondary schools integrating these students and taking into account their specific needs. The Centre cooperates with the Department of Physics, Student Union 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 task 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.

Activities of the Institute cover participation in international and national organizations and institutions involved in signal and image processing, publishing, research and grant projects, organizing of 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. (ÚBMI)

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:

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Kolejní 4, 61200 Brno

Tel: +420 541 149 540, -9 541

Fax: +420 541 149 542

E-mail: erbenova@feec.vutbr.cz

Institute of Experimental Technology

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

Two projects were commenced in 2009. Institute of Experimental Technology 1 within the framework of a global grant project of the South Moravian region started on 1 April 2009 and the project Institute of Experimental Technology 2 started on 1 June 2009. It is an OP VK project.

IET1 is targeted at a system for increasing the 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 a system of 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) and IET2 (SVS FEM s.r.o., Prototypa a.s., ABB s.r.o., Eaton s.r.o.)

Address:

IET (UTEE)

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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).

SK AS has seven voted members. It acts as an intermediary between faculty management and students, contributes to mutual exchange of information covering the whole spectrum of study and faculty life, and to solution of students' problems. The Student Chamber also contributed to improving 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 (edition of 1200 copies), and also publishes the Handbook of 1st year student, and organizes cultural, sports and entertainment events. Every student can apply for membership.

In 2009 the student organizations co-organized the traditional Representation ball of FEEC and FIT. They also co-organized the EEICT 2009

Student Conference and Competition. Volunteers helped with presentation of FEEC at the trade fair GAUDEAMUS 2009. In April 2009 SPS organized open air festival Music from FEEC. It was the second year of the competition of student music groups with at least one member being a student of FEEC. The winner was the Slovak group Applause (with FEEC student Branislav Fojtlín). The guests at the event were bands Heebie Jeebies and Mňága a Žďorp. Approx. 2000 people, mainly students of BUT, attended.

To support sports activities of students, SPS organized the 2nd year of the race Run to 53. The task was to run the distance from premises at Kolejní 4 to the nearby stop of bus no.53 and back as fast as possible. There were several categories – men, women, relays, and V.I.P relays, with over 40 participants, FEEC and FP management and over 300 viewers. SPS also organized a number of minor events such as Startparty, BTBIO party, Trail of Courage, Kite Parade, Waste Harvest and other.

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. Jozef Honec, CSc.
Doc. Ing. Václav Jirsík, CSc.
Doc. Ing. Pavel Václavek, Ph.D.
Doc. Ing. Luděk Žalud, Ph.D.

Lecturers

Ing. Miloslav Čejka, CSc., Ing. Petr Fiedler, Ph.D., Ing. Marie Havlíková, 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. Jan Beran, Ing. František Burian, Ing. Miloš Čábel, Ing. Luděk Červinka, Ing. Pavel Číp, Ing. Michal Dobias, Ing. Jakub Dokoupil, Ing. Jolana Dvorská, Ing. Martin Dvořáček, Ing. Leoš Dvořák, Ing. Jiří Fialka, Ing. Petr Fidler, Ing. František Gogol, Ing. Petr Hliněný, Ing. Ondřej Hynčica, Ing. Luděk Chomát, Ing. Peter Kacz, Ing. Václav Kaczmarczyk, Ing. Zdeněk Kaňa, Ing. Stanislav Klusáček, Ing. Tomáš Kopecký, Ing. Miroslav Krupa, Ing. Marek Kváš, Ing. Ondřej Lebeda, Ing. Vlastimil Lorenc, Ing. Petr Malounek, Ing. David Matoušek, Ing. Vojtěch Mikšánek, Ing. Vojtěch Němec, Ing. Petr Nepevný, Ing. Věra Nováková Zachovalová, Ing. Petr Petyovský, Ing. Jan Pohl, Ing. Petr Polách, Ing. Václav Sáb-
lík, Ing. Michal Schmidt, Ing. David Skula, Ing. Pavel Střítecký, Ing. Jaroslav Šembera, Ing. Michal Šír, Ing. Miroslav Uher, Ing. Václav Veleba, Ing. Ivo Veselý, Ing. Libor Veselý, Ing. Miloš Veselý, Ing. Dušan Zámečník, Ing. Pavel Zbranek

Administrative and Technical Staff

Ing. Luděk Anděra, Ing. Jan Beran, Ing. František Burian, Ing. Zdeněk Havránek, Ph.D., Ing. Jakub Hrabec, Ing. Ondřej Hynčica, Ing. Jan Pásek, CSc., Lenka Petrová, Ing. Petr Petyovský, Jan Vodička

Centre of Applied Cybernetics

Ing. Luděk Anděra, doc. Ing. Petr Blaha, Ph.D., Ing. František Burian, Ing. Petr Honec, Ing. Karel Horák, Ph.D., Ing. Ondřej Hynčica, Ing. Ilona Kalová, Ph.D., Ing. Lukáš Kopečný, Ph.D., Ing. Pavel Kučera, Ph.D., Ing. Tomáš Neužil, Lenka Petrová, Ing. Jaroslav Šembera, Ing. Soběslav Valach, Ing. Libor Veselý, Ing. Miloš Veselý, Ing. Pavel Zbránek, 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 provided by the five groups in the Department of Control and Instrumentation.

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 the research on decentralized and distributed control and communication systems. The research is particularly centred on building management, safety and authorization systems. The group closely cooperates with BD Sensors, Beta Control, Siemens, Škoda Auto and other companies.

The group of computer vision concentrates on solutions related to orders from the industrial sector (Metra Blansko, APOS-TRADE, Volkswagen, Škoda Auto, AVX, Pegas, Fatra, JIP - Papírny Větrník, Police of the Czech Republic). Tuition is also focused on theoretical issues (computer vision, programming) and on applications (computer vision applications, PC subsystems).

Major Achievements

Chomát, L.: Model of an intelligent building, an operating sample

Chomát, L.; Krechler, M.; Hanyš, R.: Development Sketcher, authorized software

Engineering Academy award for 'Intelligent systems of computer vision in technical practice', utility sample 'A Device for Detection of Vehicles and Determination of Their Position and/or Velocity in a Monitored Space', an EU ESF 'Multimedia interactive didactic system' project,

The group involved in automatic control continued the development of intelligent algorithms for electric drives control, namely sensorless control and identification of the parameters of asynchronous motor. In this research the group cooperates with the company Freescale Semiconductor. Development and verification of conventional and adaptive algorithms, optimal controllers based on artificial intelligence principles in both parallel mathematical models of processes and real processes.

The group of artificial intelligence and robotics has been involved in longterm research and instruction in service mobile robotics, in close cooperation with VOP026 Šternberk, s.p. in search robots for special use. The department was involved in the international project MEB 060822 „Universal mobile robotic platform“, in cooperation with TU Wien.

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, thermodiagnosics, acoustic emissions, flux measurements and noise measurements. In 2009 the group was involved in several projects for industrial parts (ABB, MEZSERVIS, SVCS) and the European Project CREDO was completed.

Engineering Academy Award for the project 'Intelligent Computer Vision Systems in Technical Practice',

A device for precise identification of the marginal position of a steel wire in the rubber strip in production of steel cord. Development and implementation in cooperation with MEZSERVIS. s r.o. Investigator P. Beneš

In September 2009 the department organized the 8th International Conference for Ph.D. students IWCIT'09.

On 26 September 2009 the department organized a competition of autonomous mobile robots Robotour 2009 including a series of lectures and robotic exhibition.

Major Research Projects

Cabin Noise Reduction by Experimental and Numerical Design Optimization (CREDO) – FP 6 EU 030814-6

Investigator: Petr Beneš

Automation Intelligent Systems - MŠMT MSM0021630529

Investigator: Pavel Jura

Virtual Automation Network (VAN) - FP 6 EU, 016969

Investigator: František Zezulka

Research Centre of Applied Cybernetics - MŠMT 1M6840770004

Investigator: Vladimír Kučera, co-investigator: Petr Vavřín

Synergy – Mobile Sensoric Systems and Networks - GAČR 102/09/H081

Co-investigator: František Zezulka

Sensors and Intelligent Sensoric Systems - GAČR 102/09/H082

Investigator: Petr Beneš

Complex and Intelligent Management of Apartments Buildings - MPO FR-TI1/528

Investigator: Zdeněk Bradáč

New Products to Meet the Anticipated Needs of Industrial Electronics - 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

Auto Transport Safety - GAČR 102/09/1897

Investigator: Petr Honzík

Implementation of State Automatics in Real-Time Operating Systems - GAČR 102/09/P205

Investigator: Pavel Kučera

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

Investigator: Pavel Václavek

Selected Publications

KALOVÁ, I.; HORÁK, K. Automatic Counting of Jewellery Stones. In DAAAM International Scientific Book 2009. DAAAM Scientific Book. Vienna, Austria: DAAAM International, 2009. pp. 419-426. ISBN: 978-3-901509-71- 1.

HRABEC, J.; JURA, P.; ŠOLC, F.; HONZÍK, P. MODELLING AND CONTROL OF BI- STEERABLE WHEELED MOBILE ROBOT. Metalurgija, 2010, vol. 49, no. 2, pp. 278-282. ISSN: 0543- 5846.

KEPRT, J.; BENEŠ, P. The determination of uncertainty in the calibration of acoustic emission sensors. International Journal of Microstructure and Materials Properties, 2009, vol. 4, no. 1, pp. 85-103. ISSN: 1741- 8410.

ZBRANEK, P.; VESELÝ, L. The Application of Interval Computation on Non-Linear State Estimation. DAAAM International Scientific Book. 2009. 8(1). pp. 713 - 720. ISSN 1726-9687.

VÁCLAVEK, P.; BLAHA, P. Lyapunov Function based Design of PMSM State Observer for Sensorless Control. In Proceedings of 2009 IEEE Symposium on Industrial Electronics and Applications. Kuala Lumpur, IEEE. 2009. pp. 331 - 336. ISBN 978-1-4244-4681-0.

PIVOŇKA, P.; VELEBA, V.; ŠEDA, M.; OŠMERA, P.; MATOUŠEK, R. The Short Sampling Period in Adaptive Control. In World Congress on Engineering and Computer Science 2009. San Francisco, USA, IAENG. 2009. p.724 - 729. ISBN 978-988-18210-2-7.

Bachelor Degree Programme

Computer Control (Petr Pivoňka)

Databases Systems (Radovan Holec)

Electronic Measurement Systems (Miloslav Čejka)

Measurement of Physical Quantities (Ludvík Bejček)

Measurement in Elektroengineering (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 Holec)

Measurement in Nonelectrical Quantities (Ludvík Bejček)

Modeling and Inentification (Petr Blaha)

Operating Systems and Networks (Tomáš Macho)

Real Time Operating Systems (Pavel Kučera)

Optimalization 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 Acquisition, 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 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 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 Pressure and Flux Laboratory of Temperature Measurement (infratechnology and contactless temperature measurement, Ludvík Bejček)

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

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

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

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

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

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

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

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

Department of Biomedical Engineering

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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. 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. Jana Kolářová, Ph.D. (roz. Bardoňová), Ing. Vratislav Harabiš, Ing. Jan Hruběš, Ing. Jiří Sekora, Ing. Martin Vítek

Ph.D. Students

Ing. Michal Bartoš, Ing. Petr Čech, Ing. Tomáš Červinka, Ing. Vratislav Čmiel, Ing. Jiří Dlouhý, Ing. Jiří Gazárek, Ing. Vratislav Harabiš, Ing. Martin Havlíček, Ing. Jan Hrozek, Ing. Jan Hruběš, Ing. Lukáš Chmelka, Ing. Jiří Janeček, Ing. Pavel Leinveber, Ing. Denisa Maděránková, Ing. Miloš Malínský, Ing. Martin Mézl, Ing. Jan Odstrčilík, Ing. Dana Ohlídálová, Pawan Kumar Pathak, Ing. Roman Peter, Ing. Martin Plchút, Ing. Jiří Roleček, Ing. Marina Ronzhina, Ing. Milan Rychtárik, Ing. Ivo Říha, Ing. Jiří Sekora, Ing. Lukáš Smital, Ing. Helena Škutková, Ing. Martin Švrček, Ing. Pavel Taševský, Ing. Martin Valla, Ing. Petr Verner, Ing. Martin Vítek

Administrative and Technical Staff

MUDr. Kateřina Fialová, Mgr. Dušan Hemzal, Ph.D., Blanka Erbenová, DiS, Hana Rýznarová, Ing. Vlastimil Václavík

Main Interests

The department provides tuition in basic subjects, mainly processing of signals and images, and specialized subjects of biomedical and ecological engineering in the Bachelor and Master degree programmes. 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. The department cooperates with the Ophthalmological Clinic of Friedrich-Alexander-University Erlangen, Forschungs-Zentrum Karlsruhe, Germany, University of Bergen, Medical Faculty of Masaryk University Brno, the Faculty Hospital in Brno-Bohunice. In 2008 cooperation was started with the company Philips in analysis of medical image data. 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. Research is supported by a research plan whose chief coordinator is prof. Z Raida and by national grant projects on modelling of the origin and analysis of cardiologic electric signals, including a further develop-

ment of a unique apparatus for simultaneous recording of heart activity by optical and electrical methods for detection of ischemia and by-effects of medicines. In 2009 several new laboratories were set up with support of grant funding. They are used not only for research but also for instruction, mainly of gifted students.

Instruction is centred on the development of the recently introduced Master study area Biomedical and Ecological Engineering and on the newly introduced interdisciplinary Bachelor programme Biomedical Technology and Informatics. Upgrading of research laboratories to an international standard is intended as well as upgrading of instruction laboratories. Currently underway is modernization of instrument and computer laboratories, mainly the laboratory of biosystems for instruction in biomedical subjects, with focus on clinical and diagnostic procedures, the laboratory of biophysics, which was reconstructed and re-furnished, and the laboratory of cardiography. New laboratories of genetic analysis and optical representation systems are set up. In the laboratories students can get hands-on experience with the latest technology with subsequent automatic processing of measured data.

Major Achievements

In 2009 members of the department published dozens of articles and papers in scientific journals and at international conferences with favourable response within the scientific community. Several researchers were authors or co-authors of articles published in leading impact journals.

Major research results were achieved in modelling of the origin of heart signals and their analysis and in processing of medical images. In the project on heart signal analysis the measuring device for contactless optical scanning of electrical signals of an isolated animal heart was completely innovated. In the course of experiments electrical activity of heart was measured. A number of studies were conducted to identify the possible negative effect of voltage-sensitive dyes on the electrophysiological characteristics of heart and cell, and changes in velocity of propagation of electric currents in the heart muscle during simulated ischemia. Processing of medical images was the focus of the national research

center D.A.R (Data, algorithms, decision-making) coordinated by Institute of Information and Automation Theory AVAR in Prague. Attention was paid to ultrasound computer tomography (USCT), simulation of ultrasound field in large volumes approaching reality (problems involving several millions of equations) and publications on analysis of ophthalmological (retina) images, focused on detection and evaluation of retina neural layer. Partial projects continued concerned with blood supply to the heart muscle using the so called tomograms as well as the cooperation project with Philips concerned with fusion of medical images and project on the physical-technical problems of ultrasonic imaging. This research was supported by several GAČR projects. Construction of several new laboratories of genetic analysis and optical imaging systems was completed, equipped with the latest apparatus. The laboratories will be used for research and also for instruction.

Major Research Projects

Analysis of Mechanical and Electrical Activity of Heart in Experimental Cardiology – GAČR 102/07/1473

Investigator: Jana Kolářová

Patients Head Position Monitoring – GAČR 102/08/1373

Investigator: Jiří Rozman

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

Investigator: Ivo Provazník

Research Centre Data, Algorithms and Decision-Making – 1M6798555601

Co-investigator: Jiří Jan

Selected Publications

BÉBAROVÁ, M.; MATĚJOVIČ, P.; PÁSEK, M.; ŠIMURDOVÁ, M.; NOVÁKOVÁ, M.; ŠIMURDA, J. Effect of antipsychotic drug perphenazine on fast sodium current and transient outward potassium current in rat ventricular myocytes. NAUNYN-SCHMIEDEBERGS ARCHIVES OF PHARMACOLOGY, 2009, vol. 380, no. 5, pp. 125-133. ISSN: 0028- 1298.

KOLÁŘ, R.; JAN, J.; LAEMMER, R.; MARDIN, C. The segmentation of zones with increased autofluorescence in the junctional zone of parapapillary atrophy. PHYSIOLOGICAL MEASUREMENT, 2009, vol. 2009, no. 30, pp. 505-516. ISSN: 0967- 3334.

DOLENSKÝ, J.; VESELÝ, A.; VANĚK, J.; HROZEK, J. Diagnostic methods of solar cells in dependence on temperature. Proceedings of SPIE, 2009, vol. 2009, no. 7412, p. 0U (17-8 p.)ISSN: 0277- 786X.

Bachelor Degree Programme

Algorithms and Programming (Jana Kolářová)
Biological Signal Analysis (Jiří Kozumplík)
Bioelectric Phenomena (Jiří Šimurda)
Bioinformatics (Ivo Provazník)
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)
Multimedia Signals and Data (Jiří Jan)

Computers and Programming 1 (Ivo Provazník)
Standardization in Medicine (Milan Chmelař)
Therapeutic and Prosthetic Instruments (Jiří Rozman)
Artificial Intelligence in Medicine (Jiří Kozumplík)
Introduction to Biology of Man (Nataša Honzíková)
Introduction to Medical Informatics (Ivo Provazník)
Health Legislation and Law (Jiří Rozman)
Medical Imaging Systems (Aleš Drastich)

Master Degree Programme

Analysis of Signals and Images (Jiří Jan)
Biophysics (Jiří Šimurda)
Human Biology (Nataša Honzíková)
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 (Václav Chaloupka)
Medical Information Systems (Ivo Provazník)
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 (Ivo Provazník)
 Healthcare (Jindřich Vomela)

Doctoral Degree Programme

Selected Problems of Biomedical Engineering (Jiří Jan)

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

Laboratories

Laboratory of Diagnostic Systems (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 Biomedical and Ecological Technology (instruction in Therapeutic and Prosthetic Technology, Specialized Medical and Ecological Technology, Introduction to Environmental Studies, Ecological Engineering, Design)

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 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, Petr Fedra)

Laboratory of Digital Signal and Image Processing (instruction in Digital Signal Processing and Analysis, Multimedia Signals and Data, Analysis of Signals and Images, Advanced Methods of Signal Processing, Multicycle Systems, Computer and Programming I, Computer and Programming 2, Petr Fedra.)

Laboratory of Image Data Analysis (a division of the centre D.A.R., research in digital processing and analysis of images, digitization and archiving of static images and videosequences, Radovan Jiřík)

Laboratory of Biomedical Electronics (with locally controlled air-conditioning, research in instrument technology, infratechnology and diploma projects, Radovan Jiřík)

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

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

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

Construction Laboratory (mechanical and electrotechnical tasks for research related to student projects)

New Laboratories, Set Up in 2009

Laboratory of Genomics and Proteomics - E220 provides a clean environment for isolation and handling of biological samples where the samples are protected against contamination and the staff are not at hazard. Top-quality equipment can be used for basic measurement and diagnostics of biological signals (DNA, RNA, protein). Fundamental analytical technology is available (gel electrophoresis, PCR and sequence) as well as the up-to-date alternatives, the Experion device as an alternative for analysis and

imaging of gel electrophoresis the Multisizer3 particle analyzer for quantitative measurement of particles 2 to 60 micrometers in size. The laboratory is fully equipped for biological sample transition to the final data signal. The spectral analyzer Paradigm can be used to demonstrate an integrated poloautomatic system for a large number of measurements (absorbance, ELISA, fluorescence, luminescence).

Laboratory of Imaging Technology - E221 is a workplace for acquisition of various types of biological and medical images in different modalities: conventional microscopy, phase contrast microscopy and stereomicroscopy, digital retina camera, device for exo biometry and measurement of the width of cornea. There are two spectrometers for fluorescence measurement of chemical samples, and a workplace for examination of digital medical images on radiological monitors. The laboratory is used for instruction and research of processing and analysis of retina images for diagnostics of glaucoma and diabetic retinopathy.

Laboratory of Medical Diagnostic Technology - E222 is mainly used for instruction focused on scanning and processing of real-time real and simulated biosignals. Equipment was upgraded with sensors for real-time measurement and processing of biosignals (e.g. EKG, spirometry, blood pressure, breathing rate, temperature) and also measuring cards and software LabView.

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Doc. Ing. Petr Baxant, Ph.D.
Doc. Ing. Jiří Drápela, Ph.D.
Doc. Ing. Evžen Haluzík, CSc.
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. Ilona Lázničková, Ph.D., Ing. Jan Macháček, Ph.D., Ing. Petr Mastný, Ph.D., Ing. Martin Paar, Ph.D.

Ph.D. Students

Ing. Almbrok Abdoalhade Almbrok, Ing. Tomáš Bartošík, Ing. Branislav Bátora, Ing. Martin Belatka, Ing. Jaromír Bok, Ing. Lukáš Geschwinder, Ing. Nail Khisamutdinov, Ing. Jan Novotný, Ing. Tomáš Pavelka, Ing. Drahomír Pernica, Ing. Jan Pithart, Ing. Zdeněk Procházka, Ing. Michal Ptáček, Ing. Lukáš Radil, Ing. Jan Souček, Ing. Jan Šlezinger, Ing. Jaroslav Špaček, Ing. David Topolánek, Ing. René Vápeník, Ing. Michal Závodný

Administrative and Technical Staff

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

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, transfer, distribution and exploitation of electric power 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, on reduction of losses and fast localization of defects in networks due to appliances, quality assurance, increasing operating efficiency of electric energy

Major Achievements

In 2009, the staff members were involved in the research plan 'Sources, accumulation and optimization of energy exploitation in the conditions of permanently sustainable growth', 2 development projects of MŠMT, 2 GAČR projects, 1 NVP II projects, 4 FRVŠ projects and 11 projects of cooperation with industry. The department played an important role in compilation of 'Analysis of the Wind-Potential of the Czech Republic' for the Ministry of Environment.

The department's major results published in reputable scientific journals and in proceedings of national and international conferences are e.g. an algorithm of cost minimization in case of interrupted electric energy supply by means of electric network reconfiguration, analysis of atmospheric overvoltage in the distribution network with inserted cable lines, long-term analysis of temperature dependence of photovoltaic cells, design of a new complex methodology of measuring voltage fluctuations, up-to-date illumination control methods for intelligent electroinstallations, analysis of light sources resistance to short-term decrease and voltage cut offs, flickermeter im-

sources, the Stirling thermodynamic cycle for efficient exploitation of low-potential heat, utilization of the hydrogen accumulation cycle in solar systems, optimization of loading, small variable output power sources for system 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 cooperated with a number of companies, e.g. ČEPS a.s., Skupina ČEZ, E.ON, Siemens, ABB, EGÚ Brno Teplárny Brno, ABB s.r.o. and other. Cooperation continued with the departments of power electrical engineering at all Czech and Slovak technical universities.

plementation in the LabView environment, and contactless indicators of ground connection In 2009, the department continued to cooperate with the Institute of Plasma Physics of the Czech Academy of Sciences in the Joint Plasma Laboratory. Cooperation with EGÚ Brno centred on connecting wind-powered stations and with Uni-controls-Tramex s.r.o. on the development of railway signal lamps. Moreover, the department dealt with the project "Increasing the Efficiency and Safety of the Electrification System" in cooperation with the companies ČEPS,a.s., Siemens, s.r.o., EGÚ HV Laboratory, a.s., EG-Expert, s.r.o. and the University of West Bohemia, Plzeň. Conducted within the framework of the project was an experiment with a series of failures in the real high-voltage network.

The members of the department worked out an expert opinion of the issue of unauthorized electric energy consumption for the Police of the Czech Republic. Head of the department Petr Toman was elected chairman of the Czech CI-RED Committee for the period 2009-2011.

Major Research Projects

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

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

Selected Publications

GREGOR, J.; JAKUBOVÁ, I.; ŠENK, J. Radiation of electric arc burning in argon. European Physical Journal D, 2009, vol. 54, no. 2, pp. 329-334. ISSN: 1434- 6060.

GREGOR, J.; JAKUBOVÁ, I.; ŠENK, J.; MAŠLÁNI, A. Analysis of radial energy loss in an arc heater channel. High Temperature Material Processes: An International Journal, 2009, vol. 13, no. 2, pp. 153-162. ISSN: 1093- 3611.

GREGOR, J.; JAKUBOVÁ, I.; MENDL, T.; ŠENK, J.; KAVKA, T. The character of flow in the free jet close to an arc heater output. High Temperature Material Processes: An International Journal, 2009, vol. 13, no. 2, pp. 135-142. ISSN: 1093- 3611.

PÁTKOVÁ, Z.; MASTNÝ, P. Microclimate of low-energy buildings in relation to applied heating systems. International Journal of Energy and Environment, 2009, vol. 3, no. 2, pp. 85-93.

Bachelor Degree Programme

Electrical Power Distribution (Petr Toman)

Environmental Science in Electroenergetic (Antonín Matoušek)

Economy and Control (Petr Toman)

Protection of Electrical Power Equipment (Petr Toman)

Computer Modelling and Simulations (Petr Baxant)

Design of Power and Data Networks (Petr Toman)

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)

Economy of Electrical Power Engineering (Petr Toman)

Power Plants and Heating Power Stations (Antonín Matoušek)

Substations and Lines (Jaroslava Orságová)

Electrical Heat Technology (Ilona Lázníková)

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)

Municipal and Industrial Power Networks (Jaroslava Orságová)

Unconventin Conversions (Antonín Matoušek)

Lighting Systems (Petr Baxant)
Power Systems (Jaroslava Orságová)
Design of Power and Data Networks (Petr Toman)
Transient Phenomena (Vladimír Blažek)

Power Transmission Networks (Vladimír Blažek)
Power Systems Control (Petr Toman)
Lighting Technology (Petr Baxant)
Some Chosen Issues of Power Engineering (Vladimír Blažek)

Doctoral Degree Programme

Mathematical Modelling of Electrical Power Systems (Evžen Haluzík)

Selected Problems of Electricity Production (Antonín Matoušek)

Laboratories

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)

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

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

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

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)

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

Department of Electrotechnology

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Doc. Ing. Josef Jiráček, CSc.
Doc. Ing. Jiří Maxa, Ph.D.
Doc. Ing. Vítězslav Novák, Ph.D.
Doc. Ing. Marie Sedlářková, CSc.
Doc. Ing. Jiří Vaněk, Ph.D.

Lecturers

Ing. Martin Frk, Ph.D., Ing. Svatopluk Havlíček, CSc., Ing. Petr Křivík, Ph.D., Ing. Helena Polsterová, CSc., Ing. Zdenka Rozsivalová, Ing. Jiří Starý, Ph.D., Ing. Jiří Špínka

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 Jiráček, 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

Administrative and Technical Staff

Jarmila Bartošková, František Chudáček, Ing. Petr Kahle, František Kořínek, Věra Špičáková, Ing. Miroslav Zatloukal

Main Interests

In 2009 the department provided tuition in the subject Materials and Technical Documentation for all students, full-time and part-time, in the first year of the Bachelor programme EECR as well as instruction in subjects focused on electrotechnical materials, manufacturing processes and their control, 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.

New subjects for the summer semester of the second year of EVM in the Master part-time study were prepared. A new subject 'Renewable Sources of Electric Energy', was offered in the winter semester as an optional subject for first-year EVM Master students. Ten subjects in the specialization EVM in category free subjects were offered to students of other faculties at BUT.

Research was centred on basic and applied research of electrochemical sources of electric energy – lead-acid batteries, alkaline batteries and fuel cells (development of polymer membranes), renewable sources of electric energy, detection of signal electrons and methods of environmental scanning electron microscopy, 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.

The department has maintained cooperation 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, Institute

of Instrument Technology, Institute of Anorganic Chemistry, Institute of Physical Chemistry and Institute of Macromolecular Chemistry of the Czech Academy of Sciences, with the companies Biochemie Bohumín, EPRONA a.s. Rokytnice n. Jizerou, ROTOKOV Křidlůvky u Znojma, EL-MARCO Liberec, Solartec Rožnov pod Radhoštěm, ERD Praha, ENER-SERVIS Brno, ČeMe-Bo Blansko, Honeywell Brno, ALPS Electric. Within the framework of the programme KON-TAKT the department cooperates with the institute INIFTA Universidad Nacional de La Plata, Argentine and Università degli Studi di Palermo, Italy.

In November 2009 Thomas Jorge from Universidad Nacional de La Plata, Argentina, came to the department for a placement based on governmental agreement

In 2010 research will be focused on the research plan scheduled for the period 2005-2009, now prolonged for the period 2010-2011, and on GAČR, GAAV and FRVŠ projects, European research programmes and centres. The department will continue the innovation and upgrading of the study area 'Microelectronics 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.

For 2010 the department is planning the 11th international conference '11th International Conference Advanced Batteries, Accumulators and Fuel Cells (A.B.A.F.- 11) to be held from 19 to 22 September 2010 in Brno.

The department will also co-organize the 31 conference 'Non-Conventional Electric Energy Sources', Černá Hora, 8-10 September 2010.

Major Achievements

The department organized the 10th international conference Advanced Batteries, Accumulators and Fuel Cells – under the auspices of ECS (A.B.A.F.-10), (30 August -2 September 2009, Marie Sedlářiková, Jiří Vondrák).

UETE also co-organized the 30th international conference 'Non-Conventional Sources of elect-

rical energy' in Býkovice near Černá Hora, 9-11 September 2009 with the Czech Electrotechnical Society, group for chemical sources of electric energy Petr Bača, Petr Křivík).

The representative of the department attended the 36th meeting of departments and institutes of electrotechnology at Czech and Slovak universi-

ties at the conference 'Electrotechnology 2009', organized by the Department of Electrotechnology of the Faculty of Electrical Engineering, Czech Technical University in Prague, 7-9 September 2009 in Temešvár (Jiří Kazelle).

Prof. Doron Aurbach, Bar-Ilan University of Tel Aviv, Chemistry Department stayed at UETE from 31 August to 3 September 2009 and read lectures 'The global energy challenge of our time: the use of sustainable energy and electrical propulsion', 'From fundamental studies to practical rechargeable battery systems: the case of rechargeable magnesium batteries', 'Progress in materials, surface and electrochemical science related to rechargeable Li batteries', 'The use of fine electro-analytical tools in the study of electrochemical intercalation processes', 'On the electrochemistry of activated carbon electrodes for Super (EDL) capacitors and water desalination processes'.

In 2009 the department was involved in the research plan 'Resources, Accumulation and Optimization of Electric Energy Exploitation in Conditions of Permanently Sustainable Growth' in the international project ALABC C2.2 'Significance of Carbon Additive in Negative Lead-Acid Battery Electrodes', and the GAČR project 'Relationship of Local Light Emissions with Stochastic Effects on PN Junctions of Solar Cells at Very Low Temperatures', the GAAV project 'Characteristics of New Polymer Electrolytes and Contacting Methods for Carbon Electrode Mass' and four FRVŠ projects 'An Integrated Computer Labora-

tory 'Innovation and Upgrading of Laboratory Tasks for the subject Climatotechnology', 'A Measuring Workplace for Testing Photovoltaic Systems' and 'Cryo-testing Workplace for Electroluminescence of Photovoltaic Cells and Its Application in Instruction'.

The department prepared a standard project 'New Materials and Technologies for Electric Energy Sources' and submitted it via the Internal Grant Agency of BUT. In cooperation with the Department of Microelectronics the department was involved in 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'.

Some staff members were involved in preparing materials for a part of the research programme 'Advanced Materials' of the Central European Technological Institute (CEITEC).

Major Research Projects

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

Application of Modern Assembly Technologies and Materials in Electrical Engineering – MPO FR TI1/072

Co-investigator: Jiří Starý

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

Characteristics of New Polymer Electrolytes and Contacting Methods for Carbon Electrode Mass – GAAV KJB208130902

Investigator: Michal Macalík

Selected Publications

MAKOVIČKA, J.; SEDLAŘÍKOVÁ, M.; ARENILLAS, A.; VONDRÁK, J.; VELICKÁ, J. Expanded graphite as an intercalation anode materials for lithium systems. *Journal of Solid State Electrochemistry*, 2009, vol. 13, no. 9, pp. 1467-1471. 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, vol. 54, no. 7, pp. 2010-2117. ISSN: 0013- 4686.

VONDRÁK, J. Durability of carbon-supported manganese oxide nanoparticles for the oxygen reduction reaction (ORR) in alkaline medium. *JOURNAL OF APPLIED ELECTROCHEMISTRY*, 2009, vol. 38, no. 9, pp. 1195-1201. ISSN: 0021- 891X.

KŘIVÍK, P.; BAČA, P.; CALÁBEK, M.; MICKA, K.; LÁBUS, R.; BILKO, R. Studies of doped negative valve-regulated lead- acid battery electrodes. *Journal of Power Sources*, 2009, vol. 191, no. 2009, pp. 154-158. ISSN: 0378- 7753.

VANÝSEK, P., NOVÁK, V. Liquid/liquid Electrochemistry in Electroanalysis: Fundamentals Revisited. *ECS Transactions*, 2009, vol. 2009 (19), no. 6, pp. 55-63. ISSN: 1938- 5862.

DOLENSKÝ, J.; VESELÝ, A.; VANĚK, J.; HROZEK, J. Diagnostic methods of solar cells in dependence on temperature. *Proceedings of SPIE*, 2009, vol. 2009, no. 7412, p. 0U (17-8 pp.)ISSN: 0277- 786X.

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)

Počítačová podpora technických a manažerských prací (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)

Design of Production Systems and Logistic / (Jiří Špinka)

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 Jiráček)

Laboratories

Chemical Laboratory (preparation of specimens and electrode mass, thin-film deposition by means of chemical methods for electrochromic glasses, fuel cells and supercapacitors, preparation of polymer gel electrolytes, Marie Sedlářková)

Air-Conditioned Laboratory of Dielectric Materials with Highly Stabilized Environment (research in dielectric properties of electroinsulating materials, measurement at stabilized temperature and relative air moisture, Svatopluk Havlíček)

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

CAD Laboratories (2) (instruction in Materials and Technical Documentation, in subjects focused on parameter design and large CAD systems and systems for scheme design, Petr Bača)

Laboratory of Dielectric Materials (research, instruction, Bachelor and diploma projects on monitoring dielectric properties of electroinsulating materials, Svatopluk Havlíček)

Electron Microscopy Laboratory (instruction in Diagnostics and Testing in Electrical Engineering, research of detection of signals in environmental scanning electron microscopy of accumulator mass and surfaces of electrotechnical materials, namely insulators, Josef Jiráček)

Laboratory of Electrochemical Measurements (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 and electrochromic elements, Marie Sedlářková)

Laboratory of Electrotechnical Materials I (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 modelling of the parameters of semiconductor and dielectric materials in Electrotechnical materials and Electrotechnical Materials and Manufacturing, Material Structure and Properties, Climatotechnology, Zdenka Rozsivalová)

Laboratory of Electrotechnical Materials III (laboratory for work on Bachelor and diploma theses, and for doctoral students, Martin Frk)

Laboratory of Chemical Sources of Electric Energy (research of lead-acid accumulators, Petr Bača, Petr Křivík)

Laboratory of System Design and Surface Mount Technology (instruction in Printed Circuits and Surface Mounting, Jiří Starý)

Laboratory of Non-Destructive Diagnostics (instruction in diagnostic methods in electrical engineering, semester projects, Bachelor and Master theses on measurement of very small currents and diagnostics of electroinsulating fluids, Martin Frk, Zdenka Rozsivalová)

Laboratory of Renewable Sources (Laboratory instruction in subjects 'Renewable Energy Sources' and 'Alternative Energy Sources', Petr Křivík)

Laboratory of System Design and Surface Mount Technology (instruction in Printed Circuits and Surface Mounting, Jiří Starý)

Laboratory of Fuel Cells (study and development of low-temperature fuel cells, alkaline and cells with the ion-exchange membrane, study of electrochromic layers using liquid and polymer gel electrolytes Marie Sedlářková)

Laboratory for Research of Photovoltaic Cell-Accumulator Battery Systems (laboratory instruction in Alternative Energy Sources, Jiří Vaněk)

Computer Laboratory (instruction in subjects focused on reliability in electrical engineering, computer-aided design of manufacturing processes and logistics, computer-aided design of printed circuit boards, Petr Bača)

Department of Physics

Doc. Ing. Lubomír Grmela, CSc.

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Prof. RNDr. Pavel Tománek, CSc.

Associate Professors

Doc. RNDr. Milada Bartlová, Ph.D.
Doc. Ing. Lubomír Grmela, CSc.
Doc. RNDr. Pavel Hruška, CSc.
Doc. RNDr. Milena Kheilová, CSc.
Doc. Ing. Pavel Koptavý, CSc., Ph.D.
Doc. Ing. Karel Liedermann, CSc.
Doc. Mgr. Jan Pavelka, CSc., Ph.D.

Lecturers

Ing. Jitka Brüstlová, CSc., RNDr. Pavel Dobis, CSc., Ing. Vladimír Holman, Ph.D., RNDr. Eva Hradilová,
Ing. Vlasta Sedláková, Ph.D., RNDr. Naděžda Uhdeová, Ph.D.

Ph.D. Students

Hamed Mohamed Abubaker MSc., Ing. Inas Faisal 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. Petr Paračka, Miroslav Sadovský, Ing. Petr Sadovský, Ph.D., Ing. Petr Sedlák, Ph.D. Ing. Ondřej Šik, Ing. Pavel Škarvada, Ing. Pavel Tofel, Ing. Tomáš Trčka, Ing. Alena Václavíková, Ing. Vít Vrba

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 within the framework of FRVŠ projects nos. 1525/2009 a 2743/2009.

Research is centred on basic and applied research of the physical parameters of semiconductor and dielectric materials. The main areas of interest are noise spectroscopy, measurement of

nonlinearities and design of the quality and reliability indicators for non-destructive assessment of each technological stage in mass production. Very good results have been 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, Germany in research of dielectrics, and cooperated with leading Czech laboratories in the development and enhancement of the parameters of CdTe radiation detectors.

Research laboratories were equipped with a number of modern devices. A workplace for experimental study of semiconductor and dielectric samples at low temperatures (up to 10 K) was set up.

Major Achievements

A majority of the department's research staff were involved in the research plan MSM 0021630503 – MIKROSYN, with co-investigator L. Grmela. In 2009, there were 75 publications, most of them in international journal and at proceedings of major world conferences.

The department was involved in 6 GAČR projects, 2 FRVŠ projects, 2 international projects KONTAKT with universities in the USA, 1 MPO project and 1 INGO project. The GAČR projects are focused on nonlinear defectoscopy of solids, electro-ultrasonic spectroscopy of composites and alloys on the basis of magnesium, cold emission cathodes, irreversible processes in dielectrics, and processes with impact on energy transport in arc charge with liquid stabilization. The 2 FRVŠ projects dealt with upgrading of laboratories for Bachelor and Master study.

The MPO project in the programme TIP drala with applications of laser technology in the production process of quartz crystalsolar cells. The chief investigator is the company Solartec s.r.o., co-investigator for BUT is Pavel Koktavý.

Owing to the international project INGO Prof. P. Tománek became one of the six members of the Executive Board of European Optical Association and the chairman of its Research Advisory Committee.

Professor Tománek was granted the honourable title EOS Fellow for his work in the area of optical nanometrology and his contribution to EOS development.

On the basis of achieved results an increasing number of department's members are becoming reviewers for impact and other reputable world journals.

Published for instruction in laboratories were lecture notes Laboratory Tasks in Physics, authors Uhdeová et.al.

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

Major Research Projects

Diagnostics of Schottky and Cold Emission Cathodes By Means of Electric Noise – GAČR 102/07/0113

Investigator: Lubomír Grmela

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

Investigator: Pavel Tománek

Non-Linear Ultrasonic Spectroscopy of Composites and Alloys on the Basis of Magnesium–GAČR 106/07/1393

Investigator: Josef Šikula

Low Frequency Noise in Submicron MOSFET and HEMT structures – GAČR 102/08/0260

Investigator: Jan Pavelka

Stochastic Effects in Semiconductor Structures MIS and MIM – GAČR 102/09/1920

Investigator: Josef Šikula

Diagnostics of Defects in Materials Using Latest Defectoscopic Methods – GAČR GD102/09/H074

Investigator: Karel Liedermann

Laser Technology Application in the Production Process of Quartz Crystal Solar Cells – MPO FR-T11/305

Investigator: Pavel Koktavý

Selected Publications

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, 2009, vol. 14, no. 1, pp. 55-69. ISSN: 1093-3611.

SEDLÁK, P.; HIROSE, Y.; KHAN, S.; ENOKI, M.; ŠIKULA, J. New automatic localization technique of acoustic emission signals in thin metal plates. ULTRASONICS, 2009, vol. 49, no. 2, pp. 254-262. ISSN: 0041- 624X.

AUBRECHT, V.; BARTLOVÁ, M. Net Emission Coefficients of Radiation in Air and SF6 Thermal Plasmas. Plasma Chemistry and Plasma Processing, 2009, vol. 29, no. 2, pp. 131-147. ISSN: 0272-4324.

Bachelor Degree Programme

Physics 1 (Pavel Dobis)

Physics for informatics (Lubomír Grmela)

Physics 2 (Milada Bartlová)

Seminar of Physics (Eva Hradilová)

Master Degree Programme

Solid State Physics (Lubomír Grmela)

Non-destructive Diagnostics and Physics of

Modern Physics (Milena Kheilová)

Dielectrics (Karel Liedermann)

Nanotechnology (Pavel Tománek)

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 Šíkula)

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

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 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, electroinsulation 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)

Department of Languages

PhDr. Milena Krhutová, Ph.D.

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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. Gabriela Kolčavová, 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. Jaroslav Trávníček, Mgr. Agata Walek

Administrative and Technical Staff

Miroslava Purová, Hana Vondráčková

Main Interests

The department developed the concept of language tuition corresponding to the European Reference Framework. Another two courses were introduced, specializing in communication skills and cultural aspects of the North American continent. The department prepared for accreditation a new Bachelor degree programme English in Electrical Engineering and Information Technology and took part in work on language subjects for the new Master programme introduced at the Faculty of Management. The department of Languages obtained an Operational programme Education for Competitiveness 'Specific Linguistic and Methodological Qualifications of English Language Teachers and Postgraduates at FEKT and FIT' targeted at innovation of teaching professional English in courses for Ph.D. students, and further professional training of language teachers at the Department of Languages, FEEC

Major Achievements

KRHUTOVÁ, M. Parameters of Professional Discourse. Odborná monografie. ISBN: 978-80-7399-83.

KRHUTOVÁ, M. Vliv angličtiny na české odborné texty v elektrotechnickém inženýrství. ISBN: 978-80-7422-00.

KRHUTOVÁ, M. Coherence and Cohesion in Written Texts for Professional and Academic Purposes. ISBN: 978-1-4438-130.

KRHUTOVÁ, M.; NEUWIRTHOVÁ, L. The Exploitation of Professional Engineering Knowledge in Teaching English for Electrical Engineering. The 13th World Multi-Conference on Systemics, Cybernetics and Informatics. Orlando, Florida, US: International Institute of Informatics and Systemics, 2009, pp. 121-126. ISBN: 978-1-034272-58-9.

BAUMGARTNER, L. Problematik bei der Ausbildung der zweiten Fremdsprache im Rahmen der Bildungsstandards fuer Fremdsprachen. Forlang 2009. ISBN: 978-80-553-0325-3.

BAUMGARTNEROVÁ, A. Využití informačních technologií ve výuce cizích jazyků na vysoké škole. Forlang 2009. ISBN: 978-80-553-0325-3.

BORECKÁ, M. La Globalización y su Impacto en la Enseñanza Universitaria del Español como Lengua Extranjera a los Estudiantes de Inge-

BUT. FEKT VUT. Training materials for both target groups were elaborated. Also prepared was a novel methodology of professional language teaching based on the linguistic research of this professional variety, and English language didactics. Research of English as a language of electrical engineering continued with study of this professional variety. Three monographs were published. One of them – on the parameters of English of profession – is the habilitation work-submitted for the habilitation procedure at the Faculty of Arts, Masaryk University in Brno.

Research results were presented at conferences in USA, Argentina, Turkey, Bulgaria and Slovakia. Cooperation continued with Masaryk University in Brno, Faculty of Arts in the GAČR project 'Languages in Integration, Integration in Languages'.

niería Técnica. 23 international conference on updating the educational process. Mendoza, Argentina, 8 -15 October 2009.

FROEHLING, K. The Concept of Dual Citizenship in Canada. Managing Diversity and Social Cohesion: The Canadian Experience – the 5th International Conference of Central European Canadianists. Sofie, Bulharsko, 16-18 October 2009.

FROEHLING, K. Myth of Canada, the Peacekeeping Nation. 12th Symposium of English Studies. Ege University, Izmir, Turkey, 29 April – 2 May 2009.

NEUWIRTHOVÁ, L. Standard cizojazyčného vzdělávání na vysoké škole technického zaměření. Odborná monografie. Brno: Akademické nakladatelství CERM®, 2009. ISBN: 978-80-7204-612-6.

SEDLÁČEK, P. Transition of Canadian Cities. Managing Diversity and Social Cohesion: The Canadian Experience – the 5th International Conference of Central European Canadianists. Sofie, Bulgaria, 16.-18.10.2009.

SMUTNÝ, M. English Compounds and Czech Equivalents. Odborná monografie. Brno: Akademické nakladatelství CERM®, 2009. ISBN: 978-80-7204-611-9.

Selected Publications

SMUTNÝ, M. English Compounds and Czech Equivalents. Brno: Akademické nakladatelství CERM, Brno, 2009. 192 s. ISBN: 978-80-7204-611- 9.

KRHUTOVÁ, M. Parameters of Professional Discourse. librix. Brno: Tribun EU, s.r.o., 2009. 198 s. ISBN: 978-80-7399-839- 4.

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)
Present Philosophy – Postmodernism (Milan Klapetek)
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 Upper-Intermediate Students (M. A. Kenneth Froehling)
English for Intermediate Students (Přemysl Dohnal)
History and Philosophy of Technology (Milan Klapetek)
Present Philosophy – Postmodernism (Milan Klapetek)
English for Intermediate Students (Přemysl Dohnal)
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

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

Associate Professors

Doc. RNDr. Jaromír Baštinec, CSc.
Doc. RNDr. Jaroslav Bayer, 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

Ph.D. Students

Ing. Olga Archalousová, Mgr. Vladislav Biba, Kirill Gamburger, Ing. Jaroslav Klimek, Mgr. Blanka Morávková, Mgr. Alena Ryvolová, Ing. Petr Skorkovský

Administrative and Technical Staff

Eva Šimečková

Main Interests

The Department of Mathematics is responsible for tuition in mathematical 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 topology reconstructions of generalized time-space from purely causal relations and analysis of theoretical set and topological characteristics of a causal structure, validity of separating axioms and of the cover characteristics of these structures. Research was also concerned with the study of the algebraic structure of dynamic systems, mainly construction of

discrete dynamic systems created by solution spaces of n -th order linear differential equations and ministructures formed by invariant subgroups in groups of linear differential operators. Generally, these are systems of preferential relations and decision processes (fuzzy structures). The department's staff also dealt with setting the conditions in which oscillations occur in discrete and continuous systems with feedback (including the so called neutral systems), and conditions for non-oscillatory solutions. The methods applied were the development and applications of available methods, and the development of a novel method of localization of solutions, based on the retract principle. In stability study, conditions of the origin of exponential stability of neutral linear continuous differential systems and discrete hybrid systems with feedback were determined. The methods were focused on constructions of specific functionals of the Ljapunov-Krasovski type.

Major Achievements

The department was involved in solution of 3 GAČR projects and 3 FRVŠ projects. The staff participated in the research plans MSM0021630503 'New Trends in Microelectronic Systems' (MIKROSYN) and MSM0012630529 'Intelligent Systems in Automation'.

Within the framework of the above projects the department has maintained cooperation with notable world experts (Prof. D. Khusainov, Kiev, Prof. Zacher, Turkey, Prof. L. Berezansky, Israel).

The main areas of interest were conditions for the origin of oscillations in solutions of differential equations with feedback and solution of difference equations resulting from their discretization of examined systems. Great attention was paid to the study of stability of differential and discrete-systems, mainly systems with quadratic nonlinearities appearing in description of numerous phenomena, including description of circuits containing nonlinear elements. In the focus of attention

were also singular initial problems with nonlinear perturbations and construction of solution algorithms by means of the Adomian method.

Another up-to-date method of research on solution characteristics were procedures for representing solutions of linear systems with feedback (discrete and continuous) by means of the so called delayed matrix exponential. This process may result in new possibilities of application of results in control and stabilization theory. Some results were accepted for publication in impact journals 'Boundary Value Problems', 'Nonlinear Analysis Series A': 'Theory, Methods & Applications' and 'Advances in Difference Equations'.

The department's staff organized the international conferences XXVI International Colloquium on Education Process, 16 May 2009, Brno and EQUADIFF 12, 20-24 July 2009, Brno.

Major Research Projects

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

Investigator: Josef Diblík

Software for Europe – GAČR INE/07/E008

Investigator: Helena Durnová

Oscillatoris and Asymptotic Characteristics of Differential Equations - GAČR 201/08/0469

Investigator: Josef Diblík

Selected Publications

DIBLÍK, J.; HLAVIČKOVÁ, I. Combination of Liapunov and retract methods in the investigation of the asymptotic behavior of solutions of systems of discrete equations. *Dynamic systems and applications*, 2009, vol. 18, no. 3- 4, pp. 507-538. ISSN: 1056- 2176.

DURNOVÁ, H. Appropriating America, Making Europe. *IEEE ANNALS OF THE HISTORY OF COMPUTING*, 2009, vol. 2009 (31), no. 2, pp. 77-79. ISSN: 1058- 6180.

DIBLÍK, J.; BAŠTINEC, J.; ŠMARDA, Z. Multipoint singular boundary- value problem for systems of nonlinear differential equations. *Boundary Value Problems*, 2009, vol. 2009, no. 1, pp. 1-20. ISSN: 1687- 2762.

HLINĚNÁ, D.; KRÁL, P.; KALINA, M. Choquet integral with respect to Lukasiewicz filters, and its modifications. *INFORMATION SCIENCES*, 2009, vol. 2009, no. 179, pp. 2912-2922. ISSN: 0020- 0255.

DIBLÍK, J.; KHUSAINOV, D.; ŠMARDA, Z. Construction of the general solution of planar linear discrete systems with constant coefficients and weak delay. *Advances in Difference Equations*, 2009, vol. 2009, no. 3, pp. 1-18. ISSN: 1687- 1839.

DIBLÍK, J.; RŮŽIČKOVÁ, M.; ŠMARDA, Z. Wazewskis method for systems of dynamic equations on time scales. *Nonlinear Analysis, Theory, Methods and Applications*, 2009, vol. 2009, no. 71, p. e1124 (e1131 s.)ISSN: 0362- 546X.

DIBLÍK, J.; ŠMARDA, Z.; SVOBODA, Z. Retract principle for neutral functional differential equations. *Nonlinear Analysis, Theory, Methods and Applications*, 2009, vol. 2009, no. 71p. e1393 (e1400 p.) ISSN: 0362- 546X.

BAŠTINEC, J.; DIBLÍK, J. Oscillation of solutions of a linear second order discrete delayed equation. *Journal of Applied Mathematics*, 2009, vol. II:(2009), no. II., pp. 13-18. ISSN: 1337- 6365.

NOVÁK, M. Commutative hyperstructures constructed on a set of transformation operators I. *Journal of Applied Mathematics*, 2009, vol. II (2009), no. 1, p. 45 (p.)ISSN: 1337- 6365.

HLINĚNÁ, D.; BIBA, V. Generated fuzzy implicators and their properties II. *Journal of Applied Mathematics*, 2009, vol. 2, no. 1, pp. 77-88. ISSN: 1337- 6365.

ŠMARDA, Z.; FAJMON, B. Application of integral inequalities in the theory of integral and integrodifferential equations II. *Journal of Applied Mathematics*, 2009, vol. II., no. 2, pp. 43-48. ISSN: 1337- 6365.

ŠMARDA, Z.; FILIPPOVA, O. Singular initial problem for Fredholm-Volterra integrodifferential equations II. *Journal of Applied Mathematics*, 2009, vol. II., no. 2,pp. 69-75. ISSN: 1337- 6365.

CHVALINA, J.; SVOBODA, Z. Sandwich semigroups of solutions of certain functional equations and hyperstructures determined by sandwiches of functions. *Journal of Applied Mathematics*, 2009, vol. II(2009), no. 1, pp. 35-43. ISSN: 1337- 6365.

CHVALINA, J.; CHVALINOVÁ, L. Action of join spaces of continuous function on the underlying hypergroups of 2- dimensional linear spaces of functions. *Journal of Applied Mathematics*, 2009, vol. II(2009), no. 1, pp. 23-33. ISSN: 1337- 6365.

ŠMARDA, Z. Generalization of Certain Integral Inequalities II. *Journal of Applied Mathematics*, 2009, vol. II., no. 2, pp. 143-148. ISSN: 1337- 6365.

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)

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 Modelling (data simulation and processing using software StatSoft and MapleSim, Michal Novák)

Department of Microelectronics

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Prof. Ing. Jaromír Brzobohatý, CSc.
Prof. Ing. Vladislav Musil, CSc.
Prof. Ing. Radimír Vrba, CSc.

Associate Professors

Doc. Ing. Arnošt Bajer, CSc.
Doc. Ing. Jaroslav Boušek, CSc.
Doc. Ing. Jaromír Hubálek, Ph.D.
Doc. Ing. Pavel Legát, CSc.
Doc. Ing. Ivan Szendiuch, CSc.
Doc. Ing. František Urban, CSc.
Doc. Ing. Jiří Háze, Ph.D.
Doc. Ing. Lukáš Fucík, Ph.D.

Lecturers

Ing. Martin Adámek, Ph.D., Ing. Daniel Bečvář, Ph.D., Ing. Edita Hejátková, RNDr. Michal Horák, CSc., Ing. Jaroslav Kadlec, Ph.D., Ing. et Ing. Fabián Khatib, Ph.D., Ing. Radek Kuchta, 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.

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Main Interests

The department provides instruction in basic subjects, mainly on electronic components and circuits, and subjects specialized in the 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 and sensors. The main areas of interest were the 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, and with the companies CEDO Brno, Autoflug Hamburg, Catalonia 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 cooperation with King Mongkut's University of Technology North Bangkok, Yeditepe University Istanbul, University Delhi and Suan Sunandha Rajabhat University oscillators were synthesized using newly developed active elements of the

type CDTA, ZC-CDTA and ZC-CG-CDBA. The department has been extending cooperation with Prof. Massimiliano Di Ventra from the Department of Physics, University of California, San Diego. Prof. Di Ventra is recognized as the successor of Prof. Chua in applications of mem-systems into the world of artificial intelligence and nanotechnology.

In close cooperation with Pbt Rožnov p.R. a new methodology for cleaning in electronics has been devised in connection to 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.

The group led by J.Boušek worked out a methodology for evaluation of hydrogen sensors. In cooperation with Joint Research Center, Institute for Energy, Petten, Holland the hydrogen sensors now available on the market were tested. The results were published in the impact journal International Journal of Hydrogen Energy. The group continued research of sputtered passivation and antireflection films, and cooperated with Institute of Instrument Technology, Academy of Sciences, Brno and the company Solartec, s.r.o. Rožnov pod Radhoštěm. Results were presented at the 24th European Photovoltaic Solar Energy Conference, September 21 - 25 2009, Hamburg.

Major Achievements

In 2009, the members of the department were involved in 2 projects of the 6th and 7th FP EU, 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 3 NPV II projects of the Ministry of Education.

In September 2009, the department organized the international conference 'Electronic Devices and Systems EDS2009' with participation of Czech and international experts. There were 96 papers on microelectronics and technology.

The group involved in microelectronic technology, headed by Ivan Szendiuch, achieved significant results in the research on the characteristics and applications of lead-free solders in connection with support of environmental management fo-

cused on ecological design of electronic products and the process of cleaning, modelling of thermal stress in soldered joints and cases, including bonding and modelling connections for semiconductor chips.

Work on the unique thermal balance sensor continued (MPO). Novel preparations and facilities, e.g. for deposition of thick films and the LTCC technology were developed. These activities were awarded by having the opportunity to organize the reputable international conference ISSE 2009 in Brno in May 2009 with nearly 200 participants from 14 countries and 28 renowned universities.

The group of electrochemical sensors, led by Jaromír Hubálek, tested two new unique systems for electrochemical analysis (Voltamet-

ry/ampereometry and EIS), an automated device for deposition of nanostructures, which was registered for utility sample, and an application for patenting the methods was submitted. Developed and verified were methods of modification of surfaces of magnetic nanoparticles and quantum dots by biomolecules. Research results were published in 9 impact journals from ISI WOS.

Prof. D. Bielek 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. In 2009 were received A number of response were received, 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.

By combination of the above principles the ZC-CITA (Z Copy-Current Inverter Transconductance Amplifier) element originated and was utilized in construction of a universal biquadratic current-mode filter with unique characteristics. Another developed application of this element is a current-mode phase element. Circuit description and results of experiments were published in the reputable journal Electronics Letter. A similar solution using the VD-DIBA element was published in the impact journal Analog Integrated Circuit and Signal Processing.

Major Research Projects

Automated Digital Fuel System Design and Simulation Process - 030798 SmartFuel ADSP (FP6)

Investigator: Jaromír Brzobohatý

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

An Intelligent Platform for Wireless Communication – MPO FI-IM4/034

Investigator: Radimír Vrba

Signal Digitization Methods for Modern Sensors– GAČR 102/08/1116

Investigator: Radimír Vrba

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

Investigator: Radimír Vrba

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

Investigator: Radimír Vrba

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

An Intelligent Platform for Wireless Communication – MPO FI-IM4/034

Investigator: Radimír Vrba

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

Investigator: Jaromír Hubálek

New Trends in Microelectronic Systems and Nanotechnologies (MIKROSYN) – ČR MSM0021630503

Investigator: Radimír Vrba

Special Methods of Modelling and Simulation of Switched Circuits – GAČR 102/08/0784

Investigator: Dalibor Biolek

Development of Technology Procedures Characterization– GAČR 102/07/P493

Investigator: Radovan Novotný

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

Investigator: Radimír Vrba

Research of the Technology for Monitoring Thermodynamic Balance by Balance Sensors and its Applications– MPO FT-TA4/115

Investigator: Ivan Szendiuch

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 Universal and Complex Authentization and Authorization for Fixed and Mobile Computer Networks – MŠMT 2C08002

Investigator: Radimír Vrba

Selected Publications

HÚSKA, D.; FABRIK, I.; BALOUN, J.; ADAM, V.; MASÁŘÍK, M.; HUBÁLEK, J.; VAŠKŮ, A.; TRNKOVÁ, L.; HORNA, A.; ZEMAN, L.; KIZEK, R. Study of Interactions between Metallothionein and Cisplatin by using Differential Pulse Voltammetry Brdicka' s reaction and Quartz Crystal Microbalance. SENSORS, 2009, vol. 2009 (9), no. 3, pp. 1355-1369. ISSN: 1424- 8220.

ZÍTKA, O.; HÚSKA, D.; ADAM, V.; HORNA, A.; HUBÁLEK, J.; BEKLOVÁ, M.; KIZEK, R. Liquid chromatography with electrochemical detection as a tool for study of oxidative stress in organisms. TOXICOLOGY LETTERS, 2009, vol. 2009 (189), no. Sp. Iss., pp. 126-126. ISSN: 0378- 4274.

DRBOHLAVOVÁ, J.; HRDÝ, R.; ADAM, V.; KIZEK, R.; SCHNEEWEISS, O.; HUBÁLEK, J. Preparation and Properties of Various Magnetic Nanoparticles. SENSORS, 2009, vol. 2009 (9), no. 4, pp. 2352-2362. ISSN: 1424- 8220.

HÚSKA, D.; HUBÁLEK, J.; ADAM, V.; VAJTR, D.; HORNA, A.; TRNKOVÁ, L.; HAVEL, L.; KIZEK, R. Automated nucleic acids isolation using paramagnetic microparticles coupled with electrochemical detection. Talanta, 2009, vol. 79, no. 2, pp. 402-411. ISSN: 0039- 9140.

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KUKAČKA, J.; HÚSKA, D.; ADAM, V.; PRŮŠA, R.; KREIDLOVÁ, M.; HUBÁLEK, J.; KIZEK, R. Rapid isolation and detection of Hepatitis B virus by using of paramagnetic microparticles modified by streptavidin. CLINICAL CHEMISTRY, 2009, vol. 2009 (55), no. 6, p. A42 (A42 p.)ISSN: 0009- 9147.

BIOLEK, Z.; BIOLEK, D.; BIOLKOVÁ, V. SPICE Model of Memristor with Nonlinear Dopant Drift. Radioengineering, 2009, vol. 2009 (18), no. 2, pp. 210-214. ISSN: 1210- 2512.

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KŘÍŽKOVÁ, S.; KRYŠTOFOVÁ, O.; TRNKOVÁ, L.; HUBÁLEK, J.; ADAM, V.; BEKLOVÁ, M.; HORNA, A.; HAVEL, L.; KIZEK, R. Silver(I) Ions Ultrasensitive Detection at Carbon Electrodes-Analysis of Waters, Tobacco Cells and Fish Tissues. SENSORS, 2009, vol. 2009 (9),no. 9, pp. 6934-6950. ISSN: 1424-8220.

HÚSKA, D.; HUBÁLEK, J.; ADAM, V.; KIZEK, R. Miniaturized electrochemical detector as a tool for detection of DNA amplified by PCR. Electrophoresis, 2009, vol. 2008 (29), no. 24, pp. 4964-4971. ISSN: 0173- 0835.

BIOLEK, D.; BIOLKOVÁ, V. Allpass filter employing one grounded capacitor and one active element. Electronics Letters, 2009, vol. 45, no. 16, pp. 807-808. ISSN: 0013- 5194.

HÚSKA, D.; ADAM, V.; HUBÁLEK, J.; TRNKOVÁ, L.; KIZEK, R. Adsorptive transfer stripping techniques coupled with voltammetry as a tool for detection of sulphur- containing aminoacids in nanolitres. AMINO ACIDS, 2009, vol. 2009 (37), no. 1, pp. 35-35. ISSN: 0939- 4451.

BIOLEK, D.; BIOLKOVÁ, V.; KOLKA, Z. Single-CDTA (Current Differencing Transconductance Amplifier) Current- Mode Biquad Revisited. WSEAS Transactions on Electronics, 2009, vol. 5, no. 6, pp. 250-256. ISSN: 1109- 9445.

ŠVÉDA, M.; VRBA, R. Meta- Design with Safe and Secure Embedded System Networking. International Journal on Advances in Security, 2009, vol. 2, 2009, no. 1, pp. 8-15. ISSN: 1942- 2636.

HUBÁLEK, J.; PRÁŠEK, J.; HÚSKA, D.; ADÁMEK, M.; JAŠEK, O.; ADAM, V.; TRNKOVÁ, L.; HORNA, A.; KIZEK, R. Modification of working electrode surface with carbon nanotubes as an electrochemical sensor for estimation of melting points of DNA. Eurosensors XXIII: Sensors, Actuators and Micro/ Nanosystems, 2009, vol. 2009, no. 1, pp. 1011-1014. ISSN: 1876- 6196.

SZENDIUCH, I.; HEJÁTKOVÁ, E.; BURŠÍK, M.; ŘEZNÍČEK, M. Innovation in Microelectronics Technology Education. In 32 nd International Spring Seminar on Electronics Technology. 1. Brno: Printed in Novpress, 2009. pp. 344-347. ISBN: 978-80-214-3874- 3.

HUBÁLEK, J.; HRDÝ, R.; VOROZHTSOVA, M. A new tool for the post- process modification of chips by nanostructures for chemical sensing. Eurosensors XXIII: Sensors, Actuators and Micro/ Nanosystems, 2009, vol. 2009, no. 1, pp. 36-39. ISSN: 1876- 6196.

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 od AD do 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

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

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

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

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

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

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

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

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Doc. Ing. Zdeněk Nováček, CSc.
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Ing. Viera Biolková, Ing. Jiří Dřínovský, Ph.D., Ing. Zbyněk Fedra, Ph.D., Ing. Tomáš Frýza, Ph.D., Ing. Ivana Jakubová, 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. Jiří Šebesta, Ph.D., Ing. Petr Vágner, Ph.D., Ing. Tomáš Urbanec

Ph.D. Students

Ing. Filip Adamec, Ing. Ondřej Baran, Ing. Jan Beneš, Ing. Jiří Blumenstein, Ing. Marek Bobula, Ing. Jan Diblík, Ing. Lucie Dordová, Ing. Radek Dvořák, Ing. Michal Fuchs, Ing. Jiří Hermany, Ing. Zdeněk Hruboš, Ing. Ondřej Hüttl, Ing. Jana Jilková, Ing. Petr Kadlec, Ing. Zdeněk Kejík, Ing. Petr Kejík, Ing. Zdeněk Kincl, Ing. Vlastimil Koudelka, Ing. Michal Kováč, Ing. Peter Kovács, Ing. Jan Kovář, Ing. Michal Kubíček, Ing. Baláz Lábsky, Ing. Michal Pokorný, Ing. Ladislav Polák, Ing. Karel Povalač, Ing. Aleš Povalač, Ing. Jan Puskely, Ing. Jaroslav Rumánek, Ing. Václav Růžek, Ing. Zdeněk Řezníček, Ing. Josef Slezák, Ing. Michal Stryček, Ing. Jitka Svobodová, Ing. Radek Šebela, Ing. Vladimír Šeděnka, Ing. Břetislav Ševčík, Ing. Václav Šnajdr, Ing. Roman Šotner, Ing. Vladimír Šporik, Ing. Petr Šrámek, Ing. Vít Štencel, Ing. Radim Štukavec, Ing. Martin Štumpf, Ing. Petr Tošovský, Ing. Josef Urban, Ing. Václav Valenta, Ing. Rostislav Vídenka, Ing. Pavel Vyskočil, Ing. Husain Muwafak Yousif, Ing. Petr Zelinka

Administrative and Technical Staff

Ing. Martin Horák, 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 mainly from two MŠMT research plans, 1 project of the National Research Programme 2, 1 project of the Operational programme Education for Competitiveness and from the Research Centre, GAČR projects (6 standard, 6 postdoctoral and 2 doctoral grant programmes). The department participated in 3 MPO projects and 1 project for the Ministry of the Interior.

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 were supported by the companies T-Mobile and TheNet.

Major Achievements

In 2009 work started on the project Communication systems for perspective frequency ranges funded from the operational programme Education for Competitiveness. The project included lecture stays of international specialists at FEEC and short-term placements of senior lecturers of the Department of Radioelectronics at selected workplaces abroad.

The staff members continued work in two FP7 projects. The project 'High Intensity Radiated Fields – Synthetic Environment', focused on virtual EMC certification of small planes, progressed to the stage of software implementation of individual modules of synthetic environment. The project 'Advanced Communication Systems and Technologies' focused on a detailed analysis of the current research activities at the department worked out with international specialists and its targets for the future.

The department has been involved in 2 international activities of COST. Activity IC0603 'Antenna

Research results are immediately transferred into education of Bachelor, Master and Ph.D. students. Upgrading of the educational process was funded from 20 FRVŠ projects. Education is also supported by partner companies (the competition Freescale Technology Application, Freescale Race Challenge, Radioelectronics seminars, Master and Bachelor theses).

Special training courses were offered to cooperating companies. In 2009 the department organized training courses for Honeywell and e4t electronics.

The department cooperates with a number of professional and other organizations. Prof. Lubomír Brančík was chairman of the Czechoslovak 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, the department is a collective member of the international organization AMSAT.

Systems and Sensors for Information and Communication Technologies' dealt with research of semiconductor antennas with spread amplification and research of solution methods of Maxwell integral equation in the time-domain. Activity IC0803 'RF/Microwave Communication Subsystems for Emerging Wireless Technologies' was mainly focused on synthesis of advanced analog circuits, adaptation of the parameters of communication systems with multiple carriers, use of modern systems of radio identification (RFID) in the UHF for space orientation and on blocks of the synchronization subsystem for software defined radio.

Within the framework of the project AKTION the department has been extending cooperation with the Technical University in Wien.

In 2009 the department processed research and development orders for Volkswagen, Škoda-Auto, Andrew, ERA, Omikron and Intriple, and was involved in 3 MPO projects.

Major Research Projects

Analytic Research of Threats in Electro-Magnetic Integrated Systems – MPO FT-TA4/043

Investigator: Zbyněk Raida

Analysis and Modelling of Transmission Distortions in Digital TV DVB-T/H – GAČR 102/08/P295

Investigator: Tomáš Kratochvíl

Near Field of Aerial Systems – GAČR 102/07/1084

Investigator: Zdeněk Nováček

Center of Quasioptical Systems and Terahertz Spectroscopy – ČR LC06071

Investigator: Zbyněk Raida

New Generation Electronic Communication Systems and Technologies (ELKOM) –

MSM0021630513

Investigator: Zbyněk Raida

Modelling of Large Electric Structures in Time Domain by the Method of Moments – GAČR 102/08/P349

Investigator: Jaroslav Láčík

Modelling and Simulations – GAČR 102/08/H018

Investigator: Zbyněk Raida

Models of Mobile Networks and Their Parts – GAČR 102/07/1295

Investigator: Stanislav Hanus

Novel Methods of Multi-Objective Synthesis of Antennas on Special Substrates - OCO8027

Investigator: Zbyněk Raida

Advanced Optimization and Design of Microwave Aerials – GAČR 102/07/P385

Investigator: Zbyněk Lukeš

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 Structures on Non-Conventional Substrates – GAČR 102/07/0688

Investigator: Zbyněk Raida

Research of Methods of Digital Detection of Low Energy Radio Signals – GAČR 102/07/P514

Investigator: Jiří Šebesta

Advanced Communication Systems and Technologies - EU FP7 – 230126

Investigator: Zdeněk Kolka

Communication Systems for Perspective Frequency Ranges – MŠMT CZ.1.07/2.3.00/09.0092

Investigator: Zbyněk Raida

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

Investigator: Otakar Wilfert

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

Investigator: Roman Maršálek

Selected Publications

KRATOCHVÍL, T.; SLANINA, M. Digital Video Image Quality. In Kordic, V. (ed.) Digital Video. InTech. Vienna, Austria: INTECH Excelence in Education and Publishing, 2010. pp. 1-14. ISBN: 978-3-902613-44- 8.

RAIDA, Z. Time domain design of radiated structures. In Antennas: Parameters, Models, Applications. Antennas. New York: Nova Science Publishers, 2009. pp. 263-280. ISBN: 978-1-60692-463- 1.

SIGMUND, M. Information Mining from Speech Signal. In Recent Advances in Signal Processing. 1. Wien: In- Tech Publishing, 2009.pp. 1-23. ISBN: 978-953-7619-41- 1.

GREGOR, J.; JAKUBOVÁ, I.; ŠENK, J.; MAŠLÁNI, A. Analysis of radial energy loss in an arc heater channel. High Temperature Material Processes: An International Journal, 2009, vol. 13, no. 2, pp. 153-162. ISSN: 1093- 3611.

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ŠTUMPF, M.; LEONE, M. Efficient 2D-Integral Equation Approach for the Analysis of Power- Bus Structures With Arbitrary Shape. IEEE Transaction on Electromagnetic Compatibility, 2009, vol. 51, no. 1, pp. 38-45. ISSN: 0018- 9375.

PUSKELY, J.; NOVÁČEK, Z. Application of the Global Optimization Approaches To Planar Near- Field Antenna Phaseless Measurements. Radioengineering, 2009, vol. 18, no. 1, pp. 9-17. ISSN: 1210- 2512.

ŠOTNER, R.; JEŘÁBEK, J.; PETRŽELA, J.; DOSTÁL, T.; VRBA, K. Electronically tunable simple oscillator based on single-output and multiple- output transistor. IEICE Electronics Express, 2009, vol. 6 (2009), no. 20, pp. 1476-1482. ISSN: 1349- 2543.

LÁČÍK, J. Laguerre Polynomials' Scheme of Transient Analysis: Scale factor and The Number of Temporal Basis Functions. Radioengineering, 2009, vol. 18, no. 1, pp. 23-28. ISSN: 1210- 2512.

KEJÍK, P.; HANUS, S. Enhanced receivers for interference cancellation in 3G systems. Radioengineering, 2009, vol. 18, no. 4, pp. 477-484. ISSN: 1210- 2512.

RAIDA, Z.; KOUDELKA, V.; TOBOLA, P. Simple electromagnetic modeling of small airplanes: neural network approach. Radioengineering, 2009, vol. 18, no. 1, pp. 38-41. ISSN: 1210- 2512.

PROKEŠ, A. Atmospheric Effects on Availability of Free Space Optics Systems. Optical Engineering, 2009, vol. 48, no. 6, pp. 1-12. ISSN: 0091- 3286.

RAIDA, Z.; HORÁK, J. Influence of EBG structures on the far- field pattern of patch antennas. Radioengineering, 2009, vol. 18, no. 2, pp. 223-229. ISSN: 1210- 2512.

JILKOVÁ, J.; RAIDA, Z. Genetic Homogenization of Composite Materials. Radioengineering, 2009, vol. 18, no. 1, pp. 34-37. ISSN: 1210- 2512.

DŘÍNOVSKÝ, J.; KEJÍK, Z. Electromagnetic Shielding Efficiency Measurement of Composite Materials. Measurement Science Review, 2009, vol. 9, no. 4, pp. 109-112. ISSN: 1335- 8871.

FÍŠER, O.; WILFERT, O. Novel processing of Tipping-Bucket Rain Gauge Records - Examples from Czech Republic. ATMOSPHERIC RESEARCH, 2009, vol. 92, no. 1, pp. 283-288. ISSN: 0169- 8095.

RAIDA, Z.; ZVOLENSKÝ, T.; TOBOLA, P. Homogeneous dielectric equivalents of composite material shields. Radioengineering, 2009, vol. 18, no. 1, pp. 29-33. ISSN: 1210- 2512.

PROKEŠ, A. Modeling of Atmospheric Turbulence Effect on Modeling of Atmospheric Turbulence Effect on Terrestrial FSO Link. Radioengineering, 2009, vol. 18, no. 1, pp. 42-47. ISSN: 1210- 2512.

GREGOR, J.; JAKUBOVÁ, I.; MENDL, T.; ŠENK, J.; KAVKA, T. The character of flow in the free jet close to an arc heater output. High Temperature Material Processes: An International Journal, 2009, vol. 13, no. 2, pp. 135-142. ISSN: 1093- 3611.

- ŠOTNER, R.; PETRŽELA, J.; SLEZÁK, J. Current-Controlled Current-Mode Universal Biquad Employing Multi- Output Transconductors. Radioengineering, 2009, vol. 18, no. 3, pp. 285-294. ISSN: 1210- 2512.
- ŘÍČNÝ, V. Maximum Available Accuracy of FM- CW Radars. Radioengineering, 2009, vol. 18, no. 4 part II, pp. 556-560. ISSN: 1210- 2512.
- KADLEC, P.; RAIDA, Z.; KEJÍK, P. Comparison of Pilot Symbol Embedded Channel Estimation Algorithms. Radioengineering, 2009, vol. 18, no. 4, pp. 23-28. ISSN: 1210- 2512.
- PETRŽELA, J.; HRUBOŠ, Z. A note on chaos conversion in frequency domain. WSEAS Transactions on Systems, 2009, vol. 14, no. 1, pp. 19-22. ISSN: 1790- 2769.
- ŠOTNER, R.; SLEZÁK, J.; DOSTÁL, T.; PETRŽELA, J. Universal tunable current-mode biquad employing distributed feedback structure with MO- CCCII. Journal of Electrical Engineering, 2010, vol. 61, no. 1, pp. 52-56. ISSN: 1335- 3632.
- PETRŽELA, J.; HRUBOŠ, Z. Simplest chaos converters: modeling, analysis and future perspectives. WSEAS Transactions on Systems, 2009, vol. 8, no. 1, pp. 160-163. ISSN: 1790- 2769.
- BRANČÍK, L. Utilization of NILTs in Simulation of Nonlinear Systems Described by Volterra Series. Przegląd Elektrotechniczny, 2010, vol. 86, no. 1, pp. 68-70. ISSN: 0033- 2097.
- KOLKA, Z.; BIOLEK, D.; BIOLKOVÁ, V. Symbolic Analysis of Linear Circuits with Modern Active Elements. WSEAS Transactions on Electronics, 2009, vol. 5, no. 6, pp. 88-96. ISSN: 1109- 9445.
- PETRŽELA, J. Three-segment piecewise- linear vector fields with orthogonal eigenspaces. Acta Electrotechnica et Informatica, 2009, vol. 9, no. 2, pp. 44-50. ISSN: 1335- 8243.

Bachelor Degree Programme

- | | |
|---|---|
| Analog Electronic Circuits (Lubomír Brančík) | Computers and Programming 2 (Zbyněk Raida) |
| Analog Filter Design (Jiří Petržela) | CAD in Electronic Circuits (Zdeněk Kolka) |
| Electromagnetic Compatibility (Jiří Dřínovský) | CAD in Communication Subsystems (Zbyněk Raida) |
| EM Waves, Antennas and Lines (Zdeněk Nováček) | Radio and Mobile Communication (Stanislav Hanus) |
| Electronic Practice (Ivana Jakubová) | Radio Receivers and Transmitters (Aleš Prokeš) |
| Pulse and Digital Techniques (Tomáš Frýza) | Signals and Systems (Milan Sigmund) |
| Communication Systems (Aleš Prokeš) | Special Electronic Devices and Their Applications (Tomáš Urbanec) |
| Microprocessor Techniques and Embedded Systems (Tomáš Frýza) | HF and Microwave Techniques (Tomáš Urbanec) |
| Power Supply Systems (Jiří Šebesta) | HF Techniques and Antennas (Miroslav Kasal) |
| Low-frequency and Audio Electronics (Tomáš Kratochvíl) | Fundamentals of TV Technology (Stanislav Hanus) |
| Optical Communication Fundamentals and Optoelectronics (Otakar Wilfert) | |

Master Degree Programme

- | | |
|--|---|
| Advanced Radio Communication Systems (Zbyněk Raida) | Digital Television and Radio Systems (Tomáš Kratochvíl) |
| Speech Signal Analysis and Synthesis (Milan Sigmund) | Electronics in German (Milan Sigmund) |
| Antennas and Applications (Zbyněk Lukeš) | Photonics and Optical Communications (Otakar Wilfert) |
| CAD in HF and Microwave Techniques (Zbyněk Raida) | Quantum and Laser Electronics (Otakar Wilfert) |

Microcomputers for Instrumental Applications (Zbyněk Fedra)
 Microwave Integrated Techniques (Zbyněk Lukeš)
 Radio Links Design (Jaroslav Láčik)
 Computer and Communication Networks (Zdeněk Kolka)
 Computer Systems and Applications (Zdeněk Kolka)
 Programmable Logic Devices (Jaromír Kolouch)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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 sub-systems for satellite communication and navigation, telemetric and command station of experimental AMSAT satellites, Miroslav Kasal)

Department of Telecommunications

Prof. Ing. Kamil Vrba, CSc.

Head

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Professors

Prof. Ing. Zdeněk Smékal, CSc.
Prof. Ing. Kamil Vrba, CSc.

Associate Professors

Doc. RNDr. Milan Berka, CSc.
Doc. Ing. Karel Burda, CSc.
Doc. Ing. Miloslav Filka, CSc.
Doc. Ing. Ivo Lattenberg, Ph.D.
Doc. Ing. Karel Němec, CSc.

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. Lubomír Cvrk, Ph.D., Ing. Petr Číka, Ing. Radim Číž, Ing. Otto Dostál, CSc., Ing. Ivo Herman, CSc., Ing. Ladislav Káňa, Ing. Dan Komosný, Ph.D., Ing. David Kubánek, Ph.D., Mgr. Pavel Rajmic, Ph.D., Ing. Kamil Říha, Ph.D., Ing. Jiří Schimmel, Ph.D., Ing. Michal Soumar, Ing. Petr Sysel, Ph.D., Ing. Pavel Šilhavý, Ph.D., Ing. Radek Zezula, Ph.D.

Ph.D. Students

Ing. Hicham Atassi, Ing. Radek Beneš, Ing. Petr Berka, Ing. Radim Burget, 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. Pavel Hanák, Ing. Martin Heneš, Ing. Norbert Herencsár, Ing. Pavel Holešínský, 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. Ivan Koula, 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. Milan Šimek, Ing. Ondřej Šmirg, Ing. Jan Šporik, Ing. Vladimír Tejkal, Ing. Michal Trzos, Ing. Vít Vrba, Ing. Petr Vychodil, Ing. Michal Vymazal, Dina Younes

Administrative and Technical Staff

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

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

Main Interests

The 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 the 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. The students are instructed in the design of analog and digital circuits, microprocessors and signal processors, and their applications. They can specialize in media informatics, i.e. digital processing of speech, music or images. There is a follow-up Master study programme Telecommunication and Information Technology and the doctoral study programme Teleinformatics. The department is successful in obtaining sufficient funding from various research

and education projects. In 2009 the research and development teams in the department were involved in projects relating to basic and applied research in the total amount of nearly 43 million CZK. A research team is engaged in providing up-to-date multimedia services via mobile and wireless networks. 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. WESTCOM s.r.o., ENJOY s.r.o., SEV Litovel, URE, Academy of Sciences, MEGa-Měřicí Energetické aparáty, s.r.o., GTS Czech a.s., ApS Brno, s.r.o., AIS s.r.o. and Sattarn Holešov. The practical outcome of the research is the development of user-friendly videoconferencing systems, modular architecture for information and videoconferencing systems, the development of universal architecture for DTV multicast for IP networks and other. The department conducted the international project European Tempus – Erasmus Mundus for implementation of the programme Teleinformatics in Syria.

Major Achievements

The main research interests of the department are communication systems focused on media informatics, and support systems for medical technology. In 2009 research was focused on 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 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 network 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 medical data transmission and processing and implementation of algorithms for processing 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 network, data network for data acquisition and control in industry (waterworks, sewage plants, heating plants, transport).

Design and optimization of algorithms for digital processing of signals (digital filters, signal detection, harmonic 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, control of digitally controlled signal sensors and steppers).

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 speech 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-T11/075

Investigator: Jiří Mišurec

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

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

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

Investigator: Dan Komosný

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

Investigator: David Kubánek

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

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 and Development of Internet Telephone Exchange– MPO FT-TA3/011

Investigator: Zdeněk Smékal

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

Investigator: Kamil Vrba

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

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

Investigator: Kamil Vrba

Multitone Modulation Implemented through Overlapping Filter Bank – GAČR 102/09/1846

Investigator: Pavel Šilhavý

Automatic Classification of Digital Modulations - GAČR 102/09/P626

Investigator: Anna Kubánková

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

Investigator: Karol Molnár

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

Multiple Use System of Digital Processing of Multimedia Signals – MPO FR-TI1/495

Investigator: Jiří Schimmel

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

Investigator: Zdeněk Smékal

Selected Publications

HERENCŠÁR, N.; VRBA, K.; KOTON, J.; LATTENBERG, I. The conception of differential-input buffered and transconductance amplifier (DBTA) and its application (IF=0.436). IEICE Electronics Express, 2009, vol. 6, no. 6, pp. 329-334. ISSN: 1349- 2543.

KOTON, J.; VRBA, K.; HERENCŠÁR, N. Tuneable filter using voltage conveyors and current active elements. INTERNATIONAL JOURNAL OF ELECTRONICS, 2009, vol. 96, no. 8, pp. 787-794. ISSN: 0020- 7217.

HERENCŠÁR, N.; VRBA, K.; KOTON, J. A new electronically tunable voltage-mode active- C phase shifter using UVC and OTA. IEICE Electronics Express, 2009, vol. 6, no. 17, pp. 1212-1218. ISSN: 1349-2543.

HERENCŠÁR, N.; KOTON, J.; VRBA, K.; LAHIRI, A. New voltage- mode quadrature oscillator employing single DBTA and only grounded passive elements. IEICE Electronics Express, 2009, vol. 6, no. 24, pp. 1708-1714. ISSN: 1349- 2543.

MLÝNEK, P.; KOUTNÝ, M.; MIŠUREC, J. The Communication Unit of Measuring Device in Power Engineering. WSEAS TRANSACTIONS on COMMUNICATIONS, 2009, vol. 1, no. 8, pp. 1-11. ISSN: 1109- 2742.

HAJNÝ, J.; PELKA, T.; ZEMAN, V. Flexible authentication framework with bound authentication and authorization. WSEAS TRANSACTIONS on COMMUNICATIONS, 2009, vol. 2009, no. 8, pp. 143-152. ISSN: 1109- 2742.

SMÉKAL, Z.; ČERMÁK, J. Undertermined Blind Source Separation Using Linear Separation System. Lecture Notes in Computer Science (IF 0,513), 2009, vol. 2009, no. 5398, pp. 300-305. ISSN: 0302-9743.

ATASSI, H.; RIVIELLO, M.; SMÉKAL, Z.; HUSSAIN, A.; ESPOSITO, A. Emotional Vocal Expressions Recognition using the COST 2102 Italian Database of Emotional Speech. Lecture Notes in Computer Science (IF 0,513), 2009, vol. 2009, no. 5967, pp. 1-14. ISSN: 0302- 9743.

KUBÁNKOVÁ, A. Design and Analysis of New Digital Modulation classification method. WSEAS TRANSACTIONS on COMMUNICATIONS, 2009, vol. 8, no. 7, pp. 628-637. ISSN: 1109- 2742.

KOUTNÝ, M.; ŠILHAVÝ, P.; HOŠEK, J. Data Collection System Design in SSM Networks with Unicast Feedback: Server Message Definition. WSEAS Transactions on Information Science and Applications, 2009, vol. 6, no. 2, pp. 253-262. ISSN: 1790- 0832.

ZEZULA, R. Watermarking of Audio Signals through Changing the Tonal Components in DWPT domain. WSEAS Applied Informatics & Communications, 2009, vol. 2009, no. 1, pp. 104-108. ISSN: 1790- 5117.

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

Laboratory of Wireless Computer Networks and XoIP (operation in wireless computer networks based on standards IEEE 802.11, access part of second generation mobile networks using Motorola station and controller and on voice and video images transmission along IP network including QoS implementation, Karol Molnár, Vít Novotný)

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, Ladislav Káňa)

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 including digital processing of multimedia data - Petr Číka)

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

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

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

Laboratory of Communication Systems (instruction in the theory of systems and signals, and theory of communication, Jiří Schimmel)

Laboratory of Sensoric Systems (measurement of the characteristics of sensors, smart sensors and circuits, sensor signal processing, demonstration line of industrial system ADAM, research of ICA and BSS, Ivan Rampí)

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

Laboratory of High-Rate Communication Systems (research and instruction in high-rate data transmission up to a minimal rate of 10 Gb/s, Vladislav Škorpil)

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

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

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)

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)

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

Department of Theoretical and Experimental Electrical Engineering

Doc. Ing. Pavel Fiala, Ph.D.

Head

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Professors

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

Associate Professors

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.

Lecturers

Ing. Petr Drexler, Ph.D., Ing. Eva Kroutilová, Ph.D., Ing. Miloslav Steinbauer, 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. Michal Hadinec,
Ing. Tomáš Jirků, Ing. Radim Kadlec, Ing. Tomáš Kříž, Ing. Lukáš Machálka, Ing. Petr Marcoň, Ing. Jan
Mikulka, Ing. Ksenia Ostanina, Ing. Zdeněk Roubal, Ing. Zoltán Szabó, Ing. Michal Zycháček

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 Krajčirovičová, Ing. Tomáš Kříž, Veronika Raabová, Ing. Jan
Rychnovský, Ph.D., Ing. Zoltán Szabó

Main Interests

Research is focused on impedance tomography methods in numerical modelling. Research results were published in international journals and presented at international conferences. Cooperation was maintained with the TU Wien. There was a meeting and joint research on MEMS. The department cooperated with Spacek Labs Santa Barbara, California USA in a project. Cooperation was also maintained with the Institute of Instrument Technology, Academy of Sciences, Brno in evaluation of MR images with support of numerical modelling. The focus is on interpretation of strongly disturbed or deformed NMR signals. Joint activities with research groups at Masaryk University, Mendel University, Academy of Sciences of the Czech Republic were extended. The department was involved in MPO projects concerned with the basic and applied research of unique measuring methods of identification of noise effects and partial charges in electric power transformers with transmission of over 150 MVA.

Research plans were focused on the basic research of heterogeneous structures for application in a safety program or special sources of electric energy in nanomaterial engineering. The basic research of numerical models of elementary mass particles, in cooperation with Academy of

Sciences, Institute of Instrument Technology. The department's staff is involved in research of methods for measuring concentration of air ions, in cooperation with Faculty Hospital, Brno-Bohunice. Basic and applied research on measurement of solitary electromagnetic pulses as a support for solutions of the above projects. Another research area were EMC fabrics for construction industry, development of lighting and illumination techniques for biological laboratory research. Basic research was conducted with support from the MPO project on numerical methods and modelling of relativistic electrohydrodynamic models of pulse sources, and in cooperation with PROTOTYP A.s. research into problems of single processes. Research into signals was focused on holographic methods of recording in the range of 1 to 1000 MHz, building of a workplace for spectral analysis of low-level or ultrawideband signals. Special MR techniques have been dealt with and their relationship reference to metamaterial components.

As a part of the department the Institute of Experimental Technology 1 and 2 operates with focus on human resources.

Major Achievements

Unique research results on MR technology for measurement of gradient magnetic fields and filtering technology on the basis of wavelet transformation and filter banks were presented. Also presented were the outcomes of the theoretical research of impedance tomography technology for applications in biomedical engineering. Designed and experimentally verified were unique algorithms for analysis of combined electromagnetic fields and electromagnetic-hydrodynamic models. The department was granted an international patent PCT in harvesting – design of a microgenerator. Implemented and completed were modules for construction of a antireflective chamber in the range 0.5-10GHz. Also implemented were prototypes of special light sources for basic biological research at Mendel and Masaryk University. Constructed and calibrated was a measuring apparatus for measurement of concentration of air ions for research at Mendel

University. A number of numerical analyses were completed for ABB s.r.o. with an international opposition procedure for sensors in the multiprocessor grid station WOOD, www.utee.feec.vutbr.cz. A numerical model of an optimal metamaterial structure for first experimental implementation with tunable structures and operating samples of metamaterial structures in the basic research of novel NMR techniques were designed. The basic research of noise spectroscopy was commenced and in cooperation with a workplace in the USA a technical text was prepared. A shielded antireflective electromagnetic laboratory was built for measurement of pulse electromagnetic fields mainly. Equipment of research laboratories for dynamic laser interferometry was completed. Cooperation with Prof. Hiroshi Kikuchi of Tokyo University in the basic research of microscopic models of electrohydrodynamics focused on biomedical applications

continued. Research results were presented at the Progress In Electromagnetics Research Symposium MIT Boston USA, in China and in

Moscow in the framework of the Electromagnetic Academy Cambridge, USA.

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

MICHAL, V.; SEDLÁČEK, J. Low - pass biquadratic filters with high suppression rate. Electronics Letters, 2009, vol. 45, no. 12, pp. 591-593. ISSN: 0013- 5194.

SZABÓ, Z.; SEDLÁČEK, J. A Simple Economical Building FDNR Blocks with Modern Operational Amplifiers. Progress In Electromagnetics, 2009, vol. 2009, no. 2, pp. 1056-1060. ISSN: 1559- 9450.

SZABÓ, Z.; BARTUŠEK, K. Air Ions Concentration Influence on Bacterial Colony Count in the Dwelling Spaces. Progress In Electromagnetics, 2009, vol. 2009, no. 2, pp. 1053-1055. ISSN: 1559- 9450.

SZABÓ, Z.; FIALA, P. Characterisation and Testing Shielding Fabrics. PIERS ONLINE, 2009, vol. 2009, no. 7, pp. 609-612. ISSN: 1931- 7360.

SZABÓ, Z.; SEDLÁČEK, J. A Simple Economical Building FDNR Blocks with Modern Operational Amplifiers. PIERS ONLINE, 2009, vol. 2009, no. 7, pp. 1056-1060. ISSN: 1931- 7360.

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

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

Laboratory of Electrical Engineering (instruction in Electrical Engineering 1 and 2, Milan Murina)

Computer Laboratory for 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)

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

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

Laboratory of Prototypes Development (laboratory for semester and year projects and development of prototypes, 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, Jiří Sedláček)

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

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

Department of Power Electrical and Electronic Engineering

Doc. Ing. Čestmír Ondrůšek, CSc.

Head

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Professors

Prof. RNDr. Vladimír Aubrecht, CSc.
Prof. Ing. Vítězslav Hájek, CSc.
Prof. Ing. Jiří Skalický, CSc.

Associate Professors

Doc. Ing. Bohuslav Bušov, CSc.
Doc. Ing. 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. Bohumil Klíma, Ph.D., Ing. Jaromír Vaněk, CSc., Ing. Jaromír Vrba, CSc.,
Ing. Ondřej Vítek, Ph.D., Ph.D., Ing. Marcel Janda, Ph.D.

Ph.D. Students

Ing. Mustafa Osman Elrayah Aboelhassan, Ing. Josef Běloušek, Ing. Radoslav Cipín, Ing. Ramia Deeb,
Ing. Jan Hejkrlik, Ing. Mohammed Hussain Mohammed, Ing. Rostislav Huzlík, Ing. Jindřich Hvězda, Ing.
Ondřej Kasal, Ing. Jan Knobloch, Ing. Zoltán Kocsis, Ing. Jiří Kurfürst, Ing. Jan Kuzdas, Ing. Aleš
Mikulčík, Ing. Vladimír Minárik, Ing. Jan Němec, Ing. Jan Novotný, Ing. Erik Odvářka, Ing. Tomáš Ondrák,
Ing. Ivo Pazdera, Ing. Martin Pochyla, Ing. Petr Procházka, Mousa Sattouf, Ing. Miroslav Skalka, Ing. Jan
Tůma, Ing. Eva Vítková, Ing. Jiří Vondruš

Administrative and Technical Staff

Ing. Dalibor Červinka Ph.D., Josef Daněk, Ph.D., Ing. Zdeněk Feiler, Ph.D., Zdeněk Liška, Ph.D., Alena
Šmídková

Main Interests

The department provides instruction in the study area Power Electrical and Electronic Engineering in the Bachelor and Ph.D. programmes and in the study 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 modern disciplines in the focus of attention are power electronics including DC/DC pulse transducers (switching sources), DC/AC alternators, rectifiers etc. Another area of interest is the theory of regulation and control by means of DSP.

In basic research, the department deals with theoretical modelling of radiation energy transport in thermal plasma. In applied research the main area 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, asyn-

chronous and DC machines. The department's staff have experience in the development of special machines such as startergenerators, controlled magnetic bearings, levitation systems. A longterm systematic research and innovation of the sliding contact has been conducted. 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 Náchoď, EMP Slavkov u Brna, JULI Motorenwerk Moravany, VUES Brno a.s., IVEP Brno, ŠLP Křtiny a.s. and other.

Major Achievements

In 2009 the department was the chief coordinator of work on the project of a research centre of research and exploitation of renewable energy sources (CVVOZE) in the framework of the Operational Programme Research and Development for Innovation. The project with the proposed budget of over 300 mil. CZK was positively evaluated on national and international level and will start at the beginning of 2010.

Within the framework of the MPO project from the programme IMPULS FI-IM3/035 a prototype of a synchronizing system for control of two independent wipers was completed. The project finished with a final opposition procedure that took place in March 2009.

Publications in the IEEE journal Transactions on Industrial Electronics: J. Leuchter, P. Bauer, V. Řeřucha, V. Hájek 'Dynamic Behavior Modeling and Verification of Advanced Electrical Generator Set Concept', January 2009, Vol. 56 No.1, ISSN 0278-0046, pp. 266-279. In 2009 the MPO project no. FR-TI1/061 'Application of the

VUT 001 Marabu plane driven from hydrogen fuel cells' started in cooperation with Institute of Aerospace Engineering of the Faculty of Mechanical Engineering and Jihlavan Airplanes.

Instruction started in the new laboratory of information technology at the premises Technická 8. The laboratory was funded from the FRVŠ project no. 728/2008 – 'An Innovation of the Laboratory of Computer Design, Animation and Visualization'.

Cooperation with EÚ OFE FSI resulted in certification of two utility samples - Institute of Instrument Technology, Prague, Czech Republic PUV 2009-21543 a PUV 2009-21561: Membrane and Piston Pumps (mainly blood pumps).

A prototype of a synchronous machine 2.5MW. was produced in the framework of the MPO project from the programme IMPULS FI-IM4/030 'Higher Output Synchronous and Asynchronous Machines', in cooperation with SIEMENS Elektromotory Drásov.

Major Research Projects

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

Investigator: Ondřej Vitek

Assessment of Constructions Exposed to Extremely Rapid Loading – FT-TA3/073

Investigator: Čestmír Ondrůšek

Intelligent Diagnostics of Electrical Machines – GAČR 102/08/1118

Investigator: Čestmír Ondrůšek

Low-Load Drive of Lift with Switched Reluctance Motor – MPO FI-IM3/153

Investigator: Vítězslav Hájek

A Device for Efficient Disposal of Explosive Objects– MPO FT-TA4/072

Investigator: Čestmír Ondrůšek

Direct Drive for Material Handling Truck – MPO FT-TA3/120

Investigator: Vítězslav Hájek

Cost Rationalization in Small Electric Machines – MPO FI-IM4/053

Investigator: Vítězslav Hájek

Starters for Engines of Aircraft Models– MPO FI-IM4/087

Investigator: Vítězslav Hájek

Higher Output Synchronous and Asynchronous Machines- Platforma A – MPO FI-IM4/030

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

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

Investigator: Vítězslav Hájek

Special Cast Motors for Water Pumps – MPO FR-TI1/017

Investigator: Vítězslav Hájek

Gas Generators – MPO FR-TI1/068

Investigator: Čestmír Ondrůšek

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

Investigator: Čestmír Ondrůšek

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

Investigator: Vítězslav Hájek

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

Investigator: Vítězslav Hájek

Selected Publications

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, 2009, vol. 14, no. 1, pp. 55-69. ISSN: 1093-3611.

LEUCHTER, J. BAUER, P. ŘEŘUCHA, V. HÁJEK, V. Dynamic Behavior Modelling and Verification of Advanced Electrical - Generator Set Concept. IEEE Transactions on Industrial Electronics, 2009, vol. 2009(56), no. 1, pp. 266-279. ISSN: 0278- 0046.

AUBRECHT, V.; BARTLOVÁ, M. Net Emission Coefficients of Radiation in Air and SF6 Thermal Plasmas. Plasma Chemistry and Plasma Processing, 2009, vol. 29, no. 2, pp. 131-147. ISSN: 0272-4324.

KUCHYŇKOVÁ, H.; HÁJEK, V. New Trend in Education - Virtual Model of Electrical Motors. Zeszyty Problemowe - Maszyny Elektryczne, 2009, vol. 83, no. 83/ 29, pp. 157-160. ISSN: 0239- 3646.

HADAŠ, Z.; ONDRŮŠEK, Č.; SINGULE, V. Increasing Sensitivity of Vibration Energy Harvester. Proceedings of SPIE, 2009, vol. 7362, no. 1, pp. 1-8. ISSN: 0277- 786X.

Bachelor Degree Programme

Automobile Electric and Electronic Systems
(Vítězslav Hájek)

Electrical Drives (Josef Kolářný)

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 Visualization 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 Kolářný)

Electrical Controlled Drives (Jiří Skalický)

Plasma Physics and Diagnostics (Vladimír Aubrecht)

Laboratory of Electrical Machines and Apparatuses (Marcel Janda)

Laboratory of Electric Drives (Josef Kolářný)

Microcomputer Control of Electrical Drives
(Bohumil Klíma)

Mikromachines (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

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

Laboratory of Mechatronics (Čestmír Ondrůšek)

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)

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

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

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

Sliding Contact Laboratory (sliding contact research for various electrical machines, František Veselka)

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

Laboratory of Electrical Drives (research of nonlinear dynamic systems with changed parameters, Josef Koláčný)

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

Laboratory of Microprocessor Technology (control of converters for ecological transport systems by digital signal processors, Bohumil Klíma)

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